Deliverable Proof – Reports resulting from the finalisation of work package 1 - EIT-BP2020

Name of KIC project the report results from that contributed to/ resulted in the deliverable	201413-A2000 OS-Pan-European Approach on Sustainable Heritage: Regeneration by a retrofitting economy
Name of report	Summary report describing the collection of pan-European retrofitting measures for historic buildings.
Summary/brief description of report	In this report we describe the: 1. Pan-European retrofitting measures for historic buildings; for which De Groene Grachten shared their knowledge with E-Zavod and FCT-NOVA. We describe the activities undertaken to gather the necessary content. Including identifying and selecting building typologies. 2. In this chapter we describe the socio-economic context for the two countries we are scaling the Green Menu to. We have added a COVID-19 impact analysis for our three countries. 3. The third chapter is the outcome of our customer journey analysis, including the visualizations. In the appendixes you find: 1 Selection of Building Typology Slovenia 1 A Selection of Building Typology Portugal 1 B List of measures for Portuguese context 1 C List of measures for Slovenian context 1 D List of measures for the Netherlands 1 E Content Slovenian Green Menu 1 F List of new measures for Portugal 3 A Customer Journey Map 3 B Customer Journey visualisation overview
Date of report	31/12/2020

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Summary report

1 Pan-European retrofitting measures for historic buildings

Project PAS2020 – Pan-European Approach on Sustainable Heritage: Regeneration by a retrofitting economy (co-funded by the EIT Climate-KIC) – aims to promote systemic transformation, job creation and community resilience. Based on the successful online platform Green Menu for Dutch historic buildings, PAS2020 partners developed 3 country specific (The Netherlands, Slovenia and Portugal) one-stop-shops for retrofitting that are planned to be replicated at EU scale. The following steps were taken: i) selecting country appropriate building typologies, ii) identifying key building characteristics (e.g. bearing structure, visual features, energy consuming equipment, layout), iii) gathering data on financial instruments, policy issues, historical values and technical measures, iv) identifying bottlenecks, and v) mapping local retrofitting economies context and challenges.

1.1 Selecting building typologies

SLOVENIA

The first phase of WP1 included the selection of a suitable building typology for which the initial country specific Green Menu toolbox has been developed. The typology had to meet the criteria of high representation in the country and of historic relevance of the typology.

For Slovenia, the chosen building typology is the pre-1945 multilevel, single-family terraced house, which is representative for all historic centres of Slovenian cities and towns. We chose it because it represents an important cultural legacy, defining the look of our historic city centre as well as being an important housing typology. Many of these buildings are also protected as cultural heritage.

The typology selection was based on Slovenian building typology classification, developed as part of European TABULA project.

To support the graphic design of buildings (3-D model) and measures, visual and descriptive material was provided to designers, for respective building typology and measures. Online meetings to finalise design details were also held.

Please check Appendix 1 for further details on the methods and results from the process of selecting an appropriate building typology for Slovenia, as well as a comprehensive set of pictures that highlight the exterior and interior features of the buildings.

PORTUGAL

For the Portuguese case, due to large regional differences, a uniform and iconic building typology from Lisbon was selected as a showcase of the process. Based on previous work by the FCT-NOVA's team on energy efficiency and on energy poverty vulnerability mapping, the typology of a single-family house built before 1919 was chosen for analysis and for representation on the 3D model. Nevertheless, a significant portion of the information available on the Green Menu is also applicable to other similar building typologies.

Three variables were used to identify the selected typology of buildings within the city of Lisbon – "built before 1919", "1-2 dwellings" and "1-2 floors" – based on detailed data from Portugal Statistics. Local hotspots of the typology were mapped using the processed data from Portugal Statistics and Google Maps. Buildings' visual features were collected mostly through Google Maps, since Covid-19 lockdowns advised against on-site visits. These external visual features were highlighted for the design of a 3D model. Indoor features were collected on real estate companies websites, where ads for the sale and rental of homes that belong to the selected building typology are easily found.

Please check Appendix 1 A for further details on the methods and results from the process of selecting an appropriate building typology for Portugal, as well as a comprehensive set of pictures that highlight the exterior and interior features of the buildings.

1.2 Knowledge exchange

In august we started with the exchange of knowledge on financial instruments, policy issues, historical values and in depth technical know-how on historic building retrofitting. The first step was an assessment of the green measures on the Green Menu in the Netherlands and how these worked for Slovenia and Portugal. We quickly realized that changes to the structure were necessary. See attached the list of energy retrofitting measures for each country

- 1 B List of measures for Portuguese context
- 1 C List of measures for Slovenian context
- 1 D List of measures for the Netherlands

THE NETHERLANDS

De Groene Grachten has developed the Green Menu in 2013 and expanded since then. In 2020 within the Green Light District project the website was connected to the newly developed database. In order to scale the Green Menu we needed to translate the data in this database and make it suitable for the context of Portugal and Slovenia. This data consists not only of technical know-how on historic building retrofitting but also holds financial instruments, policy issues, historical values, cost-profit calculations and information that helps the user with every step of the customer journey. De Groene Grachten shared this information through formats, instruction documents and the English version of the Green Menu (www.degroenemenukaart.nl/en) .

De Groene Grachten could also benefit from the knowledge of the other partners. For instance, in the Netherlands traditionally there is a lot of focus on heating systems, but in the other countries cooling is just as important. In the Netherlands heat waves are just starting to be a problem with consequences as an increase in energy use due to the use of air conditioning systems and drought problems. For this reason it was interesting for the Netherlands as well to learn more about these cooling solutions.

SLOVENIA

Based on the Green Menu blueprint, developed by de Groene Grachten, the process of developing the content for Slovenian version has been defined.
In terms of technical content the partners have established that while some measures captured in the blueprint are applicable in all cases, there is a need to thoroughly review the whole inventory and adjust it so that it better reflects the conditions of each local context.

The technical measures were translated and reviewed in detail. Adjustment and additions were made to contextualize them better. In addition new measures were added that have not been applied in the blueprint in Slovenia many of those were related to windows and central heating systems. Some of the measures featured in the blueprint version were also not applicable in Slovenian context and were hence not included. Financial and policy tools are differing widely across the three contexts so much work has been invested to scope and develop content for these sections of the tool guided by the predefined structure.

While the structure of the menu remains the same as the blueprint, Slovenian version puts additional emphasis on high-lightning and detailing the advice on the renovation process from planning to execution, as this is perceived as one of the major barriers to renovations. Also high-lighted here are the many regulations that apply to renovating a historic house and need to be complied with.

In total there are 116 technical measures, tips, points of attention, and innovations, 25 financial support mechanisms, and 13 different policies included in the Zeleni Meni platform. See appendix E

PORTUGAL

Technical measures were evaluated, selected, and detailed using the original Dutch Green Retrofitting Menu and previous work by the FCT-NOVA team in the Interreg Med PrioritEE project, EnACT initiative and others. Financial and policy tools, as well as regulations, were collected in synergy with other related projects.

In total, 130 technical measures, tips, points of attention, and innovations were selected and incorporated on the website. Of this set, 97 were transferred from the Dutch Green Menu and adapted to the Portuguese context (requiring from small to deep modifications); indicating that a high level of knowledge exchange was possible even if national contexts vary. Knowledge exchange with Slovenian partners also proved important to understand common similarities and differences from the Dutch Green Menu.

On the other hand, 35 measures of the original Dutch set were considered as not applicable to the Portuguese context or to the selected building typology. A few differences from the Dutch set merited the creation of a specific structure for the Portuguese Green Menu (e.g. larger emphasis on cooling and end-use appliances). 33 new measures were specifically written for the Portuguese Green Menu, although they will also probably prove themself useful to other countries (*e.g.* cooling is becoming more widespread in nordic countries due to increasingly common heat waves related to climate change), and can be found in Appendix 1 F. User-friendly calculation tools for 12 key measures were also created by the Portuguese team, adapted to the required format for upload to the Green Menu and are available on the online platform.

In total, 12 Portuguese financing mechanisms and tax benefits were detailed for the Green Menu, and are available in the financing section of the platform. National and municipal regulations were identified specifically for each measure, taking in consideration heritage protection as well as more general legislation. The Portuguese Green Menu also features sections on Counselling and Implementation which were inspired by the Dutch Menu and adapted to the Portuguese context including, for example, a set of useful links for homeowners that wish to retrofit their house.

2 Socio-economic context – challenges and opportunities for building renovation

Global greenhouse gas emissions from the building sector have more than doubled since 1970. In Europe, buildings are responsible for 40% of energy consumption and 36% of emissions. Approximately 80% of existing European buildings will still be used in 2050 and 75% of this stock is inefficient. As such, a low-carbon transformation of the building sector and the refurbishment of the existing building stock is a key component of the EU Green Deal and related strategies and programmes.

In this context, the EU has highlighted energy efficiency for the economic recovery from the COVID-19 pandemic. Building renovation is a key investment area and current very low renovation rates (approximately 1%) are insufficient. The European Green Deal foresees a ‘Renovation wave’ initiative, which will scale up current building retrofitting rates. Renovation at urban scale will enable a wider range of solutions, paving the way for Positive Energy Districts. Improving buildings performance will alleviate energy poverty and improve comfort, while saving energy and reducing emissions.

SLOVENIA

Slovenia is one of the smaller EU member states with a population of just over 2.1 million in 2018, or 0.4% of the EU28 population. The GDP represented 0.3% of the EU28 GDP. As a proportion of the total consumption, the monthly housing and energy expenditures amounts to around 20%.

The construction sector accounted for about 6% of Slovenia's GDP in 2018, when some €1.4 billion was spent in building construction-related expenditures. Since 2005 the total investments in building construction have increased at an average annual rate of +3.2%. (BMB).

In Slovenia, buildings account for about 30% of energy use and likewise, a corresponding share of CO_2 emissions. In addition, Slovenia is characterised by aged housing stock, with almost 20% of housing built pre-1945, over 40% pre-1970 and 76% pre-1990. Overall, this means that the great majority of Slovenia's housing stock is over 30 years old and to a large extent in need of renovation.

Residential floor area makes up 73% (64 million m^3) of the entire building stock. In the residential category, single-dwelling buildings (SDBs) make up 72% of the building floor area, and the remaining 28% is made up of multi-dwelling buildings (MDBs). Over 91% of the residential dwelling stock in Slovenia is privately owned by natural persons and around 81% of the residential dwellings are owner-occupied. (DESPS 2050, BMB) It is estimated that around 50.000 residential buildings are protected as part of different heritage protection regimes.

Household energy consumption represents 22.5% of the total final energy consumption. Space heating is the dominant usage of residential energy (63.7%), followed by water heating (16%) and lighting and appliances (15.8%). About 40% of SDB and 8% of MDB or about 125.000 households are living in low energy efficiency homes (Class F and G) - high E demand, high E costs. In addition, a high share of total population (21%) is living in a poor-quality dwelling (leaking roof, damp walls, floors or foundation, or rot in window frames of floor).

Slovenia employs different fiscal and regulatory policy instruments to target energy efficiency and GHG emission reduction. The key legislations supporting this are the Energy Act of Slovenia (EZ-1), the Rules on Efficient Use of Energy in Buildings (PURES 2), and most recently the Integrated National Energy and Climate Plan of the Republic of Slovenia (NEPN) and the Long-term Strategy for Energy Efficient Renovation of Buildings (DSEPS 2050).

The key goals and targets relating to housing sector within these policies are:

- Reduction of GHG in buildings by at least 70% by 2030
- Increase the use of RES to at least 2/3 for energy use in buildings
- Renovation of most buildings by 2050
- Carbon neutrality by 2050

According to DSEPS 2050, Slovenia will need to renovate residential buildings at an avg. rate of about 4,5% per annum by 2030 to meet the set targets. Renovation rates for the past 3 years stand at around 2% per annum.

Some climate modelling analysis suggest that Slovenia lies in a geographical area that is the meeting point of two climatic zones that are most affected by global warming. The two zones are the northern Mediterranean and the Alpine region. Ljubljana, the capital of Slovenia is

considered to become the fastest-warming city in the world according to Swiss institute Crowther Lab projections. In addition to mitigating climate change impacts strong adaptation efforts will be necessary including in the housing sectors, where housing stock will need to be futureproofed for new climatic conditions.

PORTUGAL

In Portugal, buildings account for 32% of energy consumption (households 18%); being highlighted in key energy and climate policies. Most Portuguese dwellings, particularly in historic areas, have very low construction quality and require some degree of retrofitting. Main problems include indoor air pollution, humidity problems, structural problems, low thermal comfort, and energy poverty. Previous research by FCT-NOVA's team shows the Portuguese housing stock low energy performance and lack of thermal comfort. In Portugal, 19,4% of the population cannot adequately heat their homes and 75% of existing energy certificates for residential buildings are C class or lower and 19. Thus, building retrofitting has been highlighted as the future of the construction industry.

Historically the renovation market in Portugal was extremely residual. Since 2014, urban centers saw a boom in building retrofitting, driven by tourism, gold visas, and gentrification. However, retrofitting was not consistently done according to energy performance regulations due to an exceptional regime (from 2014-2019) that deregulated the market. Nevertheless, building retrofitting rates in Portugal remain very low, especially when compared with the values expected in the Renovation Wave. The lower economic capacity of Portugal, compared with other EU countries, is a decisive factor. Financial barriers hinder the ability of building owners to invest, lead to delays, and often steer decision makers towards non-optimal solutions. Other barriers include slowness of licensing, small size of the labor force, lack of knowledge, and insufficient information. Looking to the future, the distribution of recovery funds can be a fantastic stimulate for renovation, if past mistakes are avoided.

For the residential sector, socio-economic variables are key for energy efficiency improvement and energy poverty mitigation. Even though saving potential for Portuguese dwellings is up to 50% of consumption, according to studies by FCT-NOVA, current rates of improvement are insufficient. Ensuring a fair 'Renovation wave' in Portugal requires tackling the worst performing buildings (e.g. constructed before energy performance codes were in place) and those stricken by energy poverty. Heritage residential buildings (built before 1945) account for 16% of the Portuguese building stock and retrofitting them is a particularly complex process which demands multiple levers of change to be all in harmony.

COVID-19 impact

The COVID-19 pandemic is exacting a severe social and economic toll on Europe. By the end of 2020, more than half million people will have lost their lives in Europe, while nearly 26 million people are estimated to have been infected with the virus. Early spring lockdowns, voluntary

social distancing, and associated disruptions in supply chains and lower demand led to a record collapse in economic activity. Real GDP fell by about 40 percent in the second quarter of 2020.

The pandemic's toll on Europe could have been much larger without the unprecedentedly strong and multifaceted response to the crisis. Across Europe, governments deployed large fiscal packages to support households and firms, with job retention programs preserving at least 54 million jobs. Central banks embarked on substantial monetary easing through both conventional and unconventional means, to support the flow of credit and prevent financial market disruptions. (IMF, 2020). Building retrofitting can play a key role in the European economic recovery from Covid-19 if the market is well aligned.

THE NETHERLANDS

When the COVID-19 pandemic hit the Netherlands of course the first concern was about the health impact. But in the lockdown the concerns for the impact on other sectors such as our economy and climate plans grew. The banks predicted a new economic crisis which brought the housing crisis of 2008 in mind. This crisis had a huge impact on the construction sector, there were almost no new built houses. Which has contributed to a shortage of houses in the Netherlands, which in turn has caused a big increase in market value of houses. Another big factor is the low interest, which makes it attractive to close a mortgage for your house. All of this was expected to change because of the COVID-19 crisis. Buyers would delay their buying of a home, the interest rate would go up and investors would lack the financial means to invest in new projects so the construction sector would decrease again.

In march we noticed an immediate decrease in projects for De Groene Grachten. Immediately in the first week of the lock down home owners called that they didn't need our services anymore. The reason for this was on the one hand they feared for their health and wanted to limit the visitors into their home. Others wanted to wait on the effects of the lock down on the economy in the coming months. After a while we also noticed a decrease in projects for real estate companies. Almost every company has made budget cuts in order to survive the crisis. In order to do so, sustainable retrofittings are postponed or even cancelled.

In order to tackle the first problem we decided to develop means for helping people in a safe and healthy manner. Which led to an online campaign on social media in which we gave tips for energy saving while working at home. With each tip we referred to De Groene Menukaart (the Green Menu) where people could find more energy savings tips and energy saving measures. For our Green Light District project we started with consultation sessions online. And for our energy scans we started with intakes by Skype. We learned that intakes still require a site visit so we took measures to do this in a safe manner. All of our advisors wear face masks, we only travel by car (not by public transport), we clean our hands before and after the visit and we remain always at a distance from our client. When possible we transfer the key of the property outside and visit the property by ourselves.

Overall in the Netherlands we saw a big shift from offline events, consults and meetings to everything online. We noticed our stakeholders had an increasing need for online communication means about sustainable retrofitting. Also they saw an opportunity to share the experiences and knowledge gained in their projects with a wider audience. For instance

the Amsterdam Region had funded several energy scans for cultural organizations. The idea was to present the outcomes of these scans in an event where cultural organizations could sign up for. The event was cancelled because of the COVID-19 restrictions. Therefore the Amsterdam Region decided that they would develop a Green Menu for Theaters and a Green Menu for Museums. So the information would be available for all cultural organizations. So instead of sharing the information just one time during an event, the information now will be easily accessible over a longer period of time and the information can be updated and added to. De Groene Grachten has started more similar projects, scaling the Green Menu to 21 municipalities in the province of Overijssel and to the province of Groningen.

The Dutch government has opened a lot of extra financial funds to stimulate the economy. For instance the grants for energy savings for homeowners were temporarily raised with 20% in order to stimulate home owners to invest in 2020. These additional financing schemes were promoted through the Green menu platform and have proven to be quite popular with erdisal home owners. Also we launched a Selfscan tool with the National Restoration Fund which informs people of the suitable retrofitting measures together with the financial possibilities.

PORTUGAL

In 2020, Covid-19 changed everything and brought on a tsunami of uncertainty to the urban renovation market. At the moment, the construction sector seems mostly immune to the crisis, outperforming many other economic activities and even growing 2.5% in 2020 (in a year where Portuguese GDP is estimated to have fallen 9.3%). Ongoing dynamics of the retrofitting market could be maintained if the pandemic came under control relatively fast. Otherwise, in the ever more probable case of a long health and economic crisis brought on by Covid-19, the renovation market may crash along with the Portuguese economy. European recovery funds will be important to leverage the Portuguese building retrofitting market in the aftermath of the pandemic. Large scale renovation of the Portuguese Building stock is crucial to improve energy performance and living standards.

Covid-19 has had a tremendous impact on everyday life and economic activities in Portugal, consequently leading to changes in energy consumption patterns. With the country on full lockdown in April 2020, compared with April 2019 and according to the Portuguese Energy Observatory, fuel consumption for aviation fell 93%, fuel consumption for private vehicles was halved, services electricity consumption was reduced by 43%, and residential electricity consumption increased by 31% (teleworking playing a major role). In 2020, Portuguese electricity consumption was 3.1% lower than in 2019, due to the impacts of Covid-19. Another lockdown in January 2021, coupled with one of the coldest winters in decades, saw daily residential electricity consumption breaking an 11-year record. Energy poverty in Portugal is a severe societal issue in normal times; mandatory Covid-19 lockdowns and teleworking, plus an extreme cold wave, plus lowering incomes and unemployment may push many more families to energy poverty.

Covid-19 temporarily freezed investors' interest in building retrofitting and may lower families' ability to invest in their house. On the positive side, the pandemic crisis may have shown real estate investors that housing is a more resilient sector than tourism, while the mandatory lockdowns might have revealed to houseowners the retrofitting needs of their dwellings. Covid-

19 also shifted the attention back to the topic of indoor air quality and health protection, which are among the key benefits of building renovation. Innovative business models based on online platforms skyrocketed during 2020.

SLOVENIA

According to the Bank of Slovenia modelling the estimate is that GDP could shrink between 6.2% and 16.1% for 2020 (decline in economic activity during 2009 recession amounted to 7.5%) due to Covid impact.

The outbreak of the covid-19 epidemic, along with austerity measures to contain it in the second quarter of 2020, caused a sharp drop in economic activity. Although many countries have taken measures to preserve jobs, companies have also responded by reducing the number of employees, especially temporary workers, greatly increasing the number of employees on temporary waiting. The fiscal package measures have largely mitigated the impact of the fall in economic activity on the fall in employment and the rise in unemployment. Nevertheless, the unemployment rates have risen with young and less qualified people, especially women, hit the hardest.

The exposure of the business sector to insolvency increased significantly in 2020 with the onset of the coronavirus crisis. The hardest hit are mostly companies exposed to high levels of indebtedness prior to crisis, namely holding companies and leasing companies, companies from manufacturing and professional and technical activities, or micro, small and medium-sized companies in terms of size. In addition to the above, in 2020 the probability of insolvency increased in many companies from service activities, which must be mostly closed due to containment measures. (UMAR, 2020)

The current situation offers however an opportunity to reflect on the future development of both the economy and society in general. The Covid-19 crisis has further demonstrated the importance of investing in more resilient and sustainable socio-economic solutions, including for a healthier indoor and outdoor living environment.

The thousands of billions of EUR that governments are devoting to maintaining jobs, market, and corporate liquidity, are in fact a historic milestone. It is the greatest state interventionism yet that could lead to reshape and restructure of the national economy towards climate neutral, circular, and better capable to revert the ensuing environmental crisis. Related to this socio-economic transformation is also sustainable renovation of buildings to provide healthy, comfortable homes for citizens that have minimal negative impact on the environment and that will help boost the economy in recession.

Solutions for COVID-19

On the Green Menu we serve custom energy advice to homeowners without the need for on-site visits, respecting the Covid-19 imposed social distancing restrictions. With the scaling of the Green Menu we connect the expertise of De Groene Grachten, FCT-NOVA, E-zavod and the financial means of the NRF in creating an easy accessible online platform that combines in depth technical know-how on retrofitting, financial instruments and policies. With the effect of a wider system transformation, regeneration of the retrofitting economy and local job

creation. With the scaling of the Green Menu we created a means for our countries to stimulate and activate home owners to invest in energy retrofitting.

3 Customer Journey

The Green Menu aims to help homeowners with every step of the retrofitting process. In order to do so we mapped the customer journey. In a work session we combined research about the target customer in our countries and the experience of De Groene Grachten with working with these customers for years. For this customer journey we looked at the jobs to be done in every phase, touchpoints, the pains and gains and possible solutions on the Green Menu platform. We also discussed the differences in every phase. With this information we could offer solutions that are tailored to the home owners situation in each country. The full list of the Customer Journey Map entries can be found in Appendix 3 A.

Green Menu customers

For this customer journey we defined the “customer” as a homeowner that owns and lives in a historical building and has an interest in sustainable retrofitting measures. These homeowners face more challenges than the average homeowner because they have to take the historical value and characteristics of their building into account when they renovate their homes. Some historical buildings also fall under heritage protection laws and the customer is limited and required to apply for permits for any changes to the building.

The thing with historical buildings is, they are often unique and therefore renovating these properties is often a tailor made process. And just like the buildings, the owners are also all unique. But, like we do with the information on the Green Menu, we can identify the most common questions, needs and barriers which help us define a customer journey.

The customer journey we designed consists of five phases:

1. Orientation
2. Advice
3. Financing
4. Implementing measures
5. Inspiration

3.1 Orientation

It all starts with an orientation phase into the possibilities and process. Which usually starts with one of the following triggers:

- Awareness of the need for retrofitting;
- changes in the household, such as expecting a newborn or kids moving out of the house;
- someone close to you has implemented green measures and is enthusiastic;
- a high energy bill;
- change of seasons.

In the ‘orientation’ phase our “customer” is looking into the possibilities for energy savings, electricity production and/or increase in comfort. In most cases in combination with a search for solutions for renovation and home improvements for a historic house. Therefore the ‘customer’ wants to know what green measures there are, what it takes to implement them and what they do.

The so called pains in this phase can be summarised as lack of expertise and lack of time and/or motivation. A lack of time is often named as a barrier, but is in fact in most cases a lack of priority. This is especially at the start a big drop out reason. Sustainable retrofitting is a high interest product, which means it takes a (lot of) effort. You might compare it to mortgages or tax declarations, it takes time and effort but in the end it is worth it because you might get a lower interest rate or tax returns. When the customer finally finds the motivation, it is important to know where to begin. Today, just like for other products and services, this starts with going

on the internet. The amount of information about sustainable retrofitting the customer can find online, from numerous organisations and institutes, can be overwhelming. Also a problem can be that the information is contradictory. Here the customer lacks the expertise to judge what information is correct or applicable in his or her situation. The fact that our customer is the owner of a historical building also poses an extra barrier. Because while there is a lot of information about sustainable retrofitting, a big part of that information does not apply for historical buildings. Because of the lack of expertise the customer can feel uncertain to take the next step.

Luckily besides these pains there are also gains to be found in this phase. Such as gaining awareness about sustainable retrofitting measures and the positive outcomes such as increase in comfort, energy savings and a positive impact on the climate. Also the customer can get enthusiastic and motivated by the possibilities and positive user stories of others. By learning more about the topic of energy retrofitting the customer feels better equipped to go ahead with the following steps and plan, implement and assess the retrofit project.

Important solutions the Green Menu offers in this phase:

- Easily accessible (online and free)
- Professional layout and user friendly with navigation through the 3D animated building
- The information in the Green Menu website is clear, easy to read and customer friendly
- All the information - measures, finance, regulation - is combined on one website
- Comprehensive information about the whole process of renovation (insight in the next steps)
- Inspirational user stories from customers that have implemented energy saving measures.

3.2 Advice

In this second phase the customer needs to answer the question: what sustainable retrofitting measures are applicable for my home and situation. And also start to wonder what will be the impact and costs? It is therefore important that the customer gains insight into his situation and can articulate the problems with the house. The customer will look for measures that fit the triggers and motivations that started the process. And filter the best measures for the situation - cost-benefit analysis. With this, the customer might need an independent professional that can help with a technical assessment of the house or that can give advice on measures, financial instruments and applicable regulations.

When looking into the sustainable measures that are tailored to the situation and building type of the customer, the customer can experience difficulties. For instance difficulties in finding and understanding the information. Here it comes down to more than just information about

the sustainable measure. The customer needs to take a lot into consideration, such as the technical limitations, costs and benefits, complex regulations, governmental policy and the right order in which to implement measures. There are experts that offer professional help, such as energy advisors, but it can be a challenge to find these experts.

The most important gain of this phase is getting information that is tailored to the needs and situation of the customer. So the customer feels confident to take the next steps and is reassured that selected measures benefit his or her situation.

The solutions the Green Menu offers are:

- Trustworthy advice about measures that are tailored to the situation of the customer. The information is tailored to the location and building type.
- Well organized links to relevant and trustworthy partners and organizations that can help with energy advice, applying for a permit and other questions.
- Well structured and easy to understand information on financing and regulation with relevant links.
- The customer can customize the cost and benefits to their situation using the calculation tools.
- The customer can select measures and save them in an advisory report.
- Information about how and when to ask for advice.

3.3 Finance

One out of three most important reasons customers don't follow through with implementing sustainable measures is a lack of financial means. An important note with this is that it can be something people give as a reason, but the real reason can be that people don't find sustainable retrofitting worth investing in. Still, a lack of financial means is a real threat to the energy transition. While at the same time rising energy costs are a problem for the group of customers that don't have the means to take measures. This group is already struggling to pay the energy bill every month and would benefit the most from energy saving measures. This is why we distinguish financing as a separate phase in the customer journey.

Lack of financial means to invest in energy retrofitting and other financial priorities is the biggest pain. For our customers the costs of these investments are often higher than they are for other groups because they are in need of customized measures for historical buildings. While this isn't always the case. So we also notice that perception of insufficient return of investment and of high costs can also be the "pain".

Here it is important to note that the COVID-19 likely will have an impact in this phase. It is too soon to oversee what these consequences will be. We expect that people choose low risk

investments. So they need more reassurance that investing in energy retrofittings will have economic benefits such as energy savings or a higher building value.

The biggest financial gains the customer strive for are lower monthly expenses, a positive return on investment, raising the market value of the house and profiting from funding opportunities. For this reason financial instruments can stimulate energy retrofitting. Especially grants with a limited budget or limited duration are a reason for customers to invest now instead of postponing the decision. Fear of missing out on financial opportunities is an important motivation to invest. Also loans with a low interest rate can make it possible for people to invest while they otherwise could not. This is why governments can use grants and loans to boost the local and national economy.

Solutions on the Green Menu platform:

- Easily accessible information on available funding opportunities
- Calculation tools give insight into the costs and possible financial gains
- Information on funding opportunities is connected with the specific measures
- Referrals to websites of funding organisations
- Collection of funding opportunities from different organisations
- List of funding opportunities tailored to the location and building type.

3.4 Implementing sustainable retrofitting measures

Some customer journeys distinguish the design phase and the actual implementation phase. We chose not to make this distinction because in our view these are tightly connected. The flow of this phase consists of planning the implementation in which the following activities can come into play:

- Applying for a permit and collecting all documents needed
- Searching for a contractor with expertise on renovating historical buildings and energy retrofitting.
- Comparing quotations

When the contractor is chosen and, when necessary, the permit is approved, the next activities are:

- Preparing the home or building for the constructions
- Control budget and timelines
- Oversee the retrofitting works
- Checking the final results
- Monitoring results after implementation

The circumstances in which a permit is required differ between our countries and in the Netherlands they may even differ between municipalities. The same goes for the permit application process. No matter the differences we distinguish this as a hurdle for our customers. The application process may require technical drawings and other documents for which the customer needs to hire an expert, which means the customer is spending money

while uncertain the permit in the end will be granted. Other difficulties are that the permit processes can be unclear and take up a long time.

A construction almost always and everywhere is a hussle. Construction works cause noise and waste and they can go over budget and time. And there is a risk of implementing some measures incorrectly which may lead to other problems in the long run. Here the customer might lack the expertise to manage the project and have the certainty that works are implemented correctly.

In this phase we distinguish a subgroup of customers. Those living in condominiums, who require approval from 2/3 of households. Condominium enterprises are not aware of benefits. So this makes the step to implement measures extra difficult for homeowners and renters in condominiums.

Luckily there are also positive results, gains, in this phase. Think for instance about the positive results of energy savings, improved comfort levels and a lesser carbon footprint. We also thought of reduced dependence on the energy grid, increased durability and reduced maintenance. And an overall better quality and healthy home.

Solutions on the Green Menu platform:

- Information and tips for the permit application process.
- Insight in the possible regulations with information about measures
- Information about what a good quotation from a contractor should look like
- Helps homeowners with the questions they should ask and what to look for during the renovation works
- Information to assist the correct implementation of measures
- Information about how to prepare your building for a renovation
- Information about what to pay attention to when attempting implementation of a historic building renovation

3.5 Inspiration

This last phase the customer is (hopefully) happy with the results and shares his or hers experience with others. This might just be telling a story about the renovation to family and/ or friends. But we also see some people who really want to be an advocate for energy retrofittings. They share their story on platforms such as the Green Menu, speak on information events or open up their homes for people who want to see the results with their own eyes.

Not every customer will be an active ambassador because not everyone wants to share their story in public or spend the time it costs to activate others. The biggest threat in this phase is

when the results turn out other than the customer expected. These unsatisfied customers might still share their story. Negative stories will delay the energy transition.

It is most likely that the customers that want to activate others live in a neighbourhood with a high social cohesion. They feel a close connection to their surroundings and want to inspire neighbours. We see this happening less in disconnected communities and individualistic societies.

A pain for the ambassador can be that others might not be interested in hearing the story or having critique on the result. But the gain is that other people feel inspired by the story. Positive stories incite inspiration and motivation to others to retrofit more buildings in the same area, raising its sustainability, quality of life and value. By working together this might stimulate social cohesion in the community.

This offers an opportunity for companies. For instance for a contractor. When the customer is happy and recommends the contractor to others this can lead to more work and so to more revenue. In this way, customers also help with recognising companies that do a good job.

When one customer inspires others who also start with energy retrofitting. These followers then also turn into inspirators, and so on. This is a cascading positive effect which stimulates the economy.

Solutions on the Green Menu platform:

- Offers a platform to owners to share their story

4. Conclusion

The Covid-19 crisis highlighted the need to focus on creating environments that support healthy lifestyles and increase community resilience. Historic buildings are a particularly complex challenge for the retrofitting economy, where the mitigation of vulnerabilities such as EP, the improvement of thermal comfort and the reduction of energy consumption and greenhouse gas emissions must be assessed together with the need to preserve their unique cultural identity.

The Green Retrofitting Menu provides a one-stop-shop for building retrofitting, closing the information gap, accelerating sustainable heritage renovation, and activating a wide range of stakeholders. The platform enables access to context appropriate measures, without on-site visits, thus accounting for new business models and Covid-19 social distancing. Green Retrofitting Menus are available to partner countries – Portugal, Slovenia and Netherlands – and further growth is anticipated by expanding to other building typologies and other locations in the EU.

Deliverable Proof – "Other document" - EIT-BP2020

Name of KIC project the report results from that contributed to/ resulted in the deliverable	Pan-European Approach on Sustainable Heritage: Regeneration by a retrofitting economy
Name of document	Appendix 1 Selection of Building Typology Slovenian
Summary/brief description of document	This document contains the results of the research of selecting an appropriate building typology for Slovenia, as well as a comprehensive set of pictures that highlight the exterior and interior features of the buildings.
Date of document	31/12/2020

Supporting Documents: attach in pdf format

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Appendix 1 – Selection of Builidng Typology from Slovenia and key features for 3D model

1. Selection of typology

	Region	Construction Year Class	Additional Classification	SFH Single-Family House	TH Terraced House	MFH	AB Apartment Block
1	national (Slovenija)	... 1945	generic (Tipična)	 SI.N.SFH.01.Gen	 SI.N.TH.01.Gen	 SI.N.MFH.01.Gen	 SI.N.AB.01.Gen
2	national (Slovenija)	1946 ... 1970	generic (Tipična)	 SI.N.SFH.02.Gen	 SI.N.TH.02.Gen	 SI.N.MFH.02.Gen	 SI.N.AB.02.Gen
3	national (Slovenija)	1971 ... 1980	generic (Tipična)	 SI.N.SFH.03.Gen	 SI.N.TH.03.Gen	 SI.N.MFH.03.Gen	 SI.N.AB.03.Gen
4	national (Slovenija)	1981 ... 2001	generic (Tipična)	 SI.N.SFH.04.Gen	 SI.N.TH.04.Gen	 SI.N.MFH.04.Gen	 SI.N.AB.04.Gen
5	national (Slovenija)	2002 ... 2008	generic (Tipična)	 SI.N.SFH.05.Gen	 SI.N.TH.05.Gen	 SI.N.MFH.05.Gen	 SI.N.AB.05.Gen
6	national (Slovenija)	2009 ...	generic (Tipična)	 SI.N.SFH.06.Gen	 SI.N.TH.06.Gen	 SI.N.MFH.06.Gen	 SI.N.AB.06.Gen

Green Menu/Zeleni meni building typology

- Pre-1945 multilevel terraced house
- Typical in historic city centres
- Important cultural legacy
- Important housing typology
- Residential or mix use

Building typology -Defining historic city centres






Exterior of the Building Examples





Interior of the Building_ Examples






Building Elements_Examples

Floor Plan example_GF

Floor Plan example_Upper Floor

Resulting 3-D model

Deliverable Proof – “Other document” - EIT-BP2020

Name of KIC project the report results from that contributed to/ resulted in the deliverable	Pan-European Approach on Sustainable Heritage: Regeneration by a retrofitting economy
Name of document	Appendix 1 A Selection of Building Typology Portugal
Summary/brief description of document	This document contains the results of the research of selecting an appropriate building typology for Portugal, as well as a comprehensive set of pictures that highlight the exterior and interior features of the buildings.
Date of document	31/12/2020

Supporting Documents: attach in pdf format

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Appendix 1A– Selection of Building Typology for Portugal and key features for 3D model

1. Portuguese building typology – Outdoor features

PAS2020

Pan-European Approach on Sustainable Heritage: Regeneration by a retrofitting economy

Restauratiefonds. FCT De Groene Grachten zavod

1

PT Building typology – key input features

- Lisbon Municipality
- House with 1 -2 dwellings
- 1-2 floors
- Built before 1919

Building type:	Period of Construction	Number of Households	Percentage (%)
House	Before 1919	5457	2,3
House	1919-1945	4511	1,9
Multiapartment	1919-1945	24525	10,4
House	1946-1960	5871	2,5
Multiapartment	1946-1960	41690	17,6
House	1961-1980	5290	2,2
Multiapartment	1961-1980	74520	31,5
House	1981-2005	1480	0,6
Multiapartment	1981-2005	66060	27,9
House	After 2005	292	0,1
Multiapartment	After 2005	7050	3,0

2

Hotspots of the selected typology in Lisbon

Civil parish level

Section level (example)

Subsection level (example)

Based on detailed data from Portugal Statistics – Census 2011 – Geographic Database for Referencing Information (BGRI)

3

Other features deduced from spatial database

- Mostly row houses
- Exclusively residential
- Masonry structure without slab
- Dwelling area up to 50 m ^{2} or between 50 and 100 m ^{2}
- 3-4 divisions
- More than half are rented spaces

4

Key visual feature – Roof tiles

- Low triangular roof (sloped) with ceramic "red" tiles
- Tiles going slightly outside roof boundaries

11060200301/02 Rua Cruz a Alcântara 171

11063600503 Rua Guilherme Braga 25

11062600102/06 Rua Maria Pia 60

11063000501/02/03/04 Rua Silva Carvalho 126

11061601001 Rua do Sol à Graça 9

11062200902 Travessa da Arrochela 7

5

Key visual feature – Attic window

- Same visual aspect as the building (wall, tiles)
- Roof is triangular or semi -circular
- One or two per building, different sizes

11062601501 Rua São Francisco de Borja 35

Rua dos Caminhos de Ferro 68

11060200502 Rua da Cascalheira 30

11062601501 Rua São Francisco de Borja 14

11062200902 Rua da Quintinha 68

11061601001 Rua do Sol à Graça 37

Key visual feature – Façades with tiles

- Some façades are covered with traditional Portuguese tiles (fully or partially); blue and yellow colors are common in tiles


11065100701/03 Rua do Paraíso 15


11063600303 Rua dos Remédios 52


11063600303 Rua dos Remédios 60


11063000501/02/03/04 Rua Silva Carvalho 126


11062200902 Rua Paz 18

Key visual feature – Doors

- Low, rectangular doors with a stone frame
- House number visible on the top
- Different materials, shapes and colors


11062200902 Rua Paz 37


11060101801/03/04/07 Rua Jardim Botânico 3


11062200902 Rua da Quintinha 68


11060200301/02 Rua Cruz a Alcântara 139


11062200902 Beco da Rosa 3


11065100801/02/03 Campo de Santa Clara 97


11062200902 Rua Paz 18

Key visual feature – Windows

- Large windows with a stone frame, either squared or rectangular following the same proportions as the doors
- Some windows have boxes for blinds
- Different materials, shapes and colors


Rua do Alvito 54


11062200902 Beco da Rosa 3


11062200902 Rua de São Bento 136


11063600303 Rua dos Remédios 60


11061601001 Rua do Sol à Graça 9


11062200902 Rua Paz 18

Key visual feature – Balcony

- Most upper floor door -shaped windows have a very small balcony (some have just the balcony frame)


11065100701/03 Calçada Cardeal 9


11061601001 Travessa Pereira 7


11062200902 Rua Paz 47


11062200902 Rua Paz 37


11062200902 Rua de São Bento 136


11062200902 Rua Paz 2

Key visual feature – Façade baseboard

- In stone or paint (white or grey)
- Less than half the height of the door


11063000501/02/03/04 Rua de Campo de Ourique 74


11060200301/02 Rua Cruz a Alcântara 155


11063600503 Rua Guilherme Braga 19


11062600102/06 Rua Capitão Afonso Pala 29


11062200902 Rua Paz 37


11062200902 Travessa da Arrochela 34


11062200902 Rua Paz 18


11065100701/03 Calçada Cardeal 5


11065100801/02/03 Campo de Santa Clara 47


11063000501/02/03/04 Rua de Campo de Ourique 95


11062200902 Rua Correia Garção


11061601001 Travessa Pereira 34


11063600503 Rua das Escolas Gerais 46

Other visual features

- Balcony flowers, vases, hanging clothes
- Leaning streets / small stairs
- Traditional Portuguese sidewalk
- Electricity cables
- Popular Saints decorations
- Portuguese old ladies


11061601001 Travessa Pereira 7


11063600303 Rua dos Remédios 52


11063600503 Rua de S Miguel 82

11062200902 Rua Paz 37

11060200301/02 Rua Feliciano de Sousa 18

11062200902 Travessa da Arrochela 7

11061601001 Rua do Sol à Graça 9

11063000501/02/03/04 Travessa de Cima dos Quartéis 9

11065100701/03 Calçada Cardeal 9

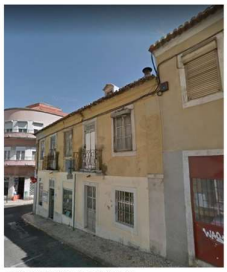
Rua Cruz a Alcântara 139

Key notes for 3D model

- Rowed House
- 2 floors
- Leaning triangular (low) roof with ceramic tiles going slightly outside roof boundaries
- Light yellow/beige façades with blue traditional tiles on upper floor
- 1 attic window (wooden, white) with triangular roof
- 1 small rectangular chimney
- 1-2 door (wooden, green) with small windows, small stairs before the door, Portuguese sidewalk around the house
- 3 ground floor squared windows (1 in front, 2 in the side; wooden white)
- 4 upper floor windows (2 rectangular with small balcony and 2 squared; one of each in each façade; wooden white)
- White/stone baseboard at 1/3 door height
- Vases with flowers on the upper floor windows, hanging clothes on ground floor window

Building typology – selected examples

11063600303 Rua dos Remédios 60



11061601001 Rua do Sol à Graça 9

11062200902 Travessa da Arrochela 34

Building typology – selected examples

11063000501/02/03/04 Travessa de Cima dos Quartéis 9

11060101801/03/04/07 Rua Jardim Botânico 3

11065100701/03 Rua do Paraíso 17

11060200301/02 Rua Feliciano de Sousa 44

2. Portuguese building typology – Indoor features

PAS2020

Pan-European Approach on Sustainable Heritage: Regeneration by a retrofitting economy

Restauratiefonds. FCT De Groene Grachten ezavod

Indoor features for the Portuguese building typology – Methodology

- Dig through online adds for sale/renting of housing real estate located in the selected Lisbon hotspots (*e.g.* website idealista.pt)
- Select cases similar to the selected building typology and to the exterior design used for the 3D model
- Extract information about dwelling organization, number and type of divisions, visual features, energy consuming equipment, layouts
- Weaknesses: most adds are for renovated buildings, building data is incomplete, 3D model is for single family house but most adds show multiapartment buildings

Key visual feature – floors

- Wooden floors
- Stone/tiles floors (kitchen, WC)

Apartamento T3 à venda em Alfama - Sé
Santa Maria Maior Ver mapa
540.000 €
150 m² construídos | T3 | 4º andar sem elevador

Apartamento T2 à venda na rua Museu da Artilharia
Alfama - Sé, Santa Maria Maior Ver mapa
259.000 €
70 m² construídos | T2 | 1º andar sem elevador

Apartamento T3 à venda em Alfama - Sé
Santa Maria Maior Ver mapa
540.000 €
150 m² construídos | T3 | 4º andar sem elevador

Key visual feature – doors

Apartamento T2 à venda em Alfama - Sé
Santa Maria Maior Ver mapa
287.000 €
45 m² construídos | T2 | 2º andar sem elevador

Apartamento T1 à venda em Alfama - Sé
Santa Maria Maior Ver mapa
145.000 €
48 m² construídos | T1
Guardar Excluir

Apartamento T1 à venda em Alfama - Sé
Santa Maria Maior Ver mapa
145.000 €
48 m² construídos | T1

T0 à venda no beco Garcês
Alfama - Sé, Santa Maria Maior Ver mapa
108.800 €
16 m² construídos | T0 | Rés do chão sem elevador

5

Key visual feature – walls

- White walls sometimes with traditional tiles
- Blue/white tiles (kitchen, WC)

Apartamento T1 à venda em Alfama - Sé
Santa Maria Maior Ver mapa
145.000 €
48 m² construídos | T1

Apartamento T3 à venda em Alfama - Sé
Santa Maria Maior Ver mapa
540.000 €
150 m² construídos | T3 | 4º andar sem elevador

Apartamento T3 à venda em Alfama - Sé
Santa Maria Maior Ver mapa
395.000 €
90 m² construídos | T3

Apartamento T3 à venda em Alfama - Sé
Santa Maria Maior Ver mapa
540.000 €
150 m² construídos | T3 | 4º andar sem elevador

3

Key visual feature – windows

Apartamento T3 à venda em Alfama - Sé
Santa Maria Maior Ver mapa
540.000 €
150 m² construídos | T3 | 4º andar sem elevador

Apartamento T2 à venda em Alfama - Sé
Santa Maria Maior Ver mapa
265.000 €
76 m² construídos | T2

Apartamento T2 à venda na rua Museu da Artilharia
Alfama - Sé, Santa Maria Maior Ver mapa
259.000 €
70 m² construídos | T2 | 1º andar sem elevador

Apartamento T1 à venda em Alfama - Sé
Santa Maria Maior Ver mapa
145.000 €
48 m² construídos | T1

6

Key visual feature – stairs

28 fotos

Apartamento T4 à venda em Alfama - Sé
Santa Maria Maior · Ver mapa
499.000 € ~~540.000 €~~ ↓ 8%
150 m² construídos | T4

10 fotos | Vídeo

Apartamento T1 à venda em Alfama - Sé
Santa Maria Maior · Ver mapa
400.000 €
60 m² construídos | T1

Apartamento T1 à venda em Alfama - Sé
Santa Maria Maior · Ver mapa
145.000 €
48 m² construídos | T1

Apartamento T2 à venda na rua Museu da Artilharia
Alfama - Sé, Santa Maria Maior · Ver mapa
259.000 €
70 m² construídos | T2 | 1º andar sem elevador

Key visual feature – kitchen

10 fotos | Vídeo

Apartamento T1 à venda em Alfama - Sé
Santa Maria Maior · Ver mapa
400.000 €
60 m² construídos | T1

17 fotos | Planta

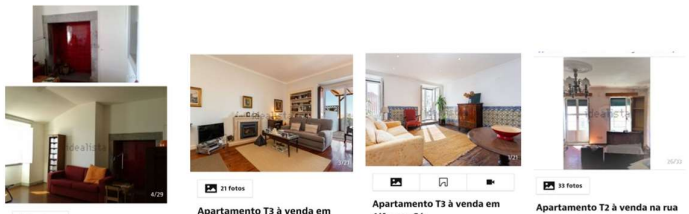
Apartamento T2 à venda na rua do Castelo Picão s/n
Alfama - Sé, Santa Maria Maior · Ver mapa
155.000 €
45 m² construídos | T2

Apartamento T3 à venda em Alfama - Sé
Santa Maria Maior · Ver mapa
540.000 €
150 m² construídos | T3 | 4º andar sem elevador

15 fotos | Vídeo

Apartamento T5 à venda em Alfama - Sé
Santa Maria Maior · Ver mapa
799.000 €
147 m² construídos | T5

Key visual feature – living room



29 fotos

Apartamento T3 à venda em Alfama - Sé
Santa Maria Maior · Ver mapa
580.000 €
120 m² construídos | T3 | 3º andar sem elevador

21 fotos

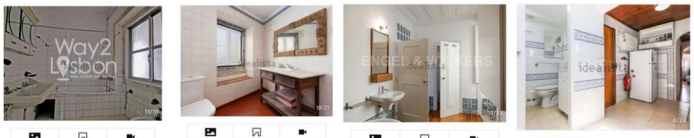
Apartamento T3 à venda em Alfama - Sé
Santa Maria Maior · Ver mapa
695.000 € ~~750.000 €~~ ↓ 7%
205 m² construídos | T3

Apartamento T3 à venda em Alfama - Sé
Santa Maria Maior · Ver mapa
540.000 €
150 m² construídos | T3 | 4º andar sem elevador

33 fotos

Apartamento T2 à venda na rua dos Remédios s/n
Alfama - Sé, Santa Maria Maior · Ver mapa
380.000 €
80 m² construídos | T2

Key visual feature – WC



Apartamento T2 à venda em Alfama - Sé
Santa Maria Maior · Ver mapa
350.000 €
107 m² construídos | T2

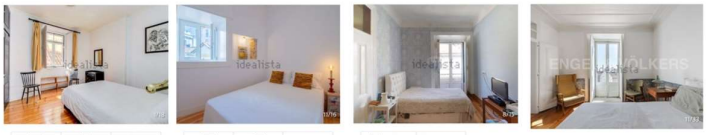
Apartamento T3 à venda em Alfama - Sé
Santa Maria Maior · Ver mapa
540.000 €
150 m² construídos | T3 | 4º andar sem elevador

Apartamento T4 à venda em Alfama - Sé
Santa Maria Maior · Ver mapa
520.000 €
98 m² construídos | T4 | 2º andar

24 fotos

Apartamento T1 à venda no beco do Belo s/n
Alfama - Sé, Santa Maria Maior · Ver mapa
212.000 €
25 m² construídos | T1

Key visual feature – bedroom



Apartamento T2 à venda na rua Museu da Artilharia
Alfama - Sé, Santa Maria Maior · Ver mapa
259.000 €
70 m² construídos | T2 | 1º andar sem elevador

360

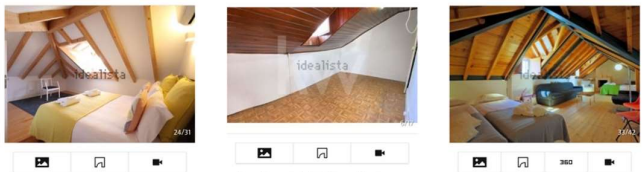
Apartamento T2 à venda em Alfama - Sé
Santa Maria Maior · Ver mapa
287.000 €
45 m² construídos | T2 | 2º andar sem elevador

15 fotos | Vídeo

Apartamento T5 à venda em Alfama - Sé
Santa Maria Maior · Ver mapa
799.000 €
147 m² construídos | T5

Apartamento T4 à venda em Alfama - Sé
Santa Maria Maior · Ver mapa
520.000 €
98 m² construídos | T4 | 2º andar

Key visual feature – attic



Apartamento T4 à venda no largo do Chafariz de Dentro
Alfama - Sé, Santa Maria Maior · Ver mapa
580.000 €
130 m² construídos | T4 | 2º andar sem elevador

Apartamento T1 à venda em Alfama - Sé
Santa Maria Maior · Ver mapa
145.000 €
48 m² construídos | T1

360

Duplex à venda em Alfama - Sé
Santa Maria Maior · Ver mapa
1.400.000 €
300 m² construídos | T4 | 1º andar sem elevador

Other visual features – old fireplaces

Apartamento T3 à venda em Alfama - Sé
Santa Maria Maior · Ver mapa
540.000 €
150 m² construídos | T3 | 4º andar sem elevador

17 fotos

Apartamento T3 à venda em Alfama - Sé
Santa Maria Maior · Ver mapa
750.000 €
106 m² construídos | T3 | com elevador

23 fotos

Apartamento T1 à venda na rua de São João da Praça s/n
Alfama - Sé, Santa Maria Maior · Ver mapa
395.000 € ~~435.000 €~~ ↓ 9%
68 m² construídos | T1

Building typology – selected examples

5 fotos

Casa ou moradia à venda em Alfama - Sé
Santa Maria Maior · Ver mapa
425.000 €
70 m² construídos | T2

Características específicas

Casa ou moradia
19 m² construídos
T2
1 casa de banho
Lote de 42 m²
Construído em 1900
Certificação energética: (Desconhecido)

Located in Alfama, the historical centre of Lisbon, more precisely in Rua da Oliveirinha, this property is part of a XVIII century building.

Outside, the facade and the roof respect the original architectural project and the interior space is organised in a simple way, allowing the light to flood into all the rooms.

Building typology – selected examples




10 fotos | Vídeo

Apartamento T1 à venda em Alfama - Sé
Santa Maria Maior | Ver mapa
400.000 €
60 m² construídos | T1

Características específicas
60 m² construídos
T1
1 casa de banho
Construído em 1750
Certificação energética: (Desempenho energético não facilitado)

Building typology – selected examples




14 fotos | Vídeo

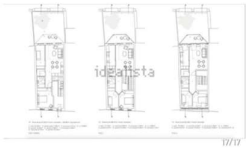
Duplex à venda no beco dos Paus
Alfama - Sé, Santa Maria Maior | Ver mapa
119.000 €
35 m² construídos | T1 | Rés do chão sem elevador

Características específicas
35 m² construídos
T1
1 casa de banho
Segunda mão/bom estado
Armários embutidos
Construído em 1937
Certificação energética: (Desempenho energético não facilitado)

16

Building typology – selected examples

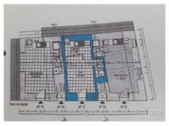




17 fotos | Planta

Casa ou moradia à venda em Campo de Ourique
Lisboa | Ver mapa
650.000 €
293 m² construídos | T5

Layouts (examples)




T0 à venda no beco Garcês
Alfama - Sé, Santa Maria Maior | Ver mapa
108.800 €
16 m² construídos | T0 | Rés do chão sem elevador

27 fotos | Planta

Moradia independente à venda em Alfama - Sé
Santa Maria Maior | Ver mapa
349.000 €
62 m² construídos | T1

360

Apartamento T3 à venda em Alfama - Sé
Santa Maria Maior | Ver mapa
395.000 €
90 m² construídos | T3

18

Energy consuming equipment

- Portable electric oil filled heater
- Gas water heater
- Lamp
- Washing machines, stove, fridge, etc
- Fireplace?
- Portable air conditioning unit?



19

Key notes for 3D model (as in NL examples)

- Energy meter near the entry door
- White walls, white/blue tiles in WC/kitchen, traditional tiles in some walls
- Wooden floor (tiles floor in WC/kitchen)
- Ground floor: kitchen with gas water heater, washing machines, stove, etc
- Ground floor: living room with fireplace and lamp?
- Staircase
- 1st floor: WC, with toilet, bathtub, etc
- 1st floor: bedroom with electric oil heater and portable air conditioning?
- Attic with wooden ceiling

20

Deliverable Proof – “Other document” - EIT-BP2020

Name of KIC project the report results from that contributed to/ resulted in the deliverable	Pan-European Approach on Sustainable Heritage: Regeneration by a retrofitting economy
Name of document	Appendix 1 B List of measures for Portuguese context
Summary/brief description of document	This document contains the assessment of the sustainable measures on the Green Menu in the Netherlands in relation to the Portuguese context.
Date of document	31/12/2020

Supporting Documents: attach in pdf format

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Appendix 1 B – List of measures in the Portuguese Green Menu

Below, we present the list of measures, tips, innovations and points of attention included in the Portuguese Green Menu. In green, we highlighted measures specifically created for the Portuguese context that were not yet included in the Dutch Menu. In the end of the list, a set of measures that were available in the Dutch Green Menu but did not fit in the Portuguese context and/or the selected building typology is also shown in yellow. Measures that are not marked in colour were transferred, adapted and modified from the original Dutch Green Menu to the Portuguese Green Menu.

1. Quick wins
    1.1. Energy use
        1.1.1. Energy consumption manager
        1.1.2. Replace energy guzzlers
        1.1.3. Really turn off devices
        1.1.4. Standby killer
        1.1.5. Insulate heating pipes
        1.1.6. Tips for heating
        1.1.7. Tips for cooling
        1.1.8. Adjusting heating equipment
        1.1.9. Thick curtains and shutters
        1.1.10. LED lamps
        1.1.11. Window insulation
        1.1.12. Ceiling and portable fans
    1.2. Water use
        1.2.1. Shower timer
        1.2.2. Flow restrictor
        1.2.3. Water-saving shower head
        1.2.4. Water-saving toilet
2. Insulation and Ventilation
    2.1. Seams and cracks
        2.1.1. Caulking strips for window frames
        2.1.2. Door sweeps
        2.1.3. Seam sealing
        2.1.4. Tip: Door closers
        2.1.5. Tip: Draught lobby

3.3.11. Tip: Water heater temperature

3.3.12. Innovation: Solar thermal and photovoltaic roof

3.3.13. Point of attention: Water heater maintenance

3.4. Space cooling

3.4.1. Single room air conditioning

3.4.2. Multi-split air conditioning

3.4.3. Portable air conditioning

3.4.4. Tip: Ceiling fans

3.4.5. Tip: Cooling temperature

3.4.6. Point of attention: Air conditioning maintenance

4. Electricity generation and End-use appliances

4.1. Electricity generation

4.1.1. Solar photovoltaic panels

4.1.2. Thin-film solar panels

4.1.3. Green energy contract

4.1.4. Energy cooperative: Remote solar and wind

4.1.5. Micro wind turbine

4.1.6. Tip: Solar panels for an owners' association

4.1.7. Tip: Inverter

4.1.8. Tip: Optimizers

4.1.9. Innovation: Solar tile

4.1.10. Innovation: Power window

4.2. Monitoring, storage & charging stations

4.2.1. Energy consumption manager

4.2.2. Home battery

4.2.3. Electric car charging station

4.2.4. Point of attention: Circuit breakers

4.3. Lighting

4.3.1. LED lamps

4.3.2. Automatic sensors for lighting

4.3.3. Tip: Central on/off switch

4.3.4. Tip: Task lighting

4.3.5. Tip: Natural light

4.4. Cooking

4.4.1. Electric cooking

Deliverable Proof – "Other document" - EIT-BP2020

Name of KIC project the report results from that contributed to/ resulted in the deliverable	Pan-European Approach on Sustainable Heritage: Regeneration by a retrofitting economy
Name of document	Appendix 1 C List of measures for Slovenian context
Summary/brief description of document	This document contains the assessment of the sustainable measures on the Green Menu in the Netherlands in relation to the Slovenian context.
Date of document	31/12/2020

Supporting Documents: attach in pdf format

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APPENDIX A: LIST OF MEASURES
GREEN MENU SLOVENIA

SLOVENIA (total 114 measures)

Quick Wins

Gas and Electricity

Energy management system
Replace energy guzzlers
Leasing household appliances
Turn devices off completely
Standby killer
Insulate heating pipes
Tips for heating
Thermostatic valve on heaters
Smart thermostat
Regulating heating equipment
Hydronic balancing of radiators
Thick curtains and shutters
Radiator foil
Radiator fan
LED lamps
Insulated letterbox

Water

Shower timer
Flow restrictor
Water-saving shower head
Water saving toilet

Insulation and ventilation

Seams and Cracks

Draught exclusion window frames
Draught exclusion doors
Seam sealing
Tip: Door closers
Tip: Draught lobby

Roof insulation

Sloped roof exterior insulation
Sloped roof interior insulation
Insulating the attic floor
Flat roof exterior insulation
Tip: Cooling roof covering
Tip: Combine with a green roof

Floor insulation

Ground floor underside insulation
Ground floor topside insulation
Soil insulation
Tip: Sound insulation

Facade insulation

Interior wall insulation
Exterior wall insulation
Cavity wall insulation
Moisture-regulating paint
Tip: Heat loss through the facade
Point of attention: Moisture problems

Windows

Window type - Škatlasto okno
Window type - Vezano okno
Window type - Enojno okno
Secondary windows
Glazing replacement
Vacuum glass
Triple glazing
Insulating stained glass windows
Insulating window film
Sun protection
Tip: Historical skylights
Tip: Curtains
Tip: Shutters and louvres
Tip: Downdraught

Ventilation

Ventilation after building renovation
Natural and mechanical ventilation
Decentralised ventilation with heat recovery
Balanced ventilation
Demand-driven ventilation
Point of attention: Clean filters

Electricity

Electricity generation

Solar panels
Tip: Solar panels for an owners' association
Solar tile
Thin-film solar panels
Green energy contract
Energy cooperative: Remote solar
Tip: Inverter
Tip: Optimisers
Tip: Field setup solar panels
Tip: PV roof
Tip: Translucent PV panels

Energy monitoring and storage

Energy consumption manager
Home battery
Electric car charging station

Lighting

LED lamps
Sensors for lighting

APPENDIX A: LIST OF MEASURES
GREEN MENU SLOVENIA

Tip: Central on/off switch

Cooking

Electric stove

Verwarming

space heating

Solar thermal roof
Solar roof
Air-water heat pump
Heat pump and solar plant
Ground - water heat pump
District heating
Condensing boiler
Biomass boiler
Smart thermostat
Tip: Setpoint and night-time reduction

heat distribution

Underfloor heating
Wall and ceiling heating
Low-temperature heating
Infrared heating
Zone control
Tip: Replace radiators with convectors
Tip: A label circulation pump
Tip: Hydronic balancing

Warm water

Solar boiler
Heat pump boiler
Continuous flow heater
Efficient gas-fired condensing boiler
Tip: Efficient with your dishwasher
Innovation: hidden solar collector

Water and Green

Green environment

Green roof
Facade garden
Tip: Growing your own vegetables and herbs

around the house

Rain barrel
Halophyte filter
Tip: Green parking lot

Water use

Water-saving shower head
Water-saving toilet
Water reuse
Tip: Shower timer
Tip: Flow restrictor

Instruction

In this document you find the translated texts for the sustainable measures on the Green Menu in the Netherlands. The measures are divided over 5 themes:

1. Quick wins
2. Insulation and heating
3. Electricity
4. Heating
5. Water and green

This document can be used as a work-document, after which you can upload the new text in the special uploading document.

Note: In some text we have used links. Unfortunately these links don't transfer well to PDF. For this document this is not a big problem since all referrals are only for extra information by third parties and that information is in Dutch.

1. Quick Wins

Gas and electricity

Energy consumption manager
When do I consume a lot of energy and with which devices? An energy consumption manager will make this transparent for you. This makes saving energy easier and more fun, because the effect is immediately visible. Systems vary from a screen on the wall to websites and apps. You will often see energy consumption decrease in real-time if, for example, you turn down the heating or turn off the lights. In some cases, you need to have a smart meter. With an energy-consumption-manager, you can save 5 to 10% on your total energy consumption.

Replace energy guzzlers
Old appliances are often energy guzzlers. New appliances labelled A++ are much more economical, quickly saving you €40 a year! Therefore, replace all old appliances with new energy-efficient ones. In addition, there may be a number of large consumers in your {pand_enkelvoud} who you can consciously deal with or reconsider the need for. A list of "energy guzzlers" can be found on the Milieu Centraal website. Don't feel like investing? You can often lease this equipment as well.

Leasing household appliances
Old household appliances are often real energy guzzlers. Certainly, old dishwashers use more energy and water than necessary. A new, energy-efficient and reliable dishwasher is a big investment. With circular washing, you lease the dishwasher from a company. You only pay a small amount per month. The maintenance of the machine is then taken care of by the company. Moreover, it is ensured that the machines are recyclable, which reduces the amount of white goods waste. So you wash cheap, clean and participate in the circular economy.

Really turn off devices
Standby consumption can consume unnecessary energy. You can quickly save 60% of standby consumption by really turning off the appliances. For example, an average household can save up to 70 euros a year on energy costs. Simply turn off the appliances via a socket with an on/off switch. Examples of standby consumers are: the decoder for digital TV, the computer with printer, the coffee machine's warming mode, audio equipment and the mini boiler.

Standby killer
With the standby killer, you prevent so-called standby consumption, which is energy consumption by devices that are in standby mode. By placing a standby killer between the device and the wall socket, you stop this standby consumption completely. This small adjustment can already have a considerable effect on the energy bill.

Insulate central heating pipes
Heating pipes often lose a lot of heat. By insulating these pipes in the unheated areas, such as crawl spaces, central heating cabinets and the attic, the heat is only dissipated where it is needed. This saves up to 2 euros on

an annual basis (= 3 m^3 gas) per metre of insulated heating pipe. It is often easy to insulate pipes yourself, but the pipes must remain easily accessible. It is important not to insulate drinking water pipes in order to avoid the risk of legionella.

Tips for heating
By heating targeted areas in your {pand_enkelvoud}, the entire building is not heated every time. This can be done by adding a timer thermostat and separate thermostat controls. Also keep doors (or attic shutters) closed to retain heat and prevent moisture from condensing in unheated rooms. Remember to ventilate the unheated rooms with outside air to prevent moisture problems. Targeted heating in an uninsulated, historical building can save up to 520 euros per year.

Smart thermostat
By turning the thermostat down one degree, you save about 5-10% in gas consumption per year. These savings can be up to 50 years on average per year. Read more savings tips here.
You can also purchase a smart thermostat. Depending on the type of thermostat, the smart thermostat automatically adapts to your living rhythm and wishes. Choose a thermostat that suits you best. This way, you can control the heating remotely or the thermostat is self-learning. Some thermostats can even show you the energy consumption, just like an energy consumption manager. This way, a smart thermostat helps you heat more efficiently.

Adjusting the central heating
By adjusting the central heating boiler properly, you save on your energy bill. You can take care of part of the adjustment yourself. For example, you can lower the temperature for hot tap water in a combi boiler. Keep it above 60 degrees Celsius, as legionella can occur at lower temperatures. The boiler temperature can often be lowered to 80 degrees Celsius. For major maintenance, it is advisable to call in an installer. Look for more details here.

Hydronic balancing of radiators
75% of heating systems are not set properly. This causes hydronic imbalance, which means that the hot water is not distributed well throughout the radiators in the building, which means that it cannot be heated uniformly, resulting in energy loss and discomfort.

Thick curtains and shutters
Hanging thick curtains can result in much less heat loss through the window. This also applies to closing shutters on the exterior facade; a centuries-old trick. Note that shutters on the inside can cause surface condensation of the glass. In buildings with historical frames and windows, you can save up to 180 euros a year by cleverly using curtains and shutters. Nowadays, there are also special insulating (roller) blinds that reduce heat loss through windows even more.

Radiator foil
With radiators, a lot of heat is lost towards the exterior walls or windows. By placing radiator foil on the back of the radiator or on the wall behind it, the heat radiates into the room. This small investment reduces the heat loss through the directly adjacent facade by up to 80%.

Radiator fan
Radiator fans bring heat from a radiator into the room at an accelerated rate and distribute the heat evenly. The fans are easy to place under or on top of the radiator and are suitable for different types of radiators and convectors. A sensor switches the fans on as soon as the radiator starts to warm up. Power consumption is very low and you can save up to 20% on your energy consumption.

LED lamps
Easily saving energy starts with your lighting. Up to 15% of the total electricity consumption in a {pand_enkelvoud} is from lighting. By replacing incandescent bulbs with LED bulbs you can make significant savings. LED bulbs already come in many types, sizes and colours. There are dimmable types available and they have no start-up time such as energy-saving bulbs.

Insulated letterbox
It may sound crazy, an insulated letterbox, but with a regular letterbox, heat is lost through the opening in the door. Often brushes have already been placed on the inside to prevent draughts, but a lot of heat is still lost. Nowadays there are also letterboxes that are fitted with a gap seal in both flaps and an insulated outside flap. This prevents draughts and keeps the heat inside.

Water

Shower timer
With a shower timer, such as an hourglass for under the shower, you can keep an eye on how long you are in the shower. With children, this is definitely recommended, because shorter showers not only save water, but also gas or electricity to heat the water. Did you know that in the Netherlands we shower for an average of 8 minutes? Showering 3 minutes less saves a lot of energy and money!

Flow restrictor
With a flow restrictor, you will consume less water during, for example, hand washing without noticing. Without sacrificing comfort, you save (hot) water at the wash basin tap. At the kitchen tap, the flow restrictor can be experienced as less practical, because it takes longer to fill a bucket or saucepan. Many faucets already have a flow restrictor, and otherwise they can be purchased for a few euros. This will pay for itself in one year, a real 'quick win'.

Water-saving shower head
With a water-saving shower head, you consume less hot water without sacrificing comfort. It reduces flow and adds air to the water, giving you a normal powerful jet. A rain shower or other luxury shower does not necessarily have to waste water, provided it has a volume flow class S or better. In addition, the 'mist shower' has a shower head that creates a mist and saves an extreme amount of water. A good idea in combination with a heat pump. An average household can easily save up to 45 euros per year. Look here for more useful tips.

Rain barrel
Rainwater can be well reused to water the greenery around your {pand_enkelvoud}. Every year, a large amount of clean drinking water is used in gardens for watering the plants and the lawn. By collecting the rainwater in a rain barrel and then using it, you save drinking water and make use of a natural source. The rain barrel can also be implemented as an underground tank, but this does require a pump. Look here for more information about the rain barrel.

Growing your own vegetables/herbs
More and more people are growing their own vegetables and herbs. This is not only sustainable, but also very fun to do. There are many different vegetables and herbs, which are easy to grow and therefore require little attention. Growing vegetables locally saves CO_2 because the food does not have to be transported and because it takes CO_2 from the air while growing. In short, a fun, easy way to make your building greener.

2. Insulation & Ventilation

Seams

Draught exclusion window frames

Draught strips can be used to close gaps between the window and frame. A draught strip can be applied to the frame or milled in. Placing a draught strip on the frame is a simple procedure. If you choose to have the draught strip milled in, make sure you have it done by a professional company and avoid the risk of moisture accumulating behind the strip. The installer mechanically makes a slot in the frame or window and then installs the draught strip. Note the difference in material. Plastic strips often do not stick or pulverize over time. A metal strip stays in place better and is therefore more 'durable' in use. Applying draught strips significantly reduces the gaps between the window and the frame, which greatly reduces draught, heat loss and noise.

Draught exclusion doors

Often the connections at doors are not completely airtight. Brushes reduce these openings, e.g. at the letterbox or at the threshold, making it less draughty. Placing a draught strip on a door is a simple procedure. Draught strips are allowed on doors with historical value, because there is no need to mill a slot in the door and the procedure can be reversed. It is also possible to mill the draught exclusion into the door. In that case, have this done professionally and avoid the risk of moisture accumulating behind the strip. A professional mechanically makes a slot in the door and then places the draught strip. Keep in mind that a milled brush is not always allowed in historically valuable doors.

Seam sealing

Draughts often come from seams and cracks in masonry, on windows and doors and on the roof, but also from the meter cupboard or the crawl hatch. Sealing seams and cracks immediately increases comfort. Do this skillfully and the annoying draught disappears. Seams between frame and (masonry) facade can be closed with a lime mortar that matches the existing masonry and joint mortar in your building. Or with water and airtight sealing tape. In old buildings, the use of sealant and PUR foam is not advisable and not permitted.

Tip: Door closers

Did you know that heat can also be lost within a building between rooms? Often, not all rooms in main and outbuildings are heated. As a result, a lot of heat is lost to unheated rooms through open doors. A simple solution to this problem is to install door closers, so you don't have to worry about it anymore!

Tip: Draught lobby

A draught lobby is a closed entrance that is placed behind (or in front of) an exterior door to prevent draughts when opening the exterior door. It is an effective heat buffer between inside and outside. A draught portal reduces heat loss and provides extra comfort by eliminating draughts.

Roof insulation

Slanted roof exterior insulation

Most heat is lost through the roof, so insulating the roof reduces energy consumption considerably. A slanted roof is best insulated on the outside, because this limits the risk of moisture problems. Renovation of the roof is the best time to insulate, when the roof tiles have to be removed anyway. Always have the roof insulation carried out by a professional insulation company. Roof insulation on the outside is not always possible because the roof becomes 5 to 15 cm thicker after insulation. This should not conflict with the monumental view or the connection to the gutter line.

Slanted roof interior insulation

Roof insulation prevents unnecessary heat loss through the roof. The roof can be insulated on the inside between the beams of the roof. This is less effective than insulating on the outside, but is often easier to implement. And for historically valuable roofs, insulating on the inside has the advantage that it does not alter the appearance of the facade on the outside. Keep in mind, however, that about 5-15 cm of space is lost inside and that the wooden structure is usually no longer visible. Always have roof insulation applied by a professional company to prevent moisture problems.

Insulating the attic floor

The attic is the upper part of a {pand_enkelvoud}, just below the roof. Warm air rises and is lost through the attic through the roof. Insulating the attic is interesting if the attic is not heated and is actually never used as a living space. The

insulation material can be placed between the wooden floor beams or on the floor. Make sure that the access to the attic is also insulated. Insulating the attic floor is cheaper than roof insulation and yields the same reduction in heat loss.

Flat roof exterior insulation

Flat roofs are easy to insulate on the outside of the roof, which prevents heat loss and reduces energy consumption. By applying insulating material on top of the roof structure, you avoid the risk of moisture damage in the wooden structure. With interior insulation, this risk is greater for flat roofs. After insulation, the insulation panels are finished with a waterproof material. If your roof with roof covering is due for replacement soon, this is a good time to insulate on the outside. If the roof covering is still in good condition, you can also place waterproof insulation panels on top of the existing roof covering. With gravel or tiles, you prevent the insulation panels from blowing away, but this 'inverted roof' does not insulate as effectively.

Tip: Cooling roof covering

Black roofs absorb a lot of light and heat, which causes the roof and the spaces underneath to heat up. It also leads to heat stress in cities. This problem can easily be solved with white roof covering. The white colour reflects the sunlight and limits the warming up of the building. Keep in mind, however, that this changes the appearance of the roof and makes pollution more visible.

Tip: Combine with a green roof

If you are replacing the roof covering, consider installing a green roof in addition to roof insulation. This can double the lifespan of the roof finish and keep the space underneath cooler in summer. Moreover, your green roof will keep the city cooler and the streets drier during heavy showers.

Floor insulation

Ground floor underside insulation

If your {pand_enkelvoud} has a basement or crawl space higher than 35-50 cm, it is possible to insulate the ground floor from below. From the crawl space or basement, the insulation material is applied under the floor, for example between the wooden beams. This saves energy, provides more comfort and can be applied without modifications to the existing floor. If there is water in the crawl space or basement, this needs to be taken care of first. In addition, always ensure that there is sufficient ventilation in the crawl space or basement so that moisture can always be removed. Therefore, always seek proper advice from a professional company.

Ground floor topside insulation

If the ground floor is not accessible from below, the floor can be insulated from above, which improves the comfort of the building. To apply the floor insulation, the existing floor must be removed. It is therefore advisable to have this done if the floor is to be replaced anyway or if you are switching to underfloor heating. There are systems in which floor insulation and underfloor heating are combined. Keep in mind that the floor will be 6 to 10 cm higher due to the insulation, this has consequences for connections with doors and stairs. Therefore, seek proper advice and prevent historical parts from being damaged. On monumental floors, it must be possible to remove the floor insulation later and return the floor to its original condition.

Soil insulation

Is the crawl space less than 35 cm high and poorly accessible? If further excavation is not permitted or not feasible, floor insulation is often not an option, but soil insulation is. In this case, the insulation material is sprayed into the crawl space, creating an insulating layer at the bottom of the crawl space. Various materials are available, including shells and EPS granules. Seek proper advice regarding which material best suits the conditions of your crawl space. Floor insulation helps against soil moisture, which keeps the crawl space and the living space above it drier. Dry air heats up faster than damp air, which reduces the heat demand. However, the insulating effect of soil insulation is slightly less compared to floor insulation.

Floor replacement

If the floor of your property is in very poor condition and is not historically valuable, it may be interesting to investigate whether the ground floor can be replaced by an insulated concrete floor. This will give you a floor with very good insulation value. It is possible to combine the new screed directly with underfloor heating. Comfort will increase considerably and the energy savings are also relatively high.

Tip: Sound insulation

Noise nuisance can be annoying. There are two ways sound moves through a building: airborne noise and impact noise. Impact sound is sound that vibrates through the structure, for example, by sliding furniture or walking. With a floating

screed, for example, impact sound can be significantly reduced because vibrations cannot be transmitted.
Airborne noise come from both inside and outside and move through the air. A secondary window or acoustic insulation material, for instance, can reduce airborne noise from the outside by increasing the structural mass and sealing seams and gaps.
First determine what type of noise nuisance is present. Usually, an insulation measure lends itself well to integrating sound insulation into the structure. For example, there are insulation materials that, in addition to thermal properties, also have good acoustic properties. Make sure that the monumental value of the historic building is not affected, such as ornamental ceilings and monumental floors. For instance, make sure that changes are reversible.

Facade insulation

Insulate thick walls from 40 cm
It is possible to insulate a solid exterior wall (>40 cm thick). This saves energy and increases comfort inside. Insulating these solid walls requires a specific approach. The walls are affected by moisture from the outside due to precipitation and moisture from inside by e.g. people, appliances and wet rooms. Some of the moisture in the wall evaporates to the outside, but due to the thickness of the wall, part will dry by evaporation to the inside. It is important that this moisture can still evaporate after the insulation. Therefore, have the insulation carefully applied by a specialist. And choose a breathable insulation material that can absorb, retain and release moisture. We call this type of material surface active.

Insulation wall with beam bearing (vapour-tight)
Pre-war buildings often do not have a cavity to insulate, but it is possible to insulate the facade on the inside with an insulation wall. With an insulation wall, a second wall is placed on the inside of the facade. The insulation wall consists of a wooden or stainless steel construction with insulation material in between. This measure requires a careful approach at so-called junctions in the facade, such as wooden floor beams that have been incorporated in the facade. By applying insulation material, these are sensitive points for moisture accumulation and problems such as mould and wood rot can occur. This can be prevented by seeking proper advice beforehand and by having the work carried out by an accredited company. You will notice a difference in the comfort of your building after your facade has been insulated.

Insulating with a timber frame construction
A wooden facade loses a lot of heat, so it pays well to provide this facade with insulation material. Because these are wooden facade parts, extra attention is required when detailing and implementing this measure. The best way to insulate also depends on the relevant situation. For example, it is unwise to simply fill a double-walled wooden facade with cavity insulation, because it must be possible to ventilate the wooden facade on the outside to prevent wood rot. Therefore, seek proper advice and always have insulation measures carried out by a professional company.

Exterior facade insulation
With exterior facade insulation, insulation material is installed against the existing masonry or stucco and finished with new stucco or stone strips. The (wooden) construction of the building is ‘wrapped’, as it were. This form of facade insulation is not always desirable and, in the case of historical buildings, it is usually not permitted because it changes the facade considerably. Sometimes it can be applied to the rear and side walls, which are not visible from the public road. The advantage is that no space is lost inside and a historically valuable construction remains visible. With facade insulation on the outside, the risk of moisture problems is nil. And with good detailing at window frames and eaves, thermal bridges and leaks are prevented.

Cavity wall insulation
Cavity walls are relatively rare in historical buildings. If you have a building built from the 1920s onwards, there is a chance that a cavity wall will be present. A cavity wall has an open space – the cavity – between the solid outer and inner wall. This cavity can be filled with insulating material, which is a quick and relatively inexpensive way of insulating. For historical buildings, this requires a careful approach. Have a check carried out to ensure that the cavity is at least 5 cm wide and clean and that there are other connections between the outer and inner wall. After insulating, these connections are considerable thermal bridges and can cause mould formation. This can be prevented by seeking proper advice beforehand and having the cavity wall insulation carried out by a professional company. If the cavity wall is not suitable, consider an insulation wall on the inside of the facade.

Moisture-regulating paint
In addition to the application of insulation material, moisture-regulating paint can be a low-threshold measure to insulate the facade a little better. The paint regulates the moisture, which improves the insulation value of the wall. Dry air heats up faster than humid air, which reduces the heat demand. In addition, the risk of flaking paint is reduced. Consider using moisture-regulating paint when you next paint your walls.

Tip: Heat loss through the façade
Did you know that it is fairly easy to gain insight into the heat loss of your {pand_enkelvoud}? By having **thermal images** taken of your facade, you can immediately see where heat is being lost. This insight helps you to better insulate and ultimately save money and energy.

Point of attention: Moisture problems
If there is mould, condensation on the windows or other visible moisture problems in your building, there is a good chance that there is a moisture problem. First resolve the moisture problem before you start working with insulating measures. Common causes of moisture problems are leaks and insufficient ventilation of crawl spaces and basement.
Tip: Humid air and a damp construction costs more energy to heat, so solving a moisture problem will save energy and increase thermal comfort.

Innovation: Films
This is a relatively new technique. Instead of a conventional insulation material, two or more layers of **heat-reflecting film** are stretched against the inside of the outer wall. The film is finished with a plasterboard insulation wall on wooden slats or metal profiles. This is also available with a plasterboard finish as a ready-made package, this package is just as thick as a traditional insulation wall. Films are only possible if no historically valuable parts are affected, and are subject to permits.

Windows

Secondary windows
Existing windows can be insulated by installing a secondary window on the inside of the building. With a secondary window - a second window behind the original window (inside) – you keep the existing historical window and do not change the facade view from the outside. Installing a secondary window is a job for a professional company. During construction, make sure that there is sufficient ventilation to prevent condensation between the windows. When selecting the window, make sure that it matches the existing window in terms of colour, thickness of the glass and decomposition. If necessary, discuss this with a municipal monument advisor.

*Tip: Er bestaan ook achterzetramen van enkel glas met een **warmtereflecterende coating**. Deze coating verhoogt de investeringskosten nauwelijks, maar zorgt voor gemiddeld 20% meer energiebesparing!*

Supplementary windows
An insulation window is an extra insulating window that is placed on the outside of the existing window. Draughts also come through gaps in the frame. The insulation window can therefore also be placed on the entire frame and thus close gaps. This is a major improvement over single glazing. With insulation windows, cold at the window and noise nuisance from the outside are reduced. In many cases, this is only possible if the windows are not visible from the public space.

Thin double glazing
Does your single glazing have no historical value? If your glass does not have those characteristic bulges and is not stained glass, consider replacing single glazing with double glazing. Thin double glazing offers a solution for windows with a narrow rebate. This type of double glazing consists of two panes of glass with a narrow cavity between them. The cavity is filled with a gas that has an insulating effect, so you can tackle cold draughts and save significantly on your energy bill. The glass is available in different thicknesses, starting at 7 mm, and in many cases only requires a small adjustment in the window. The special insulating glass can be made with the appearance of old glass. If the current glass is historical or if the rebate in the window needs to be changed, apply for a permit.

Vacuum glass
Vacuum glass consists of two panes of glass with a narrow cavity between them which is vacuum drawn. The space between the panes of glass is preserved by small black spheres between the panes. The insulation value of this type of glass is very good, even better than HR++ glass.
Due to its low thickness, vacuum glass often fits into existing window frames without major modifications. The weight does increase, however, which means that hinges or counterweights may no longer work properly in the case of sliding windows and that the windows cannot be opened or can be opened poorly. In that case, we recommend combining vacuum glass with gap sealing. By insulating windows, the natural ventilation of your building disappears, so make sure you are properly advised about possible ventilation solutions.

HR++ glass
HR++ glass has a good insulation value. It consists of two panes of glass with a space between them filled with a noble gas that insulates. An insulating film is also applied to the glass. By replacing your existing glass with HR++ glass, you save a lot

on your energy bill and take care of cold downdraught at the windows. In addition to an insulating effect, it also reduces noise pollution from outside. HR++ glass is not always possible in historical buildings due to its thickness and weight.

*Tip: There is also **HR++** glass, also known as **triple glazing**, which has an even higher insulation value than HR++ glass. This is more expensive, however. Compared to HR++ glass, the higher costs are not always recouped. Triple glazing can hardly ever be used in monumental buildings.*

Insulating stained glass windows
A stained glass window is a special element in a historical building, but it is also a major heat leak. There are various options for insulating stained glass windows. For example, you can place supplementary or secondary windows, this does not affect the stained glass. But there are two more options. In a museum setup, which is often used in churches, the stained glass window is removed from the frame, then insulating glazing is placed in the frame. The stained glass windows are placed on the inside in front of the glazing between lead strips. The last option is to place the stained glass window between two panes of glass.
For all options, the space between the new glazing and the stained glass must be well ventilated. After insulating your stained glass windows, you will notice that the cold air by your windows has disappeared.

Insulating window film
This can be a good option for monumental glass. This film bounces the internal heat radiation back into the room, so less heat is lost. The condition is that the film can be removed from the window without any damage and that the colour does not deviate from the original situation. There are different types of glass film, with different properties. Choose a water-based film, which can be removed without damaging the window. And make sure that the colour, hue, flatness and reflection of the glass does not change because of the film. This way, it is possible to retain the existing glass without any consequences for the counterweights or springs of sliding windows. Even though less heat is lost, cold draughts remain with the glass because the insulation value is insufficient.

*Tip: **Gelaagd glas** bestaat uit twee glasplaten op elkaar met een folie ertussen, of aan de binnenzijde van het glas. Dit type glas isoleert beter dan enkelglas met raamfolie en past meestal in de bestaande kozijnen. Koude tocht bij het raam en condensvorming blijven bestaan.*
*Tip: Zoekt u een folie om warmte buiten te houden in de zomer? Dan is juist een folie met een **lage LTA -waarde** geschikt. Een lage LTA -waarde beperkt de lichtinval, wat bijvoorbeeld bij musea wenselijk is.*
Tip: **Krimpfolie** wordt niet aangebracht op het glas, maar op de raamlijst. De isolatiefolie wordt eenvoudig bevestigd rond het kozijn met behulp van de onzichtbare dubbelzijdige tape. De folie wordt strak getrokken door het materiaal met een föhn te verwarmen. Zo wordt er als het ware een isolerende spouw voor de ruit gevormd.

Sun protection
Good sun protection for your windows provides a comfortable indoor climate in the summer by keeping radiant heat from the sun outside. Sun protection on the outside keeps the heat out better in the summer than sun protection on the inside, so you don't have to cool as much, which saves energy. If sun protection on the outside is not allowed in your situation, take a look at the options for sun protection on the inside. There are all sorts of sun protection systems on the market that differ in shape, size and colour. You can operate the sun protection manually, or automatically using sensors.

Tip: Curtains
In cold periods it is possible to counteract draughts at the windows by placing **thick curtains**. Thick curtains have a strong insulating effect and therefore limit heat losses through the window. Do make sure that the curtains only hang in front of the windows and not over the radiators underneath; otherwise, the heat cannot reach the room properly.

Pleated blinds have a honeycomb structure and can be provided with an insulating film on the window side. These blinds are adjustable from below and above. Pleated blinds counteract draughts in cold periods due to the insulating effect and can serve as sun blinds in warm periods.

Tip: Shutters and louvres
Even in earlier times, the shutters were closed on cold or hot days to keep the indoor climate comfortable. In some historical buildings, these shutters are still present, but it is often seen as a big job to close them. Still, this can save a lot of energy.

Tip: Downdraught
Downdraught is a cold air flow created by a cold surface at a reasonable height that ‘falls down’, as it were. This creates an uncomfortable draught flow. The solution is good window insulation with a high insulation value. You also prevent condensation on the window at a low outside temperature.

Ventilation

Ventilation grilles (natural ventilation)
By insulating, the natural ventilation of the building disappears. There is no more natural supply because gaps and seams are closed. One possibility to supply air in a natural way is to install (insulated) ventilation grilles. This can be done in the facade or in combination with new windows. Consult with the municipality on which option will best suit the facade appearance. If it is not allowed to install grilles, it is an option not to close any gaps above 1.80 metres. At this height, you will have little to no draught, but fresh air will still enter the building.

Natural and mechanical ventilation
In historical buildings, it is important to ventilate well to prevent moisture problems. This can be done through a combination of natural ventilation and mechanical ventilation. Have (insulated) ventilation grilles fitted for the supply of clean air. These ventilation grilles are available in various variants. For rooms such as the bathroom and kitchen, mechanical extraction can be used for ventilation. This requires ventilation ducts to be installed throughout the building. Make sure that no monumental parts are affected when installing the ducts.

Decentralised ventilation with heat recovery
If ventilation ducts are not possible in your building, a decentralised ventilation system with heat recovery may be the solution. You can then install a facade ventilation unit in a room you often use. The ventilation unit regulates both the extraction of polluted air and the supply of clean air. Heat recovery ensures that the heat from the extracted air heats up the fresh air, so that heat is not lost and you save energy. And the grilles for extraction and supply are also available in brick format so that they are virtually invisible. The other rooms can be provided with natural ventilation through ventilation grilles. Toilet, shower and kitchen are separately extracted mechanically, which does require ducts.

Balanced ventilation
There are various options for ventilating your building. Balanced ventilation is a central system for ventilating the entire building. Fresh outside air is blown into the rooms via a duct system from a supply air box. And the exhaust air box, in turn, dissipates the 'used' air. In a heat recovery unit, the supply and exhaust air boxes are brought together so that heat is exchanged and energy is saved. A balanced ventilation system with CO_2 and humidity sensors is efficient because no more fresh air is supplied than necessary.

Demand-driven ventilation
Good ventilation is important for healthy air in the building. A demand-driven ventilation system with smart sensors works efficiently. For instance, CO_2 sensors detect the need for clean air in rooms such as the bedroom or living room. And in the bathroom or kitchen, humidity sensors measure humidity. The system only turns on if the CO_2 or humidity levels are too high. With the choice of a demand-driven ventilation system, fresh air is only supplied when needed.

Point of attention: Clean filters
It is important that ventilation ducts are open and that the filters are clean. If filters are not clean, you will blow ‘dirty’ air into your {pand_enkelvoud}. In addition, a polluted (balanced) system has a lower capacity and consumes more electricity because of a higher resistance.

3. Electricity

Lighting

LED lamps
An LED lamp consumes 80% less power and lasts 25 times longer than an incandescent lamp. At 4 hours of operation per day, LED lamps will last 15 years. Replacing a 40W incandescent lamp with a 10W LED lamp saves around 10 euros per year (at 4 hours of operation per day). And the colour of the light? No problems there, because LED lamps now come in all sorts of shades, shapes and sizes.

Sensors for lighting
We all leave the light on from time to time. It uses quite a lot of energy unnoticed. By combining motion sensors with LED lamps, you reduce the energy consumption for your lighting. The motion sensors pick up the changes in heat radiation, so the light only comes on when someone enters a room. This way, you avoid wasting energy.

Tip: Central on/off switch
In a large building, such as a church building, it can be difficult to check whether all lighting, music systems etc. are actually switched off. Therefore, use a central on/off switch where everything is switched on or off with one button, so that no devices are accidentally left on or in standby.

Monitoring of usage

Energy consumption manager
When do I consume a lot of energy and with which devices? An energy consumption manager will make this transparent for you. This also gives you insight into standby energy consumption, for example for devices that still consume energy on standby. This makes saving energy easier and more fun, because the effect is immediately visible. Systems vary from a screen on the wall to websites and apps. You will often see energy consumption decrease in real-time if, for example, you turn down the heating or turn off the lights. With an energy consumption manager, you can save 5 to 10% on your total energy consumption. Read more on the website of Milieu Centraal.

Generating electricity

Solar panels
Solar panels are a sustainable way to generate your own electricity. On average, solar panels last 25 years while they usually pay for themselves within 10 years. The most common panels consist of photovoltaic (PV) cells, which we call PV panels. These are usually installed on roofs. Other alternative places for your roof are pergolas and carports. These solar panels come in different varieties, such as blue and matt black. The PV panels capture energy from the sun and convert it into electricity. You also need an inverter, which is a small cabinet in your house that converts the generated direct current into alternating current that we use in homes.

Extra tip
*In most cases, solar panels are placed on the roof of your house, with **a frame over the existing roof** on which the solar panels are placed. This frame makes it possible to ventilate under panels, which improves the efficiency.*

Extra tip
*Nowadays it is also possible to **integrate solar panels into the roof**. The panels are mounted watertight, so no roof tiles need to be placed underneath them. This will make the panels stand out less than if they were placed on the roof tiles. This is a good option if you are planning to replace your roof soon.*

Extra tip
*Nowadays it is also possible to apply **solar cells between glass plates**. This type of glazing allows light to pass through in addition to the generation of energy. This form of generation is relatively expensive.*

Tip: Solar panels for an owners' association
Many buildings are divided into apartments and organized as an Owners' Association. 'Even then, you can install solar panels on the roof. For example, the generated solar power from the communal roof can be distributed to the electricity meters of the residents, so that the electricity is worth more than on the collective meter of your owners' association. If you would like to know more, please contact us.

Solar tile
Solar panels that look like roof tiles: they exist! The panel is integrated into the roof tile. This solar tile resembles a modern shiny roof tile and is therefore not always permitted on historic buildings. These roof tiles are particularly suitable for smaller roofs or for roofs with many interruptions (such as chimneys or windows). It can be difficult to accommodate many solar panels on such roofs, but the solar tile can easily be placed around them.

Extra tip
*A relatively new technique for the generation of electricity is **solar slates**. These panels are processed into panels with a shape and structure similar to stone slates. The efficiency of these slates is lower compared to a standard PVC panel but usually better preserves the character of the building.*

Thin-film solar panels
Thin-film solar panels (also called CIS panels) are deep black, which makes them look better than other types of panels. Thin-film solar panels have a lower generation efficiency per surface area than standard solar panels. However, they are a lot cheaper, which makes it possible to install more of these solar panels. In addition, the panels can generate more energy per installed capacity. These are a good choice in cases where there is more surface area than needed in terms of energy generation.

Power window
If your building has many windows that need to be replaced, choose a combination of insulation and energy generation. With a power window, a thin coating is applied over the surface of the glass that can transfer the energy from the sun to the edges of the glazing. Solar cells are integrated in the edges of these windows, which convert the energy into electrical energy. There are also variants in which sun blinds can be operated between the glass panes, which keeps it cool and also generates energy!

Green energy contract
If your building does not offer opportunities to generate your own green energy, you can opt for a green energy contract. With a green energy contract, you usually only receive electricity that comes from windmills and solar panels. Your gas will be compensated and this will soon make you more sustainable. By purchasing your electricity green, your electricity consumption will become a lot more sustainable in one fell swoop. There are many different energy suppliers in the Netherlands that offer green electricity. But never forget, the less you consume, the lower your emissions.

Energy cooperative: Remote solar and wind
If you don't have a (suitable) roof for solar panels yourself, you can invest in sustainable projects at an external location near you via an energy cooperative. This is possible via the postal code scheme. Together with other participants in the cooperative, you invest in, for example, a solar park or solar panels on a large agricultural roof. The generated electricity will benefit your energy bill.

Small wind turbine
With a wind turbine you generate your own sustainable wind energy. Today, wind turbines come in many shapes and sizes. Whether a small wind turbine is suitable for your situation strongly depends on the environment, for example the wind area, the available free space and obstacles. Also check the regulations in

your municipality and province. In addition to generating energy for your own use, it is sometimes also possible to sell surplus energy back to the grid or to the neighbourhood.

Electric cooking
To get rid of gas completely, you also need to make the switch to electric cooking. An induction cooker is the most sustainable choice of electric cookers; it uses at least 20% less energy than a ceramic or halogen cooker. Check that the correct connections are present in the meter cupboard.
It is not always necessary to replace all your pans. You can test this by holding a magnet against the underside of your pan. If the magnet stays under the pan, you can also use the pan on the induction cooker.

Tip: Field setup solar panels
When it is not possible to install solar panels on your building but you own a piece of land, a field setup can be an option. This is a relatively expensive way compared to solar panels on the roof, as an entirely new construction has to be made. There are also smaller variants where ballast trays for roof constructions are used on the ground.

Tip: Inverter
When you have made the switch to solar panels, you need an inverter to be able to use the electricity. Installers often offer solar panels that include an inverter. Choose a high-quality inverter and ask about the warranties.

Tip: Optimisers
The installation of solar panels involves looking for the most optimal position in relation to the sun, but also for the building. Of course, it can happen that not all panels are oriented the same or that during the day, shade falls on one of the panels due to a tree or a chimney. Normally, solar panels are connected in series, which means all panels perform as well as the least favourable panel. What a waste! By adding an optimiser, the panels are read individually and you benefit from each panel in the most optimal way.

Storing electricity & charging stations

Home battery
Solar panels generate energy during the day, while there can also be a high energy demand early in the morning and in the evening. To be less dependent on the electricity grid, a home battery can be a solution. The home battery is also a solution for owners of electric cars. Moreover, with a battery there, is usually no need to upgrade the grid connection, which reduces annual extra costs. The current generation of home batteries has a high efficiency, takes up little space and has a nice design. Home batteries last for years.

Electric car charging station
If you have an electric car, you can charge via a charging station, which is faster than a conventional socket. Charging stations are often easy to install in or near a {pand_enkelvoud} and this is stimulated by municipal regulations. Make sure that the charging station has sufficient power, otherwise charging times may be very long. Eventually it will even become possible to temporarily store energy in the batteries of your electric car.

4. Heating (Thermal)

Generating heat

Solar boiler
A solar boiler consists of a boiler and a panel that looks very similar to a solar panel. However, the collected sunlight is not converted into electricity, but is used to heat (tap) water. Collectors on the roof ensure that the liquid in the plate or pipes is heated up. The heated liquid is led to a storage tank with water. This way, the water in the storage tank heats up. If the water is not warm enough, an after-heater (high-efficiency combination boiler, electrical element or heat pump) will be added. Solar collectors are a challenge for monuments, because they have to be placed out of sight on the roof. The solar boiler is less viable for small households with a high-efficiency combination boiler.

Solar thermal roof
A solar thermal roof is actually a combination of solar panels and a solar boiler. This PVT roof produces hot water and electricity from solar energy. Panels on the roof convert sunlight into electricity and ensure that solar heat is exchanged with water in the storage tank inside. The heated water can be used for tap water and for heating your building with the help of a heat pump.

Air heat pump
An (electric) air heat pump extracts energy from the outside air which can be used for heating tap water and for space heating. Electricity is used instead of gas. It is possible to go fully electric or install a hybrid system. In a fully electric system, the heat pump, in combination with a buffer tank, generates all the necessary heat for both heating and domestic hot tap water. You can also opt for a hybrid heat pump, whereby the heat pump only generates heat if it is above 4˚C outside. The all-electric heat pump only works in combination with a low-temperature delivery system, such as underfloor heating. It is important that your building is well insulated before you consider switching to low-temperature heating and a heat pump.

The air heat pump has an external section and a smaller internal section. The external section can be placed at various locations outside the building, taking into account possible noise production (not near windows) and whether the external section is visible from the public space. The internal section is placed next to the boiler together with the buffer tank.

Hybrid heat pump
If the heat demand is so high that it is not possible to heat with just a heat pump, a hybrid heat pump offers the solution. If it is really cold outside, below 5 degrees Celsius, it is difficult for the air heat pump to extract heat from the outside air. In the case of a hybrid heat pump, a gas-fired boiler will then switch on. Ask the installer whether your existing central heating system is suitable for this or opt for a new system with a heat pump and central heating boiler in one. The hybrid heat pump also uses a central heating system to heat tap water, so no buffer tank is required. It is also not necessary to switch to low-temperature heating, such as underfloor heating. Insulation and ventilation are required because otherwise, electricity consumption will become too high. For this reason, it is also interesting to explore whether you can combine the heat pump with solar panels. Most of the year, the heat pump will be in operation, which will save a lot of gas. And the costs of a hybrid heat pump are lower than those of other heat pump systems.

Keep in mind that air heat pumps have an external part. These must be carefully placed due to noise production, for example not near windows. It is possible to place a casing around the external part for noise insulation.

Solar heat pump
Heat pumps can extract heat from various sources. Well-known sources are air, soil and water. A less known source is solar heat. PVT (Photo-Voltaic-Thermal) panels or solar collectors can be used to extract solar heat and ambient heat. The absorbed heat is then increased by the heat pump for low-temperature heating. A solar

heat pump is particularly suitable for buildings with a large roof surface area. A large absorption surface area is required to extract enough heat even on cloudy days. Cooling is only possible at night with this system.

Ventilation heat pump
A ventilation heat pump is an interesting solution for large buildings where there is no balanced ventilation yet but there is mechanical extraction. The ventilation heat pump extracts heat from the extracted ventilation air and brings this heat into the central heating system, thus saving energy and lowering your energy bill. The ventilation heat pump is installed in the place of the existing ventilation box. The capacity of this type of system is usually low, which is why this system is often used in a hybrid setup with a central heating boiler.

Surface water heat pump
Water in the surrounding area can be used to heat your building, such as a nearby lake, pond or moat. Heat is extracted from surface water in the summer. A heat pump increases the temperature, making it suitable for low-temperature heating. The investment is high compared to an air heat pump. This heating system is particularly suitable for buildings where the heat demand is high and people also want to cool. In combination with a thermal energy storage system, heat can be stored and the temperature in the water remains balanced. The construction of the water source is subject to permit and life in the water must not be disturbed.

Ground source heat pump
A ground source heat pump uses ground heat. At 55 to 100 metres below ground level, the constant ground temperature of 12 °C is used with a ground source. A heat pump increases this ground heat to a suitable temperature for low-temperature heating, maximum 55 degrees. A ground source is most suitable if you also use it to cool the building, so that you also return heat and the temperature in the ground remains balanced. This heat pump requires good insulation, ventilation and possibly a new form of heating in your building, such as underfloor heating. The investment is higher than with an air source heat pump, especially because of the construction of the ground source. Keep in mind that you need a permit for this and that the garden must be accessible. With monuments, this can often be challenging.

Ground-coupled heat exchanger
A ground-coupled heat exchanger is basically a storage for heat (or cold) deep in the ground. The system lies between 55 and 100 metres below ground level, and uses the constant ground temperature of 12 degrees Celsius. In summer, this temperature can be used to cool. In winter, 12 degrees Celsius is relatively warm and can therefore heat the water. A heat pump increases the temperature to make it suitable for low-temperature heating. A ground-coupled heat exchanger system is particularly suitable for heating at a district level or for large buildings. In other situations, such as for a residential home, an ordinary heat pump with a ground source is more suitable.

Heat pump energy pile
One of the more innovative heat pump systems is the energy pile. With this system, heat is extracted from foundation piles. To apply this system, the entire foundation (ground floor, crawl space or basement) must be cleared to install the new foundation piles. The foundation piles are equipped with a heat exchanger when installed. This system is particularly suitable when foundation repair takes place and the installation of an outdoor unit of a heat pump is not possible. A point of attention is that the foundation piles are usually less deep than a regular ground source, which often limits the yield. For optimal operation, low-temperature heating, good insulation and ventilation are required. If the energy pile does not have sufficient power, you can opt for a hybrid setup with, for example, a gas-fired central heating boiler or another sustainable source, such as PVT panels or an air heat pump.

District heating
The heat released by waste and power plants can be used in some areas to heat residential areas and industrial estates. The residual heat from large power plants is collected in large vessels of water and channelled into the city via an underground pipe system. Buildings connected to district heating can use this heat for heating and hot tap water. Heat grids can operate at both high and low temperatures, in which case good insulation and low-temperature heating, such as underfloor heating, are important.

Condensing boiler
Most people opt for a Condensing boiler when their old central heating boiler needs replacing. On average, a boiler will last fifteen years, during which time boilers will have become more energy efficient. Modern condensing boilers use condensation heat and can therefore achieve a high efficiency. In addition, modern boilers can modulate and are better adjustable, so that they do not run at full speed with a small heat demand. With a new boiler, you can save up to 20% on the gas bill, which means you earn back your investment within a few years.

Pellet boiler
An alternative to atmospheric heating such as an open fireplace or an ordinary wood-burning stove is a pellet stove. The pellet stove only heats the room in which the stove is located. There is also a central heating pellet stove, which is a variant of the pellet stove that can be connected to the central heating system, such as the boiler or a buffer tank for hot water. The central heating pellet stove can therefore heat water for several rooms. The fuel of a (central heating) pellet stove consists of wood pellets, which are small rods of sawdust and wood waste, a cheaper fuel than gas. The pellet reservoir will need to be refilled regularly. For both variants of the pellet stove, place a particulate filter in the chimney or flue gas duct to capture particulate matter.

Biomass boiler
Do you have residual wood from your garden or park, or from the surrounding area? This is more than just a waste stream and can be used as biomass. There are various types of wood-fired heating systems suitable for residual wood. For example, a wood gasifier can heat with logs, sawdust and large shreds. Well-dried wood shavings from felling, pruning and sawdust from your area can be used in a woodchip installation. A biomass boiler produces heat by burning this waste. The heat released is used to heat water for central heating. An indirectly fired boiler can also be used to heat tap water.

Is a biomass boiler also sustainable? Burning wood releases CO¬2. The idea behind this is that trees can absorb this CO_2. The trees later serve as fuel again, thus creating a sustainable chain. This is questionable because CO_2 is still released into the air and burning is much faster than trees grow back. In any case, pay close attention to the origin of the fuel.

Hydrogen boiler
As an alternative to the gas boiler, the hydrogen boiler is emerging. In this new boiler, hydrogen is used for the production of hot tap water and central heating water. The major advantage of this system is that it works at a high temperature (i.e. does not require high insulation or low-temperature heating) and that the local residual product consists of water. This makes the hydrogen boiler itself a sustainable 1-to-1 replacement for the gas boiler. An important note is that hydrogen is produced on a large scale from natural gas. The alternative production method, electrolysis, is not yet widespread and is also very inefficient. Transport is also not yet optimal. Distribution ideally runs via the natural gas pipelines, but so far, the hydrogen still has to be fed into tanks. Finally, it is difficult to predict when and if hydrogen will become accessible for home use. The use of hydrogen boilers is currently still limited to a few pilots and not yet a proven approach.

Tip: Ground source heats the façade
A technique that has been used since 2011 for energy savings in heating is the active insulation of exterior facades. This involves pumping heat from the ground of approx. 10-12˚C to heat the exterior walls. This heat is further heated to 20˚C in winter by a heat pump. The existing heating can be retained. In summer, the 10-12˚C water is used for cooling. The system can be applied to the exterior or interior facade with prefabricated elements, in which the piping is pre-installed.

Heat release

Underfloor heating
Underfloor heating is a comfortable and efficient way of heating. Thin pipes are laid in the floor through which hot water flows. The water gives off its heat to the floor, which in turn radiates heat itself. The room is heated

uniformly. This is in contrast to traditional radiators, where the heat flow is different and heated air often remains suspended under the ceiling. Underfloor heating is a form of low-temperature heating, where the central heating only has to heat the water up to a maximum of 55 degrees. This saves energy consumption.

Wall and ceiling heating
Like underfloor heating, wall and ceiling heating consists of thin tubes located just below the surface. These are installed on the inside of the wall or ceiling. By allowing hot water to flow through them, the heat is emitted to the wall or ceiling, giving off a pleasant radiant heat. A combination with insulation on the inside of the wall is required to prevent the radiant heat from radiating to the outside as well.

Low-temperature heating
Low-temperature radiators (also known as LT radiators or LT convectors) heat with central heating water at a significantly lower temperature than conventional radiators. Depending on the situation, the central heating system only needs to heat the water up to 55 degrees Celsius instead of up to 70-90 degrees. This saves you energy consumption. It is also an improvement in comfort, as low-temperature radiators heat your home evenly and constantly. Good insulation and the switch to low-temperature heating are an important prerequisite for a heat pump.

Infrared heating
Unlike other systems, infrared does not heat via water. Infrared panels, like the sun, use radiant heat, which means it heats floors, walls, people and objects, which then release their heat to the air. Although heating via electricity is more expensive than gas, you can still save money with infrared heating. This is because you are heating in a targeted way and do not need to heat unnecessary space to achieve the desired comfort. Heating with infrared panels is an environmentally friendly choice as a supplementary heating system and in rooms that are used incidentally (such as a music room, study room or bathroom). Please note that if they are constantly on, it once again becomes more expensive than heating with gas.

Tip: Replace radiators with convectors
If your radiator is in need of replacement and low temperature radiators are not yet an option, consider replacing them with convectors. Cold air is sucked in at the bottom of the convector and rises as it is heated. Convectors are often smaller than radiators, heat up the room faster and, in some variants, convectors can also cool. In addition to the normal convectors, there are also low temperature convectors that can save 25% on the energy bill.

Tip: A label circulation pump
If you have underfloor heating and/or radiators, chances are you still have an old B or C label circulation pump. The circulation pump unobtrusively – you can barely hear it – pumps (hot) water around at the same speed throughout the year. This means that energy consumption can really add up; sometimes up to 5-10% of total energy consumption. An A label pump has three different settings and the pump adjusts its speed depending on the power required. This can save a lot in energy costs. Especially if your circulation pump is up for replacement soon, it will pay off to look at a modern A label pump.

Tip: Ultra-low-temperature heating
Ultra-low-temperature heating (also called ULT heating, capillary heating or climate mats) has the same principle and the same advantages and disadvantages as low-temperature heating. However, the big difference is that the tubes of ULT heating have a smaller diameter (up to 10 mm) and are made of plastic instead of copper. This fine structure allows for heating with water at an even lower temperature, around 30 degrees. ULT heating is supplied in ready-made climate mats that can be used in the floor as well as in the walls and ceiling. This is often a big challenge in buildings with historical value. en het plafond verwerkt kunnen worden. Dit is vaak een grote uitdaging bij panden met historische waarde.

Innovation: Undirected air heating system
By bringing the pre-heated air into the room in an undirected way, an optimal mixture of indoor and outdoor air is created. This gives the air in the room a more constant temperature, so less energy is needed for heating

and ventilation of the room. This also reduces draughts and cold air at the windows. This innovative system can easily be connected to the existing air heating system of a church.

Smart Use

Zone control
With zone control, the temperature can be set separately for each room. For example, you can turn the heating on in one room and leave it off in the other. This is done by installing an electrically operated radiator button on each radiator. This system can be operated via an app (e.g. on your smartphone) or a control panel. Zone control provides more comfort, energy savings and works well together with a smart thermostat.

Smart thermostat
A smart thermostat can help you to heat your building in a more energy-efficient way. Depending on the type of thermostat, the smart thermostat automatically adapts to your living rhythm and wishes. Choose a thermostat that suits you best. This way, you can control the heating remotely or the thermostat is self-learning. Some thermostats can even show you the energy consumption, just like an energy consumption manager. Or they read the meter readings of the smart meter automatically. This way, a smart thermostat helps you heat more efficiently.

Tip: Hydronic balancing
75% of the heating systems are not set properly. This causes hydronic imbalance, which means that the hot water is not distributed well throughout the building, which means that it cannot be heated uniformly, resulting in energy loss and discomfort.

Tip: Setpoint and night-time reduction
Heating systems are only set properly if they are adjusted to all available internal and external heat sources, such as people, lighting, computers and the sun. Night-time reduction is one of the resulting measures. With night-time reduction, the temperature is lowered. This ensures that there are no large fluctuations, and therefore large peaks, in the system. Especially for larger buildings, it is useful to set a setpoint and a night-time reduction. This allows the entire building to be set correctly at once (although preferences can still be adjusted manually). The lighting and heating/cooling will be lowered or switched off during absence and this can save a lot of money and energy!

Hot water

Heat pump boiler
A heat pump boiler is a compact heat pump connected to a cylinder that uses ambient air or ventilation air to heat tap water. The system uses heat from the ventilation air to heat tap water up to 60 °C. The cooled ventilation air is sent outside. This heat pump system is not intended for space heating but only for the generation of hot tap water. A heat pump boiler is often used as a replacement for a ventilation system (mechanical extraction) or as a replacement for an electric boiler system.

Booster heat pump
If you are connected to a heat network or collective heat pump with a supply of up to 50 °C, you will need a separate tap water supply. A booster heat pump is suitable for heating tap water up to 65 °C with the heat of the central heating water. Even in summer, when no hot central heating water is supplied, this booster heat pump can make tap water from the central heating water. The water is stored in a boiler tank. Depending on the

Close-in boiler
The close-in boiler is an energy-saving alternative to a hot water loop where the tap water loses a lot of energy over a long distance. With short and varying use of hot tap water, it can be interesting to install an electric close-in boiler per water point. A close-in boiler consists of an electric heating element for heating the tap water and a storage tank with a capacity of 5 to 15 litres. In a close-in boiler, water is continuously kept warm so that you have immediate hot water. The disadvantage is that the boiler uses more energy and takes up

more space than a continuous flow heater. But compared to a continuous flow heater, a close-in boiler has a smaller electricity connection. There are also ‘smart’ boilers that regulate the temperature in the boiler according to use, which saves in energy consumption.

Continuous flow heater
There are several ways to heat the hot tap water of your building without gas. Systems such as electric boilers and heat pump boilers take up a relatively large amount of space. An electric continuous flow heater can offer a compact alternative. An electric continuous flow heater only heats the water that is actually used. The heating element switches on when you open the hot water tap and immediately heats the water that flows through it. For brief and varied usage, it is interesting to install an electric continuous flow heater because it lets you heat more efficiently. A instantaneous water heater uses less energy and takes up less space than an electric boiler. However, an electric continuous flow heater does require a larger electricity connection.

Shower pipe heat recovery
In households, most hot tap water is used in the bathrooms. If you manage to reduce this consumption, you will need smaller all-electric heat pump and boiler tanks. This will save costs and space for the installation. Heat can be recovered from the dirty shower water, which is being flushed away hot. With shower pipe heat recovery, the vertical outlet pipe under the shower is replaced by a copper shower pipe consisting of an inner pipe with (hot) wastewater and an outer casing with clean (cold) water. Heat exchange takes place between these two layers, so that the cold (clean) water is pre-heated without consuming energy.

Shower tray or drain heat recovery
With heat recovery in the shower drain and shower tray, the heat exchange takes place in the shower drain or directly under the shower tray. Dirty shower water that flows into the drain when showering flows adjacent to the cold water supply. As a result, less energy is required to get the shower water to the right temperature. A heat recovery shower drain or shower tray is higher than a conventional shower tray, so take an elevated shower tray and the height of the shower area into account.

Hotfill white goods
A washing machine and dishwasher use electric heating elements to generate hot water. Because a sustainable heating system or gas boiler can do this more efficiently, it is convenient to use this system for these appliances as well. With a hotfill, you can connect the white goods to a hot water tap. In this way, the machine does not have to heat up the water first to be able to wash, which of course saves a lot of electricity. The hotfill is particularly efficient if the hot water is generated sustainably, for example by a heat pump or solar boiler. Not all washing machines have both cold and hot water connections, in which case a hot water selector needs to be installed.

Tip: Efficient with your dishwasher
Saving energy can easily be achieved by not pre-rinsing the dishes by hand, loading the dishwasher properly or by washing it at a lower temperature (Eco program). It can also pay off to replace your old dishwasher with a new eco-version. Another possibility is a hotfill water selector, which reduces (or even eliminates) the need for a dishwasher to heat up the water it uses.

5. Water and green

Green environment

Green roof
It's raining more and more frequently and heavily in the Netherlands. Our gutters and sewers can't process all that water fast enough. When you have a green roof, some of that water ends up in the soil and gradually evaporates. This not only prevents water nuisance, it also has a cooling effect on your house and the surroundings. In addition, green roofs are good for biodiversity and provide an attractive view for those who look out on the roof. There are various options, from a simple sedum roof to an extensive edible roof garden with trees. Which option suits your roof best depends on your wishes and roof, so it is important to check whether your roof can handle the greater weight.

Facade garden
Exchange your street tiles for a facade garden! A facade garden is good for the greening and water resistance of the immediate surroundings. Because rainwater can sink into the facade garden, less rainwater is discharged into the street sewer. The greenery also has a cooling effect and increases biodiversity. This measure is easy to implement yourself.

Around the building

Rain barrel
Rainwater can be well reused to water the greenery around your {pand_enkelvoud}. Every year, a large amount of clean drinking water is used in gardens for watering the plants and the lawn. By collecting the rainwater in a rain barrel and then using it, you save drinking water and make use of a natural source. Different sizes are available. The rain barrel can also be implemented as an underground tank, but this does require a pump.

Rainproof outdoor area
It is starting to rain more often and more heavily, which causes a lot of water nuisance. You can make the space around your {pand_enkelvoud} extra rainproof by choosing better water infiltration options. First of all, choose water-permeable pavements. There are different water-permeable pavements, such as shells, gravel, wood chips or even porous tiles. Try to limit the amount of pavement in the outdoor area, so there is more room for water, but also for greenery.

If you want to do even more, disconnect rainwater drains from the sewerage system and look at the possibilities of using a crate system. These are water buffers where rainwater is temporarily stored and can be slowly released to the groundwater. These can be integrated into the outdoor area or in combination with a green roof.

Helophyte filter
You can purify and reuse your grey wastewater (slightly contaminated wastewater, such as shower or washing-up water) on your own premises using a helophyte filter. A helophyte filter or swamp filter is a simple, natural way to purify grey wastewater. Helophytes are aquatic plants and provide a suitable living environment for the bacteria that break down the waste substances from the wastewater to a quality that is harmless to the environment. The water can then be discharged to the surface water instead of the sewer. The process has a high purification efficiency and the purified water can even be reused to flush toilets. Some energy is needed to pump the wastewater through the filter.

Aquaponics
There are more and more beautiful, circular solutions. An age-old solution is an Aquaponic, with which water can be purified and plants, such as vegetables and herbs, and fish, can easily be grown. This separate tank can be placed in the garden, for example. In this closed system, a tank is filled with water, fish and bacteria. The waste products of aquatic animals, such as fish and crustaceans, are converted by bacteria into food for plants. These plants on top of the tank thus receive food, moisture and sunlight. The plants in turn purify the water. Aquaponics systems come in many different shapes and sizes, from industrial scale to an aquarium connected to a few plant trays.

Tip: Green parking lot
The parking lot can be used for more than just parking. It is advisable to cover the parking spaces with semi-paved surfaces so that they are nice and green and rainwater can infiltrate into the ground. Moreover, by placing

a carport, covered with solar panels, electric cars can be charged with self-generated electricity. Of course, the energy can also be used in your {pand_enkelvoud}.

Tip: Filtration circulation pump
Do you have a swimming pool or pond by your {pand_enkelvoud}? With a durable filtration circulation pool and pond pumps, you can regulate the flow and speed entirely by yourself or automatically, unlike standard circulation pumps, which only run at full power, saving you over 80% of energy costs!

Shower and toilet

Water-saving shower head
A modern water-saving shower head uses considerably less water without compromising on shower comfort. Standard shower heads use 10 to 15 litres of water per minute, while a water-saving showerhead can reduce this water flow to as little as 5 litres per minute. It reduces the flow and adds air to the water, which means you experience a normal powerful jet that remains pleasant. Even a rain shower or another luxury shower does not necessarily have to waste water. Pay attention to the volume flow class, this must be S. An important additional advantage is that less water needs to be heated. This does more than just reduce the water and energy bill: the generator can often be downsized, which is especially interesting for sustainable generators such as heat pumps. Moreover, your water and energy bills will be lower.

Water-saving toilet
A water-saving toilet has a flush system with a selector switch that allows you to choose between 3 or 6 litres instead of 9 to 12 litres for a traditional toilet. The more often the toilet is used, the more sense it makes to purchase a modern toilet. For example, for a 4-person household, the toilet will pay for itself in 4 to 9 years, whereas for a single-person household, it can take up to 20 to 35 years. Is a new toilet not an option? For just 6 euros, you can buy a flush stop for in the reservoir. This will result in savings without spending much. Please note, the savings are considerably less than with a modern toilet.

Water reuse
Rainwater or greywater can be used for, among other things, flushing the toilet. The water is collected in a reservoir, possibly cleaned, and then used in the toilet. In an ultimate situation, you no longer use drinking water to flush with. This often requires a larger intervention, because a separate pipe system may have to be installed to separate greywater and/or rainwater from drinking water. This is often a costly and complicated modification in existing buildings.

Tip: Shower timer
A shower timer – such as an hourglass at the shower – stimulates a more conscious time management under the shower. Shorter showering not only saves water, but also energy to heat the water. This is a simple and effective way to save energy! On average, we shower almost 8 minutes in the Netherlands. By reducing this to 5 minutes, an average household quickly saves €70 a year.

Tip: Flow restrictor
With a flow restrictor, you will consume less water during, for example, hand washing without noticing. Without sacrificing comfort, you save (hot) water at the wash basin tap. At the kitchen tap, the flow restrictor can be experienced as less practical, because it takes longer to fill a bucket or saucepan. Many faucets already have a flow restrictor, and otherwise they can be purchased for a few euros. This will pay for itself in one year, a real 'quick win'.

Tip: Heat recovery in the shower
By exchanging heat in the shower drain you save energy to heat water. Good for your wallet and very handy if you want to start heating with sustainable generators such as a heat pump. Read more about this in the topic 'heating'.

Deliverable Proof – "Other document" - EIT-BP2020

Name of KIC project the report results from that contributed to/ resulted in the deliverable	Pan-European Approach on Sustainable Heritage: Regeneration by a retrofitting economy
Name of document	Appendix 1 E Content Slovenian Green Menu
Summary/brief description of document	This document contains the information that is included in the Slovenian Green Menu. Including measures, tips, points of attention, and innovations, 25 financial support mechanisms, and 13 different policies.
Date of document	31/12/2020

Supporting Documents: attach in pdf format

Climate-KIC is supported by the EIT, a body of the European Union

Appendix E - Content included in the Slovenian Green Menu

This document contains the full inventory of measures, tips, innovations, and points of attention; financial mechanisms; and policies referred to in the Slovenian version of the Green Menu platform (Zeleni Meni).

The content is in Slovenian language.

1. Technical content for measures included in the Slovenian Green Menu

Navodila

Ukrepi so razdeljeni na 5 tematik:

1. Hitre rešitve
2. Izolacija in prezračevanje
3. Elektrika
4. Ogrevanje
5. Voda in zeleno

Ta dokument lahko uporabite kot delovni dokument, novo besedilo pa lahko po tem naložite v poseben dokument, namenjen nalaganju.

1. Hitre rešitve

Raba energije

Sistem za nadzor rabe energije
Zakaj rabimo toliko energije za delovanje stavbe in katere naprave in sistemi so njeni največji porabniki? Odgovor nam lahko da npr. sistem za spremljanje porabe elektrike ali pa centralni nadzorni sistem (CNS) za upravljanje stavbe. Oblike nadzornih sistemov se med seboj razlikujejo in vključujejo različne rešitve od zaslonov na steni do spletnih strani in mobilnih aplikacij. Učinki ukrepov kot je npr. izklop razsvetljave so vidni v realnem času. Programska oprema CNS na podlagi stanja in sprememb izmerjenih parametrov nadzira in vodi delovanje stavbnih sistemov in komponent. Sistem lahko uravnava temperaturo, prezračevanje, senčenje, hlajenje, osvetlitev in druge parametre v prostoru in tako omogoča tudi 5 do 10-odstotne prihranke energije.

Zamenjava velikih porabnikov elektrike
Starejše gospodinjske naprave in aparati so navadno tudi veliki porabniki elektrike. Nove naprave z oznakami A+, A++ in A+++ so gospodarnejše in z njimi lahko prihranite tudi nekaj deset evrov letno pri strošku za elektriko. Pri nakupu novega aparata bodite zato pozorni na energijski razred, označen na nalepki. Pozor, v letu 2021 se bodo oznake na nalepkah nekaterih aparatov in sijalk spremenile. Več informacij: https://europa.eu/youreurope/business/product-requirements/labels-markings/energy-labels/index_sl.htm. Razmislite tudi, ali res potrebujete vse aparate, ki jih imate trenutno doma. Če jih uporabljate le občasno ali nimate denarja za nakup novih, jih lahko morda tudi najamete.

Najem gospodinjskih aparatov
Star pralni stroj gotovo porabi več energije in vode, kot je potrebno. Enako velja za druge velike gospodinjske aparate. Nov, energijsko učinkovit in zanesljiv aparat pa ni nujno poceni. V tujini se v duhu spodbujanja krožnega gospodarstva uveljavlja najem gospodinjskih aparatov. Uporabnik tako plača zgolj znesek mesečne najemnine, za vzdrževanje pa poskrbi podjetje. Če določen aparate uporabljate le občasno ali nimate denarja za nakup novega, se splača preveriti, ali je na voljo tudi za najem. Najhitreje boste informacije našli na spletu ali npr. pri Zvezi potrošnikov Slovenije.

Popolnoma izklopite naprave
Naprave v stanju pripravljenosti, spečem stanju ali mirovanju (navidezni izklop) še vedno

porabljajo energijo. Če naprave popolnoma izklopite, lahko prihranite veliko energije. Notesnik lahko v stanju pripravljenosti porabi do 15 % svoje skupne rabe elektrike, večfunkcijska naprava pa ob povprečni uporabi tudi do 90 %. Naprave enostavno izklopite s pomočjo vtičnice s stikalom za vklop in izklop. Gospodinjstvo lahko tako na leto prihrani nekaj deset evrov pri stroških energije. Med naprave, ki porabljajo elektriko v stanju pripravljenosti, denimo spadajo dekodirnik za digitalno televizijo, računalnik in tiskalnik, kavni in sorodni aparati, avdio oprema in mini grelnik.

Stikalo za izklop naprav v stanju pripravljenosti
Stikalo za izklop naprav v stanju pripravljenosti preprečuje nepotrebno porabo elektrike. To je učinkovito zlasti pri napravah, ki jih uporabljate le občasno. Če med napravo in stensko vtičnico namestite stikalo za popoln izklop naprave, boste popolnoma prekinili porabo elektrike. Ta majhna prilagoditev že lahko bistveno spremeni vaš račun za energijo.

Izolirajte cevi za centralno ogrevanje
Neizolirane cevi za ogrevanje so lahko velik vir toplotnih izgub. Če cevi izolirate v območjih, kjer ogrevanje ni predvideno ali zaželeno, npr. v hodnikih, shrambah ali na neogrevanem podstrešju, se bo toplota oddajala le tam, kjer je to potrebno. Letno boste tako lahko prihranili tudi do 3 m^3 zemeljskega plina na tekoči meter izolirane cevi za ogrevanje. Cevi lahko večinoma povsem enostavno izolirate sami, pazite le, da bodo ostale lahko dostopne.

Nasveti za ogrevanje
S segrevanjem ciljnih površin v vašem domu ne boste vsakič segrevali celotne stavbe. To lahko storite tako, da namestite časovni termostat in ločeno krmiljenje termostata. Vrata med ogrevanimi in neogrevanimi ali manj ogrevanimi prostori naj bodo vedno zaprta, da preprečite uhajanje toplote. Še pomembneje pa je, da s tem preprečite kondenzacijo vodne pare v hladnejših prostorih. Topel zrak namreč vsebuje veliko vodne pare, ki lahko kondenzira na hladnih površinah. Sčasoma se lahko razvije plesen. Ne pozabite, da morate neogrevane prostore zračiti z zunanjim zrakom; »prezračevanje med prostori« je nepravilno in škodljivo. Z razdelitvijo notranjosti na toplotne cone lahko v neizoliranih zgodovinskih stavbah opazno znižate stroške za ogrevanje, vendar morate pri tem pridobiti in upoštevati nasvet strokovnjaka.

Termostatski ventil na ogrevalih

Najučinkovitejše je uravnavanje temperature s termostatskimi ventili na radiatorjih. Termostatska glava odpira ali zapira ventil in s tem uravnava pretok vode v sistemu glede na temperaturo v prostoru ter preprečuje pregrevanje. Letne stroške za ogrevanje lahko znižate celo do 12 %. Bivalno ugodje je zaradi stalne temperature v prostoru mnogo boljše, temperaturo pa lahko nastavite glede na svoje želje in potrebe v vsakem posameznem prostoru. Izbiro in vgradnjo termostatskega ventila prepustite strokovnjaku.

Pametni termostat
Če na termostatu znižate nastavljeno temperaturo za eno stopinjo, boste na leto prihranili med 5 % in 10 % energije za ogrevanje. Kupite pa lahko tudi pametni termostat. Ta se samodejno prilagodi vašemu življenjskemu ritmu in željam, saj upošteva aktivnosti v posameznih delih dneva in vnesene urnike. Upravljate ga lahko na daljavo s pomočjo mobilne aplikacije, sposoben pa je tudi samoučenja. Nekateri termostati vam lahko celo prikažejo porabo energije, podobno kot sistem za upravljanje porabe energije. Na ta način vam bo pametni termostat pomagal do učinkovitejšega ogrevanja in v kombinaciji s pametnimi radiatorskimi ventili tudi za eno tretjino znižal stroške ogrevanja.

Nastavitev centralnega ogrevanja
S pravilno nastavitvijo kotla za centralno ogrevanje boste prav tako prihranili pri stroških za energijo. Za manjše prilagoditve, npr. temperature in urnika ogrevanja ali nočnega znižanja temperature, lahko ob upoštevanju navodil za uporabo poskrbite kar sami. V kombiniranem kotlu lahko tudi znižate najvišjo temperaturo vroče vode iz pipe. Temperatura pa ne sme biti nižja od 60 stopinj Celzija, da ne pride do razvoja legionele. Večje prilagoditve so odvisne od tipa kotla in tudi od načina ogrevanja (visoko- ali nizkotemperaturno), zato naj jih opravi strokovnjak.

Hidravlično uravnoteženje radiatorjev
Ocenjeno je, da okoli 75 % ogrevalnih sistemov ni pravilno nastavljenih. To povzroči neenakomerno razporejanje vroče vode po radiatorjih v stavbi oz. med prostori. Toplotno ugodje se poslabša, raba energije za ogrevanje pa poveča. Vsak radiator mora prejeti računsko določen pretok ogrevne vode, ki zagotavlja ustrezno temperaturo prostora, neodvisno od dinamičnih tlačnih razmer v sistemu. Potrebna je izvedba hidravličnega uravnoteženja vseh dvižnih vodov ogrevalnega sistema stavbe, kar mora opraviti strokovnjak.

Debele zavese in polkna
Če obesite debelejše zavese, bo skozi okno ušlo bistveno manj toplote. Podobno velja tudi za zapiranje polken na zunanji fasadi, česar so se s pridom posluževali že naši predniki. Vendar pa lahko zavese, pa tudi notranje žaluzije in roloji, ovirajo kroženje zraka ob notranjih šipah, zaradi česar se te začnejo rositi (kondenzacija vodne pare na steklu). Nujno je opazovati učinek takega ukrepa in ga po potrebi prilagoditi. V stavbah s starejšimi okni (škatlasta, vezana, ali enojna z enojno ali navadno dvojno zasteklitvijo) lahko s pametno uporabo zaves in polken prihranite do 150 evrov letno pri računu za toplotno energijo. Dandanes obstajajo tudi posebne zunanje izolacijske žaluzije, roloji in polkna, ki poskrbijo, da skozi okno uide še manj toplote.

Folija za radiatorje
Pri ogrevanju z radiatorji veliko toplote uide skozi neizolirane zunanje stene. V trgovinah z gradbenim materialom lahko kupite posebno folijo in jo pritrdite na zadnjo stran radiatorja ali na steno za radiatorjem, tako da bo toploto odbijala nazaj v prostor. Ta majhna naložba bo za do 80 % zmanjšala izgubo toplote skozi zid neposredno za radiatorjem.

Ventilator kot dodatek radiatorju
Radiator večino toplote prenaša na okoliški zrak, ki začne po zakonih fizike krožiti in segrevati prostor. Če je radiator nameščen tako, da je gibanje zraka oteženo, lahko stanje nekoliko izboljšate z namestitvijo ventilatorja pod ali nad radiator. Ventilator lahko kombinirate s tipalom tako, da se vklopi ob začetku segrevanja radiatorja. Domači mojstri lahko tak sistem sestavijo sami, npr. z ventilatorji iz odsluženih računalnikov. Poraba elektrike je minimalna. S tem ukrepom »pomagate« posameznemu radiatorju, da pri istem položaju ventila bolje opravlja svojo funkcijo ter vam omogoči prihranke pri stroških ogrevanja.

Razsvetljava s svetlečimi diodami (LED)
Preprosto varčevanje z energijo se začne pri osvetlitvi. Do 15 % celotne porabe električne energije v stavbi prispeva umetna razsvetljava. Če klasične žarnice z žarilno nitko zamenjate s svetlečimi diodami, ki jim pogovorno rečemo tudi LED sijalke, lahko znatno prihranite. Na voljo so v številnih velikostih, barvah, jakostih in s standardnimi grli, tudi z možnostjo zatemnitve. Imajo dolgo življenjsko dobo in v primerjavi s kompaktnimi fluorescentnimi sijalkami (t. i. varčnimi sijalkami) po vklopu ne potrebujejo časa za zagon.

Izolacija lopute za pošto na vhodnih vratih
Na vhodnih vratih nekaterih starejših stavb in stanovanj še vedno najdemo odprtino za pošto s preprosto loputo, skozi katero lahko uhaja toplota. Če želite ohraniti uporabnost take lopute in zmanjšati prepih skoznjo, lahko nanjo namestite poseben ščetkast trak, ki stanje nekoliko izboljša. Možno je tudi dodati loputo na notranji strani vrat, pri kateri po celotnem obodu pritrdimo primeren tesnilni trak.

Voda

Prhanje in kopanje
Za prhanje porabite bistveno manj vode in s tem tudi energije kot za kopel v kadi. V povprečju se odrasla oseba prha od pet do osem minut in porabi približno 140 litrov vode, pri kopeli pa 250 litrov. Med prhanjem včasih kar izgubimo občutek za čas. Že najpreprostejši pripomoček kot je peščena ura vam bo pomagal nadzorovati trajanje prhanja, otroci pa lahko to vzamejo kot igro ali tekmovanje. Še mnogo več boste prihranili, če med miljenjem in šamponiranjem zaprete vodo; porabo vode lahko znižate skoraj za dve tretjini.

Omejevalnik pretoka vode
Z omejevalnikom pretoka boste med opravili kot je denimo umivanje rok porabili manj vode, pa tega sploh ne boste opazili. Ne da bi žrtvovali udobje, boste prihranili (toplo) vodo, ki teče iz pipe umivalnika. Številne pipe že imajo omejevalnik pretoka, sicer pa ga lahko za nekaj evrov kupite tudi sami. V enem letu se vam bo nakup povrnil – prava hitra zmaga!

Varčna ročka za prho
S pomočjo varčne ročke oz. glave za prho boste porabili manj tople vode, ne da bi za to žrtvovali svoje udobje. Tovrstna izvedba zmanjšuje pretok in v vodo dodaja zrak, pri čemer je curek še vedno normalno močan in enakomeren. Tudi tropske ali dežne prhe ne porabijo veliko vode. Celo nasprotno, glava prhe ustvarja meglico in prihrani velike količine vode. Če toplo vodo pripravljate s toplotno črpalko, je to še posebej dobra ideja. Povprečno gospodinjstvo lahko tako zlahka prihrani do nekaj deset evrov letno.

Zbiralnik deževnice
Deževnico lahko uporabite za zalivanje zelenja okrog vašega doma. Na vrtu se vsako leto porabi veliko pitne vode za zalivanje rastlin in trate. Če v ta namen uporabite deževnico iz zbiralnika, ki je lahko povsem navaden sod ali pa dodelan dekorativen element, boste prihranili pitno vodo in ravnali trajnostno. Kot zbiralnik deževnice lahko zgradite tudi podzemni rezervoar, vendar pa morate v tem primeru dodati še črpalko.

Pridelovanje lastne zelenjave in zelišč (dodano pod Water and Green)
Vse več ljudi prideluje lastno zelenjavo in zelišča za samooskrbo. To ni zgolj trajnostno naravnano, pač pa tudi zelo zabavno opravilo. Obstaja veliko različnih vrst zelenjave in zelišč, ki jih lahko gojite tudi v stanovanju ali na balkonu. Z lastno pridelavo zelenjave znižujete izpuste CO_2, saj ga rastline porabljajo za fotosintezo, hkrati pa se zmanjšuje potreba po transportu teh pridelkov. To je enostaven recept za bolj trajnostno bivanje.

2. Izolacija in prezračevanje

Rege in fuge

Zatesnitev okenske pripire
Za tesnjenje rege med okenskim okvirjem in krilom lahko uporabite samolepilne tesnilne trakove, ki jih enostavno nalepite na okvir. Učinkovitejši in bistveno trajnejši način je izdelava utora v okenski profil in vgradnja namenskega tesnila, za kar pa naj poskrbi usposobljeno podjetje. Na ta način se znebite prepiha, toplotne izgube bodo manjše, pomembno pa se zmanjša tudi prenos hrupa iz okolice v prostor. Pri kulturni dediščini je treba pri pristojni območni enoti zavoda za varstvo kulturne dediščine najprej preveriti, ali je tak poseg dovoljen. Zelo priporočljivo je po takem ukrepu v prostor namestiti preprost merilnik zračne vlage, higrometer, saj se relativna vlažnost zraka praviloma zviša. Posledica je lahko površinska kondenzacija vlage na hladnejših površinah in razvoj plesni. Po takem ukrepu je potrebno prilagoditi prezračevanje; ko se relativna vlažnost zraka približa vrednosti 60 %, je treba prostor prezračiti. Več informacij o izboljšanju zrakotesnosti najdete v publikaciji na povezavi http://www.energetika-portal.si/fileadmin/dokumenti/podrocja/energetika/javne_stavbe/smernice_kd_23.2.2017.pdf.

Zatesnitev vrat
Obod vrat pogosto ni povsem zatesnjen. Na spodnjem robu vrat lahko namestite trak v obliki ščetke in zmanjšate prepih. Rego med vratnim krilom in podbojem lahko enostavno zatesnite s samolepilnimi tesnilnimi trakovi, podobno kot pri oknih. Ta postopek je povsem primeren tudi za vrata z zgodovinsko vrednostjo, saj lahko trak kadarkoli odstranite. Tesnilni trak za preprečevanje prepiha pa lahko v vrata tudi vgradite, kar naj stori usposobljeno podjetje. Strokovnjak mehansko naredi utor po obodu vratnega krila, kamor nato vgradi tesnilo. Pri kulturni dediščini je treba pri pristojni območni enoti zavoda za varstvo kulturne dediščine najprej preveriti, ali je tak poseg v vaši stavbi dovoljen. Več informacij o izboljšanju zrakotesnosti najdete v publikaciji na povezavi http://www.energetika-portal.si/fileadmin/dokumenti/podrocja/energetika/javne_stavbe/smernice_kd_23.2.2017.pdf.

Zatesnitev prebojev in vgradnih reg
Izvor prepiha so lahko tudi razpoke in preboji v zidu, stropu in strehi, ali pa vgradne rege med okni in vrati ter obodno konstrukcijo. Če jih zatesnite, ne bo več občutka prepiha, toplotne izgube bodo manjše, zvočna zaščita pred hrupom iz zunanjosti pa večja. Zmanjša se tudi nevarnost kondenzacije zaradi vdora vodne pare iz notranjosti do hladnih delov konstrukcije. Najbolje je, da zatesnitev opravi strokovnjak, vedno pa je treba uporabiti namenske materiale in izdelke. Pri kulturni dediščini je treba pri pristojni območni enoti zavoda za varstvo kulturne dediščine pridobiti ustrezna navodila. Kolikor je le mogoče se držite načela tesnjenja v treh ravneh: znotraj zrakotesno in paroneprepustno, v sredini toplotno in zvočno izolativno, zunaj pa paroprepustno in vodotesno. Pozor, relativna vlažnost zraka v prostoru se po zatesnitvi zviša, če ne prilagodite prezračevanja. Posledica je lahko površinska kondenzacija na hladnejših površinah in razvoj plesni. Več informacij o izboljšanju zrakotesnosti najdete v publikaciji na povezavi http://www.energetika-portal.si/fileadmin/dokumenti/podrocja/energetika/javne_stavbe/smernice_kd_23.2.2017.pdf.

Namig: samodejna zapirala za vrata
Ste vedeli, da se toplota lahko izgublja tudi znotraj stavbe, med prostori? V stavbah in gospodarskih poslopjih pogosto niso ogrevane vse sobe. Zato se skozi odprta vrata, ki vodijo v neogrevane prostore, izgubi veliko toplote. To pa ni edina slaba stran. Topel zrak vsebuje veliko vodne pare, ki lahko v stiku s površinami v hladnih prostorih kondenzira, kar je prvi korak k razvoju plesni. Obstaja enostavna rešitev te težave: namestitev zapiral za vrata, da vam ne bo treba več skrbeti!

Nasvet: vetrolov
Namen vetrolova je preprečiti prepih v notranjosti pri odpiranju zunanjih vrat in zmanjšati toplotne izgube. Gre za učinkovit toplotni blažilnik, imenujemo ga tudi tamponsko območje, med notranjim

prostorom in zunanjostjo. Če stavba oz. njen vhod nima vetrolova, velja razmisliti o njem. Možnosti je veliko, od zidanih masivnih konstrukcij do montažnih steklenih. Pri stavbah kulturne dediščine vetrolova najverjetneje ne bo dovoljeno dograditi, pri vseh drugih pa oblikovno zasnovo prepustimo arhitektu.

Izolacija strehe

Izolacija poševne strehe z zunanje strani

Odvisno od zasnove stavbe je lahko delež toplotnih izgub skozi streho od ene desetine pa vse do ene četrtine vseh toplotnih izgub skozi ovoj stavbe. Če streho izolirate, znatno znižate rabo energije za ogrevanje in s tem povezane stroške. Kot vse druge elemente ovoja je poševno streho najprimerneje dodatno izolirati z zunanje strani, a je v praksi to redkeje izvedeno. Izdelavo projekta, izbiro materialov oz. slojev in njihovo pravilno zaporedje prepustimo strokovnjaku. Opisani način je zlasti primeren, ko obnavljamo ali menjamo strešno kritino in njeno podkonstrukcijo. Vedeti pa moramo, da se bodo spremenili gabariti strehe; postala bo višja. Izolacije poševne strehe z zunanje strani tako ni vedno mogoče izvesti, bodisi iz tehničnih, še zlasti pa kulturnovarstvenih razlogov. Več informacij na to temo najdete v publikaciji na povezavi http://www.energetika-portal.si/fileadmin/dokumenti/podrocja/energetika/javne_stavbe/smernice_kd_23.2.2017.pdf.

Izolacija poševne strehe z notranje strani

Izolacija strehe preprečuje nepotrebno uhajanje toplote. Streho lahko na notranji strani izoliramo med in pod strešnimi tramovi (špirovci). To je lahko sicer nekoliko manj učinkovit način kot izolacija z zunanje strani, ni pa treba odstranjevati strešne kritine. Pri strehah z zgodovinsko vrednostjo je izolacija z notranje strani prednost, saj ne spremeni zunanjega videza strehe. Ključnega pomena so ustrezno projektirani in izvedeni detajli ter skrb za zrakotesnost in neovirano difuzijo vodne pare, da preprečimo njeno kondenzacijo v enem ali več slojih nove strehe. Višina špirovcev skoraj nikoli ni taka, da bi mednje položena toplotna zaščita ustrezala sodobnim merilom učinkovite rabe energije in dobrega toplotnega ugodja. Pod njimi zato namestimo še en sloj toplotne zaščite na primerni podkonstrukciji, s čimer pa prostor izgubi nekaj višinskih centimetrov. Več informacij na to temo najdete v publikaciji na povezavi http://www.energetika-portal.si/fileadmin/dokumenti/podrocja/energetika/javne_stavbe/smernice_kd_23.2.2017.pdf.

Izolacija stropa proti podstrešju

Podstrešje je najvišja etaža stavbe, tik pod streho. Toplota iz spodnjih prostorov se preko podstrešja in strehe izgublja v okolico. Izolacija stropa proti podstrešju oz. gledano od zgoraj, tal podstrešja, je dobra ideja, če podstrešje ni ogrevano in če ga ne uporabljate kot bivalni prostor. Izolacijski material lahko položite med neposredno na tla podstrešja oz. med stropne nosilce. Parna zapora pod izolacijo praviloma ni potrebna, priporočljivo pa je izolacijo prekriti oz. zaščititi s čimbolj paroprepustno folijo. Ne pozabite na izdelavo servisnih poti do dimnikov in do oboda podstrešja. Izolirajte tudi dostop na podstrešje. Izolacija podstrešja je najenostavnejši in najcenejši od vseh ukrepov za izolacijo ovoja stavbe. Bistveno je cenejši tudi od izolacije poševnih strešnih ploskev, prinaša pa enako zmanjšanje toplotnih izgub. Investicija se lahko povrne prej kot v dveh letih. Več informacij na to temo najdete v publikaciji na povezavi http://www.energetika-portal.si/fileadmin/dokumenti/podrocja/energetika/javne_stavbe/smernice_kd_23.2.2017.pdf.

Toplotna zaščita ravne strehe

Z dodatno toplotno zaščito ravne strehe pomembno zmanjšate toplotne izgube in rabo energije za ogrevanje. Ravne strehe je najbolje toplotno izolirati na zunanji strani. Najprej je treba preveriti stanje hidroizolacije. Po potrebi jo popravite ali zamenjajte. V osnovnem načinu izvedbe tople ravne strehe prevzame obstoječa hidroizolacija funkcijo parne zapore, nanjo dodamo sloj toplotne zaščite in zaključno hidroizolacijo ter zaščitno plast. Pri obrnjeni ravni strehi je vodoodporna toplotna zaščita v enem sloju položena na hidroizolacijo in zaščitena ter obtežena npr. s prodcem. Plus-streha je izvedena kot osnovna varianta tople strehe z dodano vodoodporno toplotno zaščito kot pri obrnjeni strehi. Ta tip izvedbe je primeren, kadar želimo izboljšati toplotne lastnosti

strehe, ki je že toplotno zaščitena. Več o tej tematiki, tudi o možnostih izolacije ravne strehe z notranje strani, najdete v publikaciji na povezavi http://www.energetika-portal.si/fileadmin/dokumenti/podrocja/energetika/javne_stavbe/smernice_kd_23.2.2017.pdf.

Namig: Hlajenje strešne kritine
Strehe s temno kritino absorbirajo mnogo svetlobe in toplote, zaradi česar se streha in prostori pod njo segrevajo. V mestih zaradi tega prihaja tudi do večje toplotne obremenitve (»toplotni otok«). Svetlejše kritine oz. zaključni sloji ta problem omilijo. Ne pozabite pa, da se bo s tem spremenil tudi videz strehe in da bo morebitno onesnaženje postalo bolj vidno.

Namig: Razmislite o zeleni strehi

Če prenavljate streho, razmislite o izvedbi zelene strehe v kombinaciji s strešno izolacijo. Tako se lahko podaljša življenjska doba strehe, prostori tik pod streho pa bodo poleti hladnejši. Poleg tega bo vaša zelena streha pripomogla k manjši toplotni obremenitvi neposredne okolice, v primeru močnih nalivov pa bo meteorna kanalizacija manj obremenjena. Glede na vrsto ozelenitve ločimo zelene strehe z ekstenzivno in intenzivno ozelenitvijo. Zgornji sloj zelene strehe je humus oziroma zemljina, sledijo mu filtrski sloj (npr. geotekstil), akumulacijski sloj (npr. ekspandirana glina) in protikoreninska zaščita. Nižje ležeči sloji so podobni in izvedeni analogno kot pri osnovni ali obrnjeni izvedbi tople ravne strehe.

Izolacija tal

Toplotna zaščita tal nad neogrevanim prostorom na hladni oz. spodnji strani
Z vgradnjo toplotne zaščite na strop neogrevanega prostora kot je npr. klet ali odprtega prehoda boste zmanjšali toplotne izgube, ublažili temperaturna nihanja in izboljšali bivalno udobje v zgornjih prostorih. Tudi nevarnost kondenzacije vodne pare na hladnih površinah bo manjša. Ukrep je večinoma izvedljiv brez posebnih omejitev tudi v stavbah kulturne dediščine. Če doslej to še ni bilo urejeno, poskrbite tudi za prezračevanje neogrevanih prostorov. Za nasvet o ustreznih načinih izvedbe povprašajte strokovnjake.

Toplotna zaščita tal na terenu ali nad neogrevanim prostorom na topli oz. zgornji strani
Če so tla v vaši stavbi obložena s keramičnimi, kamnitimi ali drugimi oblogami kulturnozgodovinske vrednosti, morate pridobiti pogoje in navodila pristojne konservatorske službe. Če ni zadržkov, lahko z namestitvijo namenskega materiala za toplotno zaščito zelo izboljšate bivalno ugodje in zmanjšate toplotne izgube. Posvetujte se s strokovnjakom, ali in katere sloje obstoječega poda je nujno ali smiselno odstraniti pred namestitvijo toplotne zaščite in izdelavo novih zaključnih slojev. Pri tleh na terenu najprej preverite stanje hidroizolacije in jo po potrebi popravite ali zamenjajte. Ne pozabite, da bo zaradi večje skupne višine podne konstrukcije, zlasti če boste npr. položili še sistem talnega gretja, treba prilagoditi tudi vratne odprtine in pragove.

Toplotna zaščita pod talno ploščo
V Sloveniji redko naletimo na izvedbo talne plošče, ki bi bila v celoti nekoliko dvignjena nad teren. Morda pa imate v pritličju posamezen prostor, ki ne leži neposredno na terenu. Če izvedba toplotne zaščite takih tal z zgornje strani ni možna, lahko razmislite o vpihovanju granul posebnega vodoodpornega izolacijskega materiala v spodnji medprostor. To ni delo za domačega mojstra, zato za nasvet povprašajte strokovnjaka.

Namig: Zvočna izolacija
Hrup je lahko izjemno moteč. Zvok se skozi stavbo premika na dva načina: po zraku in v obliki udarnega hrupa. Udarni hrup nastane zaradi prenosa vibracij po konstrukcijah. To se lahko zgodi neposredno, npr. prenos v spodnji prostor pri hoji po tleh brez ločilnega sloja za zvočno zaščito, ali pa posredno, npr. prenos hrupa s tal na steno, če ta elementa nista ločena med seboj. S plavajočim estrihom, ki ga lahko izvedemo tudi med prenovo prostorov, lahko obe obliki prenosa udarnega hrupa praktično povsem omejimo. Hrup, ki se prenaša po zraku, pa lahko prihaja od znotraj in od zunaj; pot najde preko t. i. zvočnih mostov kot so netesne vgradne rege, preboji in podobno, pa tudi preko konstrukcij z majhno maso ali stavbnega pohištva s slabimi zvočnoizolacijskimi lastnostmi. Netesna mesta lahko zatesnimo, okensko zasteklitev pa zamenjamo s takšno z boljšo

zvočno izolativnostjo. Slednji ukrep morda ne bo dovoljen pri stavbi kulturne dediščine. Mase konstrukcij praviloma žal ne moremo enostavno povečati. Najučinkovitejši ukrepi proti širjenju hrupa v okolico pa so na viru hrupa. Znižanje emisij hrupa (oddajanje) je lažje dosegljivo kot znižanje imisij hrupa (sprejemanje).

Izolacija fasade

Zunanja toplotna zaščita

Morda se sprašujete, ali je smiselno toplotno izolirati masivno zunanjo steno starejše stavbe. Odgovor je pritrdilen. Kakšna je optimalna debelina izolacije in kateri material je najprimernejši, pa vam bo povedal strokovnjak. Oglejmo si dva primera. Opečna stena debeline 30 cm ima toplotno prehodnost (označujemo jo s črko U) približno 1,6 W/m^2K. Že če ji dodamo samo 5 cm izolacije, se njene toplotne lastnosti trikratno izboljšajo. Opečna stena debeline 60 cm ima toplotno prehodnost približno 1,0 W/m^2K. Dodanih 5 cm izolacije njen toplotni upor več kot podvoji. Vedeti pa morate, da je treba ob tovrstni prenovi fasade upoštevati veljavni predpis, ki trenutno (v letu 2020) določa, da sme biti toplotna prehodnost zunanje stene največ 0,28 W/m^2K. V omenjenih primerih bi tako izbrali toplotno zaščito debeline vsaj 12 oz. 10 cm. Pri stavbah kulturne dediščine je toplotna izolacija fasade z zunanje strani iz razumljivih razlogov dovoljena le izjemoma. Več informacij na to temo najdete v publikaciji na povezavi http://www.energetika-portal.si/fileadmin/dokumenti/podrocja/energetika/javne_stavbe/smernice_kd_23.2.2017.pdf.

Notranja toplotna zaščita

Notranja toplotna zaščita je primerna rešitev, kadar stene ne moremo ali ne smemo izolirati z zunanje strani. Vedeti pa morate, da lahko z nepravilno izvedbo naredite bistveno več škode kot koristi. Z izbiro materialov in postopkov morate poskrbeti, da v sloju toplotne zaščite ne pride do kondenzacije vodne pare in da zid ohrani zadostno sposobnost sušenja po padavinah. Odločite se lahko za klasičen sistem s podkonstrukcijo, med katero namestite toplotno zaščito, nato sledi parna ovira ali zapora in zaključna obloga. Uporabite pa lahko tudi t. i. kapilarno aktivni sistem. Namenske obložne plošče z visoko sposobnostjo uravnavanja vlage se lepijo neposredno na zid. Še posebej pa se je treba posvetiti toplotnim mostovom, tj. delom ovoja, ki ostanejo neizolirani. Najbolj značilen primer so ležišča medetažnih plošč in lesenih stropnih nosilcev v zunanjem zidu. To nikakor ni ukrep, ki bi se ga lahko lotil laik. Nujno poiščite pomoč izkušenega strokovnjaka. Več informacij na to temo najdete v publikaciji na povezavi http://www.energetika-portal.si/fileadmin/dokumenti/podrocja/energetika/javne_stavbe/smernice_kd_23.2.2017.pdf.

Izolacija prezračevanih in obešenih fasad

Marsikje v tujini so nekoč gradili dvoslojne zunanje stene, kjer je vmesni zračni prostor predvsem poskrbel za sušenje vlage, ki je prodrla skozi zunanji sloj stene. Pri nas pa poznamo t. i. prezračevane in obešene fasade, ki so se bolj razmahnile v drugi polovici 20. stoletja. Za izboljšave toplotnih lastnosti takih fasad pri stavbah kulturne dediščine veljajo posebne omejitve in zakonitosti. Pri drugih stavbah lahko morda obešeno fasado demontirate, dodate ali povečate sloj toplotne zaščite in obešeno fasado namestite nazaj, pri čemer bo zagotovo treba prilagoditi ali zamenjati nosilce. Če je taka fasada prezračevana, morate tudi po prenovi ohraniti zračni sloj širine najmanj 4 cm. Pri klasičnih prezračevanih fasadah (npr. iz fasadne opeke) lahko v vmesni prostor vpihate primeren izolacijski material. To je lahko zelo tvegan poseg, zato ga mora predhodno potrditi strokovnjak s področja gradbene fizike. Izvedba je smiselna le, če fasada v popolnosti ščiti pred atmosferskimi vplivi in padavinami.

Barve z votlimi polnili

V zadnjih letih so proizvajalci barv in fasadnih sistemov razvili barve z votlimi polnili (t. i. nano-struktura), ki imajo izboljšane toplotnoizolativne lastnosti. Priporočljivo je, da notranje stene predhodno obdelamo z izravnalno maso na enaki osnovi. Taka barva je dražja od običajnih barv in seveda ni enakovredna standardnim materialom za toplotno zaščito, v pomanjkanju drugih možnosti pa vendarle izboljša toplotno ugodje v prostoru. Tudi stroški za ogrevanje so lahko nižji. Površinska

temperatura se nekoliko zviša in površina je na otip toplejša, struktura barve pa pomaga pri prerazporejanju vlage oz. vodne pare iz kritičnih predelov prostorov na širše območje sten. S tem se zmanjša nevarnost razvoja plesni. Tudi za fasado so na trgu dostopne barve, pripravljene s podobnimi tehnologijami. So paroprepustne, hkrati pa omogočajo hitrejše sušenje fasade po padavinah in se tem celo nekoliko izboljšajo njene toplotne lastnosti. Zelo dobrodošla prednost je tudi visoka odpornost na razvoj alg in plesni.

Namig: Uhajanje toplote skozi fasado
Ste vedeli, da lahko dokaj enostavno preverite, na katerih delih stavbnega ovoja vaše stavbe izgubljate največ toplote? S termografsko kamero lahko posnamete **toplotne slike** (termograme) svoje fasade in strehe in ugotovite, kje so toplotno šibka mesta. To vam pomembno pomaga pri načrtovanju najustreznejših ukrepov prenove, pa tudi manjših popravil kot je npr. dodatna zatesnitev okenske vgradne rege. Termografski pregled je relativno enostaven in hiter postopek, pravilno tolmačenje termogramov pa zahteva znanje in izkušnje. Pred dokončno odločitvijo vedno preverite reference ponudnikov!

Poudarek: Težave z vlago
Če je v vaši zgradbi plesen, kondenzat na oknih ali druge vidne poškodbe notranje barve ali ometa (cvetenje, odpadanje), je očitno, da ima stavba težave z vlago. Najprej morate ugotoviti, ali je v prostorih previsoka relativna vlažnost zraka, ali gre za poškodbo vodovodne instalacije, za zamakanje skozi streho ali različne špranje in rege, ali pa za kapilarni dvig talne vlage. Šele potem lahko poiščete pravo rešitev. Vedno morate najprej odpraviti vlago v konstrukciji in vzroke zanjo, šele nato se lotite toplotne zaščite. Če pa je vlaga posledica površinske kondenzacije vodne pare, morate prilagoditi način prezračevanja in ogrevanja. Po toplotni izolaciji ovoja stavbe se temperature notranjih površin zunanjih sten zvišajo, zato se tudi nevarnost površinske kondenzacije močno zmanjša. Vedeti morate tudi, da za segrevanje vlažnega zraka potrebujete precej več energije kot za segrevanje suhega. Zato se mnogi, ki živijo v vlažnih prostorih, hkrati pritožujejo nad visokimi stroški za ogrevanje. Zelo priporočljivo je vsaj v prostore kot so spalnica ali otroška soba namestiti preprost vlagomer, spremljati zračno vlažnost in na njeno povišanje takoj odgovoriti z zračenjem prostora.

Okna

Vgradnja sekundarnega okna
Kadar je enojno okno vgrajeno v zunanjo ravnino zidu in če debelina stene in način odpiranja okna to omogočata, lahko v notranjo ravnino zidu vgradite dodatno okno. S tem v ničemer ne posežete v izgled in strukturo fasade. Pri stavbah kulturne dediščine morate tako možnost najprej preveriti pri pristojni območni enoti Zavoda za varstvo kulturne dediščine. Tam boste tudi izvedeli, kakšno mora biti dodatno okno. Vgradnjo naj opravi strokovno dobro podkovan izvajalec. Najpomembnejše je, da pripire novega okna temeljito tesnijo in da se vgradnja okna izvede po načelu tesnjenja v treh ravneh. Nikakor se ne sme zgoditi, da bi topel in vlažen notranji zrak uhajal skozi špranje v pripiri in okrog sekundarnega okna do izvirnega zunanjega okna, saj lahko pride do obilne kondenzacije na šipi. Če sekundarno okno občasno odprete, odprite istočasno tudi prvotno okno.

Škatlasto okno
Pri škatlastem oknu zatesnite samo pripiro notranjega okna. To velja tudi za vgradnjo povsem novega škatlastega okna ali zamenjavo notranjih kril. Če notranja krila povsem odstranite, morate ustrezno zatesniti zunanja krila. Kadar pa škatlasto okno zamenjate z novim enojnim oknom s sodobno zasteklitvijo, morate novo okno vgraditi po sodobnih pravilih stroke s tesnjenjem v treh ravneh. Pozor, izmenjava zraka skozi netesne pripire in rege bo manjša, zato bo treba prilagoditi prezračevanje. Več informacij na to temo najdete v publikaciji na povezavi http://www.energetika-portal.si/fileadmin/dokumenti/podrocja/energetika/javne_stavbe/smernice_kd_23.2.2017.pdf.

Vezano okno
Pripire in spoje vezanega okna morate zatesniti tako, da preprečite kondenzacijo na zunanjih šipah zaradi vdora toplega in vlažnega notranjega zraka v prostor med okenskimi krili. Enako ravnajte pri

zamenjavi notranjih kril z novimi, pa tudi pri zamenjavi celotnega starega vezanega okna z novim. V slednjem primeru morate okno seveda vgraditi po sodobnih pravilih stroke s tesnjenjem v treh ravneh. Pozor, izmenjava zraka skozi netesne pripire in rege bo manjša, zato bo treba prilagoditi prezračevanje. Več informacij na to temo najdete v publikaciji na povezavi http://www.energetika-portal.si/fileadmin/dokumenti/podrocja/energetika/javne_stavbe/smernice_kd_23.2.2017.pdf.

Enojno okno
Pri enojnem oknu zatesnite pripiro med okvirjem in krilom z ustreznim tesnilom. Po potrebi dodatno zatesnite tudi okensko vgradno rego z ustreznimi namenskimi proizvodi (tesnilne mase ali trakovi). Upoštevajte pravilo tesnjenja v treh ravneh: znotraj paroneprepustno in zrakotesno, vmes toplotno- in zvočnoizolativno, zunaj vodotesno in paroprepustno. Enako ravnajte, kadar menjate celotno okno. Pozor, izmenjava zraka skozi netesne pripire in rege bo manjša, zato bo treba prilagoditi prezračevanje. Več informacij na to temo najdete v publikaciji na povezavi http://www.energetika-portal.si/fileadmin/dokumenti/podrocja/energetika/javne_stavbe/smernice_kd_23.2.2017.pdf.

Menjava zasteklitve
Če je menjava zasteklitve dovoljena, morate upoštevati nekaj logičnih pravil. Pri škatlastem in vezanem oknu zamenjajte notranje šipe s sodobno dvojno zasteklitvijo, kadar seveda debelina in nosilnost krila to dopuščata. Podobno velja za enojno okno. Danes se kot osnovni tip okenske zasteklitve uporablja dvojna zasteklitev z nizkoemisijskim nanosom in polnjenjem z žlahtnim plinom. Toplotne izgube skozi tako zasteklitev so bistveno manjše, občutek toplotnega ugodja v prostoru pa opazno boljši zaradi višje temperature notranje šipe. Tudi gibanje zraka v prostoru je upočasnjeno, saj se ob stiku z oknom manj ohlaja in počasneje pada ob njem navzdol. Več informacij na to temo najdete v publikaciji na povezavi http://www.energetika-portal.si/fileadmin/dokumenti/podrocja/energetika/javne_stavbe/smernice_kd_23.2.2017.pdf.

Vakuumska zasteklitev
Vakuumska zasteklitev je posebej primerna za okna v stavbah kulturne dediščine, saj je njena skupna debelina zelo majhna. Iz prostora med šipama je izsesan zrak, zato je oddaja toplote od notranje k zunanji šipi zelo zmanjšana. V kombinaciji z nizkoemisijskim nanosom, ki deluje kot zrcalo za toplotno sevanje iz prostora v zunanjost, so toplotne lastnosti take zasteklitve izjemno dobre. Na pogled je taka zasteklitev povsem enaka običajni dvojni zasteklitvi, z izjemo točkovnih distančnikov, ki skrbijo za ustrezen razmak med šipama. Praktično edina slaba stran vakuumske zasteklitve je njena višja cena.

Trojna zasteklitev

Pred leti se je navadna trojna zasteklitev (z zrakom v medstekelnem prostoru in brez nizkoemisijskih nanosov) relativno pogosto uporabljala. Toplotne lastnosti so bile resda boljše kot pri dvojni zasteklitvi, vendar se je zelo povečala teža okenskega krila. Upravljanje z oknom je bilo tako težje, pa tudi okovje je moralo biti močnejše. Slednje velja še vedno tudi za sodobna okna s trojno zasteklitvijo, vendar je zrak med stekli nadomeščen z žlahtnim plinom, nizkoemisijski nanos pa je navadno na dveh šipah. Za stavbe kulturne dediščine ta tip zasteklitve gotovo ni primeren. Uporabljamo ga pri novogradnji ali prenovi stavb, kjer želimo doseči izjemno dobre energijske kazalnike.

Izolacija vitražnih oken
V primeru vitražnih oken morate za kakršne koli posege dobiti navodila in dovoljenje pristojne območne enote Zavoda za varstvo kulturne dediščine. Ker je tako okno pomemben element vizualne podobe fasade, pa tudi notranjosti in pogleda navzven, bo morda dovoljena le vgradnja preprostega sekundarnega okna z zelo vitkimi profili v notranji ravnini zidu. Strogo morate upoštevati pravilo tesnjenja sekundarnega okna, da ne pride do kondenzacije vodne pare na vitražnem oknu.

Izolacijski film za okno
Zasilna rešitev za okna z enojno zasteklitvijo so lahko t. i. izolacijski filmi. Na trgu najdemo dve

osnovni vrsti. Konvekcijski filmi so folije, navadno iz polietilena in termoskrčljive, ki jih s pomočjo samolepilnih trakov nalepite na notranjo stran okvirja okenskega krila. S tem naredite približek dvojne zasteklitve. Če poskrbite za popolno tesnjenje folije, se ustvari tamponska zračna plast, ki nekoliko upočasni prehod toplote v zunanjost. Učinek je odvisen tudi od širine zračnega prostora. Širši kot je, bolj se v njem zrak giblje in slabši je rezultat. To lahko štejete le kot začasno, resda pa tudi poceni rešitev, npr. v najhladnejšem obdobju leta. Nizkoemisijski film oz. folijo pa nanesete neposredno na notranjo šipo in s tem nekoliko zmanjšate sevalne toplotne izgube. Tudi ta način lahko štejete kot začasno rešitev, dokler ne zamenjate oken ali okenske zasteklitve. Glede na uporabljene proizvode se lahko poslabša tako naravna osvetljenost prostora kot kakovost pogleda navzven.

Zaščita pred soncem
Dobra zaščita oken pred soncem vam poleti zagotavlja udobno ozračje v zaprtih prostorih, saj sončno toploto zadržuje zunaj. Zaščita pred soncem na zunanji strani poleti zadržuje sončno toploto zunaj bolje od zaščite pred soncem na notranji strani, zato morate hišo hladiti manj pogosto, zaradi česar se prihrani energija. Zunanja senčila so sicer pri nas načelno predpisana za vsa okna razen tistih z orientacijo od severovzhoda preko severa do severozahoda. Če v vaši situaciji zaščita pred soncem na zunanji strani ni dovoljena, raziščite možnosti za zaščito pred soncem na notranji strani. Učinek bo sicer precej slabši, a vendarle zaznaven. Na trgu najdete najrazličnejše sistemi za zaščito pred soncem, ki se razlikujejo glede na obliko, velikost, barvo ter svetlobno in toplotno prepustnost. Zaščito pred soncem lahko upravljate ročno, s pomočjoo elektrike ali samodejno s pomočjo tipal.

Namig: Zavese
V hladnih obdobjih lahko občutek prepiha ob oknih preprečite z namestitvijo **debelih zaves**. Debele zavese imajo dober izolacijski učinek, zato omejujejo uhajanje toplote skozi okno. Pazite pa, da zavese visijo le pred okni in ne prek radiatorjev pod njimi, saj v nasprotnem primeru toplota, ki jo oddajajo grelna telesa, ne more ustrezno doseči prostora.

Plisirane žaluzije imajo strukturo satovja, na strani okna pa jih je mogoče opremiti z izolacijskim filmom. Omenjene žaluzije so nastavljive na spodnji in zgornji strani. V hladnih obdobjih preprečujejo prepih zaradi izolacijskega učinka, v toplih obdobjih pa delujejo kot senčila.

Namig: Polkna in rolete
Tudi v preteklosti so v hladnih ali vročih dneh ljudje zaprli polkna, da je notranjost ostala prijetno topla ali hladna. Nekatera polkna so prava rokodelska umetnina, z možnostjo nastavitve različnih položajev posameznih sestavnih delov. Prostor je tako mogoče v poletnem času hkrati zasenčiti in zračiti. Tudi zunanje lesene rolete še najdemo v marsikateri starejši stavbi. Razmik med letvicami je možno uravnavati in tako poskrbeti za zračenje in osnovno osvetlitev prostora. Če imajo vaša okna tovrstna senčila, a so poškodovana ali jih je težko upravljati, ne obupajte. Strokovnjaki konservatorji vas bodo znali napotiti do mojstrov, ki vam jih bodo obnovili.

Nasvet: Navzdol usmerjen zračni tok
Ob oknu se zrak ohlaja in pada navzdol. Višje kot je postavljeno okno, izrazitejši je ta pojav, ki ga občutimo kot neprijeten »prepih«. Za visoko v zidu postavljena okna, okna z veliko višino, še zlasti pa za strešna okna je zato priporočljivo izbrati kar najboljše toplotne lastnosti. S tem se tudi zmanjša možnost rosenja šip zaradi površinske kondenzacije vodne pare.

Prezračevanje

Prezračevanje po prenovi stavbe
Ko stavbni ovoj dodatno toplotno zaščitimo, zlasti pa ko zatesnimo obstoječa okna ali vgradimo nova, se zelo zmanjša nekontrolirana izmenjava zraka skozi špranje, vgradne rege in pripire. To je v pogledu manjših toplotnih izgub in boljšega toplotnega ugodja v prostoru pozitivno, vendar pa morate zato zelo pozorno spremljati relativno vlažnost zraka v prostorih. Če prezračevanja ne okrepite, se lahko vlaga v prostoru prekomerno zviša. Posledice se izrazijo v površinski kondenzaciji

vodne pare in razvoju plesni. Povprašajte strokovnjake, ali bi bilo primerno vgraditi sistem kontroliranega mehanskega prezračevanja. Pri stavbah kulturne dediščine se lahko srečate z omejitvami ali prepovedjo take možnosti.

Naravno in mehansko prezračevanje
Redno in pravilno prezračevanje prostorov je nujnost. Le tako lahko vzdržujete ustrezno kakovost notranjega zraka. Tu mislimo na njegovo primerno relativno vlažnost in zdravstveno-higienske značilnosti. Ste vedeli, da potrebuje vsaka oseba vsaj 15 m^3 svežega zraka na uro, priporočena količina pa je 30 m^3? Naravno prezračujemo z odpiranjem oken v rednih časovnih intervalih, po možnosti tako, da ustvarimo kratkotrajen prepih. Nekaj minut zadostuje. Pomnite, izmenjava zraka med prostori skozi odprta notranja vrata ni prezračevanje; s tem si kvečjemu nakopljete težave. Mehansko prezračevanje nastopa v številnih izvedbah, od najpreprostejšega z ventilatorji na prezračevalnih jaških v kopalnici in kuhinji (t. i. odzračevanje), do popolnoma samodejnega centralnega prezračevanja vseh prostorov z vračanjem odpadne toplote (rekuperacijo). Osnovni pravili prezračevanja lahko strnemo takole: svež zrak naj prihaja v bivalne prostore, izrabljen zrak pa nato odvajamo iz servisnih prostorov; ventilatorji in podobni elementi lahko odvajajo zrak le, če je zagotovljen tudi dovod zraka v stanovanje ali hišo.

Decentralizirano prezračevanje z rekuperacijo
Če prezračevalnih kanalov in drugih sistemskih elementov centralnega prezračevanja v vašo stavbo ni mogoče namestiti, je rešitev morda decentraliziran prezračevalni sistem z rekuperacijo toplote. Izkoristek oz. učinkovitost sistema lokalnih rekuperatorjev bo slabša kot pri centralnem sistemu. Uporabite več manjših enot s prenosnikom toplote, ki jih vgradite v posamezne dele stanovanja ali stavbe. Enote zavzamejo nekaj prostora, moteča je lahko tudi raven hrupa ki ga oddajajo. Za lokalne rekuperatorje boste morali narediti odprtine v zidu, zato ta rešitev pri stavbni dediščini morda ne bo sprejemljiva. Skupna cena izvedbe sistema bo morda že precej podobna ceni izdelave centralnega sistema.

Centralni prezračevalni sistem z rekuperacijo
Centralni sistem prezračevanja ima centralno enoto s toplotnim izmenjevalnikom (rekuperatorjem) in ventilatorji za odvod in dovod zraka. Razvod cevi oz. kanalov povezuje centralno enoto z vsemi prostori. Toplotne izgube zaradi prezračevanja se bistveno zmanjšajo, saj se toplota odvodnega zraka prenaša na dovodni zrak in ga tako ogreva. Vzdrževanje takega sistema kot npr. popravila in menjava filtrov je navadno enostavnejše in cenejše kot pri sorazmernem številu lokalnih sistemov.

Higrosenzibilno prezračevanje
Higrosenzibilno prezračevanje je sodobna in izpopolnjena različica klasičnega odzračevanja. V ospredju je kakovost notranjega zraka, ne pa energijska učinkovitost, saj sistem ne vključuje vračanja odpadne toplote (rekuperacije). Vsak bivalni prostor je opremljen s posebnim elementom, ki zaznava relativno vlažnost zraka v prostoru in skladno s potrebami uravnava količino zunanjega, v prostor dovedenega zraka. Uravnana je tudi količina odvedenega zraka. Gre za kontrolirano prisilno prezračevanje. Sistem vključuje vstopne in izstopne oz. sesalne rozete ter ventilator za vzdrževanje podtlaka v prostorih, navadno na vrhu stavbe. Predvsem je primeren za večstanovanjske stavbe. Vedeti pa morate, da ta sistem ne zagotavlja popolne kakovosti notranjega zraka. Če je zrak zelo suh, bo prezračevanje minimalno, s tem pa ne bo rešen problem najrazličnejših onesnaževal in neprijetnih vonjav, ki se nabirajo v zraku.

Poudarek: Redno menjajte filtre in čistite kanale
Filtri prezračevalnega sistema naj bodo dostopni brez težav. Upoštevajte navodila proizvajalca sistema glede vzdrževanja in menjave filtrov in čiščenja razvodnih kanalov. Kanalske razvode manjših presekov lahko očistite tudi z zrakom pod pritiskom.

3. Elektrika

Svetlobna oprema

Svetleče diode (LED sijalke)
Svetleče diode, pogovorno imenovane LED sijalke, porabijo 80 % manj energije, trajajo pa 25-krat dlje kot žarnice z žarilno nitko. Pri štirih urah delovanja na dan bodo LED sijalke zdržale 15 let. Če zamenjate klasično žarnico z močjo 40 W z LED sijalko z močjo 10 W, boste pri štirih urah delovanja na dan prihranili približno 10 evrov v enem letu. Kaj pa npr. barva svetlobe in uporabnost v obstoječih svetilkah? Tu ne boste naleteli na težave, saj so svetleče diode sedaj na voljo v vseh odtenkih, oblikah in velikostih, tudi z vsemi standardnimi grli.

Tipala za razsvetljavo
Vsi občasno pustimo luč prižgano. Neopazno in po nepotrebnem tako porabimo precej energije. Če senzorje gibanja kombinirate z LED sijalkami, boste pomembno znižali porabo in stroške energije za razsvetljavo. Število vklopov in izklopov ne vpliva na življenjsko dobo LED sijalk. Senzorji gibanja lahko zaznajo spremembe v sevanju toplote v njihovi okolici, ali pa delujejo kot radar z oddajanjem elektromagnetnega sevanja. Luč se prižge le, ko kdo vstopi v prostor oz. območje senzorja. Čas do izklopa lahko nastavite glede na potrebe. Tak način je primeren predvsem za prostore, kjer se zadržujemo občasno, npr. hodnik, stopnišče ali WC.

Namig: Centralno stikalo za vklop/izklop
V večjih stavbah in stavbah s številnimi prostori je težko preveriti, ali so vsi porabniki elektrike kot npr. razsvetljava, avdio in video naprave ali IT oprema dejansko izklopljeni. Zato uporabite centralno stikalo za vklop in izklop, tako da nobena od naprav ne ostane v stanju pripravljenosti in ne porablja elektrike.

Spremljanje rabe energije

Sistem za upravljanje rabe energije
Kdaj porabimo veliko energije in s katerimi napravami? S pomočjo sistema za spremljanje in upravljanje rabe energije bo to področje popolnoma pregledno. Dobili boste tudi vpogled v porabo energije naprav, ki so v stanju pripravljenosti. Tako bo varčevanje z energijo lažje in zabavnejše, saj bo učinek viden takoj. Sistemi so lahko na voljo v obliki stenskega zaslona, spletne strani ali mobilne aplikacije. Pogosto boste opazili zmanjšanje porabe energije v realnem času, če denimo izklopite ogrevanje ali ugasnete luč. S sistemom za upravljanje rabe energije lahko prihranite od 5 % do 10 % celotne rabe energije.

Proizvodnja električne energije

Fotonapetostni moduli
Fotonapetostni moduli, ki jih imenujemo tudi fotovoltaični ali PV paneli, so trajnosten način za proizvodnjo lastne električne energije. Njihova uporabna življenjska doba je praviloma daljša od 25 let, investicija pa se običajno povrne v 10 letih. Fotonapetostni moduli so sestavljeni iz zaporedno vezanih sončnih celic, ki pretvarjajo sončno elektromagnetno valovanje v enosmerni električni tok in napetost. Več povezanih modulov sestavlja sončno elektrarno. Običajno so moduli nameščeni na strehah stavb. Druga mesta, kamor jih lahko namestite, so pergole in nadstreški za avtomobile. Moduli standardne monokristalne ali polikristalne izvedbe so navadno modre ali črne barve, lahko pa tudi drugih barv. Za stavbne fasade, pa tudi bivalna podstrešja so zelo zanimivi transparentni moduli, kjer je prehod svetlobe odvisen od števila celic na enoto površine. Pri otočnih sistemih se proizvedena elektrika uporabi v stavbi, hranilnik (baterija) pa služi za dnevno shranjevanje viškov električne energije podnevi za obdobje (npr. ponoči), ko ni proizvodnje. Pri sončnih elektrarnah, ki so priključena na javno elektroenergetsko omrežje, le-to prevzame vlogo hranilnika električne energije. V obeh primerih je potreben pretvornik oz. razsmernik, ki enosmerni tok spremeni v izmeničnega. Fotonapetostni moduli kot tudi sprejemniki sončne energije so zgolj izjemoma sprejemljivi pri stavbah kulturne dediščine.

Dodaten namig
V večini primerov so fotonapetostni moduli nameščeni na **poseben okvir** oz. podkonstrukcijo, ki je dvignjena od strehe. Ta okvir omogoča prezračevanje pod paneli, kar izboljša njihovo učinkovitost.

Dodaten namig
Dandanes lahko **fotonapetostne module namestite tudi v ravnino strehe, med običajno kritino**. Plošče so nameščene vodotesno, zato pod njimi ni potrebna dodatna zaščita. Na voljo so tudi velikoformatni moduli, ki hkrati opravljajo funkcijo strešne kritine. Te izvedbe so vizualno manj moteče kot moduli na podkonstrukciji, pogosto pa slabo hlajenje modulov v takšnih primerih lahko povzroča motnje v delovanju in znižuje izkoristek. Pri stavbni dediščini pa namestitev fotonapetostnih modulov na streho praviloma ni sprejemljiva.

Dodaten namig
Dandanes lahko fotonapetostne module v transparentni izvedbi **namestite tudi med zasteklitvene elemente**.

Namig: Sončna elektrarna na večstanovanjski stavbi
Slovenska uredbo o samooskrbi z električno energijo iz obnovljivih virov energije etažnim lastnikom v večstanovanjskih stavbah omogoča, da v trajnostnem duhu organizirajo proizvodnjo in porabo električne energije proizvedene iz sonca. Skupna sončna elektrarna lahko lastnikom letno prinese tudi nekaj tisoč evrov prihrankov pri stroških za elektriko, hkrati pa pokrije velik del potreb po elektriki v stavbi. Presežek se oddaja v omrežje.

Sončni strešniki
Na trgu je na voljo več variant fotonapetostnih modulov, integriranih v opečne strešnike nekoliko večjega formata od običajnih. Ti strešniki so še posebej primerni za majhne strehe ali za strehe s številnimi preboji (kot denimo dimniki ali okna) in spremembami geometrije. Pri stavbni dediščini je dopustnost vgradnje take kritine malo verjetna.

Tankoplastni (amorfni) fotovoltaični moduli
Tankoplastni fotovoltaični moduli so manj učinkoviti od mono- in polikristalnih, a se izkažejo pri visokih temperaturah in ob zasenčenju, saj v veliki meri ohranijo izkoristek, celo ob difuzni svetlobi. So fleksibilni in lahki, tudi cena je ugodnejša od cene drugih vrst modulov. Zelo so primerni za namestitev na obsežnejših površinah. Pri stavbni dediščini je dopustnost vgradnje take kritine malo verjetna.

Pogodba o zeleni energiji
Zelena elektrika je proizvedena iz obnovljivih virov energije in tako okolju prijaznejša. V Sloveniji so ti viri predvsem voda, sonce in biomasa. Dobavitelji elektrike se med seboj razlikujejo po deležu zelene elektrike v celotni ponudbi. Preverite, kateri izmed njih gospodinjstvom ponujajo pakete zelene elektrike, primerjajte cene in splošne pogoje ter naredite nov korak k trajnostnemu bivanju in ravnanju.

Energetska zadruga

Uredba o samooskrbi z električno energijo iz obnovljivih virov energije omogoča vzpostavitev skupnostne samooskrbe. V tako energetsko zadrugo se lahko povežejo odjemalci, ki odjemajo električno energijo prek dveh ali več merilnih mest, ki sta oziroma so priključena na nizkonapetostno omrežje iste transformatorske postaje kot naprava za samooskrbo. Preverite, ali je mogoče tako zadrugo ustanoviti tudi v vašem okolišu. Uredba je dostopna na tej povezavi: https://www.uradni-list.si/glasilo-uradni-list-rs/vsebina/2019-01-0700?sop=2019-01-0700.

Električno kuhanje
Cene energentov se spreminjajo v odvisnosti od cene goriv, gospodarskih tokov in drugih dejavnikov. Nekatera razmerja pa ostajajo podobna. Pri nas je povprečna cena ene kilovatne ure zemeljskega plina približno 35 do 40 % nižja od cene električne energije. Če za kuhanje

uporabljate elektriko, ob naslednji menjavi razmislite o indukcijskem štedilniku, ki porabi petino manj energije od steklokeramičnega. Kuhanje bo tudi mnogo hitrejše. Indukcija vzpostavi magnetno polje med kuhalno ploščo in posodo, preostanek kuhalne plošče pa ostane hladen. Žal ni vsaka posoda primerna za indukcijsko kuhalno ploščo, vse pa tudi ne bo treba zamenjati. Tradicionalne črne železne posode ali emajlirane posode in lonci so recimo povsem uporabni. Ponve lahko preizkusite tako, da pod spodnjo površino pridržite magnet. Če magnet ostane pod ponvijo, jo lahko uporabite tudi na indukcijskem štedilniku.

Namig: Fotonapetostni moduli, nameščeni na terenu
Če na vašo stavbo ni mogoče namestiti fotonapetostnih modulov, ste pa lastnik zemljišča, se lahko odločite za njihovo namestitev npr. na travniku, delu vrta ali dvorišča. Morali boste le pripraviti namensko podkonstrukcijo. Če želite ravnati povsem trajnostno, seveda ne boste postavili električne elektrarne na obdelovalni zemlji.

Namig: Pretvornik
Ko boste prešli na fotonapetostne module za napajanje klasičnih aparatov, boste potrebovali tudi pretvornik enosmernega toka v izmenični (t. i. razsmernik), da boste lahko proizvedeno električno energijo tudi uporabljali. Nekatere vrste modulov pretvornik že vključujejo. Izberite visokokakovosten pretvornik in se pozanimajte tudi glede garancije.

Namig: Optimizatorji
Namestitev fotonapetostnih modulov vključuje iskanje optimalnega položaja glede na sonce, položaj pa mora biti ugoden tudi za stavbo. Ni nujno, da so vsi moduli enako usmerjeni ali da so vsi istočasno in enakomerno osončeni. Optimizator sledi največji moči modula, zmanjša izgube sistema zaradi različnih izhodnih moči, različnega staranja, senčenja in umazanije na modulih. Tako delovanje vaše elektrarne ni odvisno od trenutne učinkovitosti najšibkejšega modula v nizu.

Shranjevanje elektrike in polnilnih postaj

Hranilnik elektrike
Fotonapetostni moduli elektriko proizvajajo podnevi, potrebe po njej pa so lahko velike tudi zgodaj zjutraj ali zvečer. Če želite biti manj odvisni od električnega omrežja, bo domači hranilnik elektrike (tudi: akumulator, baterija) prava rešitev za vas. To je tudi priročna rešitev za lastnike električnih avtomobilov. Posodobitev internega električnega omrežja navadno ni potrebna. Hranilniki so zelo učinkoviti, zanesljivi in imajo dolgo življenjsko dobo, mnogi modeli so, tako kot npr. kotli in toplotne črpalke, oblikovno dovršeni.

Polnilna postaja za električne avtomobile
Če imate električni avtomobil, ga lahko bistveno hitreje kot preko hišne električne vtičnice napolnite s pomočjo polnilne postaje. Časovna razlika v trajanju polnjenja je kar nekaj ur. Domači električni priključki navadno ne omogočajo postavitve hitre polnilnice, kakršne najdete npr. na javnih parkirnih mestih in garažnih hišah. Investicija v polnilno postajo je za posamezno gospodinjstvo pri nas še relativno visoka. Prinaša pa precej prednosti, vključno z večjo varnostjo uporabe in možnostjo upravljanja preko mobilne aplikacije, in je sestavni del trajnostne mobilnosti.

4. Gretje

Proizvajanje toplote

Sprejemnik sončne energije
S sprejemnikom sončne energije oz. sončnim kolektorjem na učinkovit in okolju prijazen način pripravite toplo vodo za potrebe gospodinjstva. Sistem je sestavljen iz sprejemnikov z absorberji, medija za prenos toplote in hranilnika, v katerem se hrani topla voda. Večje sisteme lahko uporabite tudi za podporo sistemu ogrevanja stavbe. Črpalka poganja ogreto vodo iz sprejemnika do prenosnikov toplote. Svojo toploto odda vodi v hranilniku toplote, ki jo nato uporabljamo za umivanje, pranje in druge potrebe. Posebna regulacija vklopi črpalko, ko je temperatura vode v sprejemnikih višja kot v hranilniku, in jo izklopi, ko je temperaturna razlika premajhna. V sistem lahko vključite grelnik, ki ob slabih vremenskih razmerah sanitarno vodo v hranilniku dogreje. Tako kot fotonapetostni moduli, so tudi sprejemniki sončne energije zgolj izjemoma sprejemljivi pri stavbah kulturne dediščine.

Sončna toplotna streha
Sončna toplotna streha izkorišča energijo sonca za proizvodnjo tako elektrike kot sanitarne tople vode. Če velikost in oblika strehe dopuščata, lahko na njej postavite takšno sončno elektrarno. Fotonapetostni moduli pretvarjajo sončno svetlobo v elektriko, medtem ko spodnja toplotna plošča pretvarja toploto sonca v vročo vodo. To lahko uporabite za pripravo tople sanitarne vode ali za ogrevanje stavbe s toplotno črpalko.

Toplotna črpalka zrak/voda
Toplotna črpalka zrak/voda črpa toploto iz zunanjega zraka in z njo ogreva prostore in sanitarno vodo. Toplotne črpalke so primerne za (skoraj) vse stavbe, saj ogrevajo prostore tudi ob zunanjih temperaturah -20 °C, tako da ni potreben dodaten (t. i. hibridni) ogrevalni sistem za oskrbo stavbe s toploto. Če je stavba slabše izolirana in je potrebna višja temperatura ogrevalne vode, izberemo dvostopenjsko (visokotemperaturno) toplotno črpalko. V vsakem primeru je toplotna črpalka poceni in okolju prijazen način oskrbe stavbe s toploto, uporablja visok delež OVE in je udobna za upravljanje, kar je pomembno predvsem z vidika starajoče se populacije. Pri stavbi kulturne dediščine morate pri območni enoti ZVKDS najprej preveriti, ali in kje v okolici stavbe je namestitev zunanje enote toplotne črpalke dovoljena. Enako velja za notranjo enoto.

Zračna toplotna črpalka se postavi zunaj, znotraj stavbe pa sta prenosnik toplote in hranilnik za sanitarno vodo. Za štiričlansko družino naj ima prostornino približno 300 litrov. Zunanji del se lahko namesti na različne, ne preveč oddaljene lokacije zunaj stavbe, pri čemer je treba upoštevati hrupnost sicer relativno tihih naprav in ga ne postavljati blizu spalnih prostorov ali tako, da bi lahko motili občutljive sosede.

Toplotna črpalka in sončna elektrarna
Toplotne črpalke obnovljivo energijo črpajo iz zraka, zemlje in vode. Pri svojem delovanju toplotna črpalka uporablja okoli 70 % obnovljivih virov energije, 30 % pa potrebuje električne energije za pogon kompresorja. Električno energijo dobi iz javnega elektroenergetskega sistema, lahko pa jo v skladu z Uredbo o samooskrbi z OVE dobi iz npr. sončne elektrarne na stavbi. Na ta način je oskrba stavbe z energijo v celoti iz OVE, zanesljiva in najcenejša. Pri stavbi kulturne dediščine morate pri območni enoti ZVKDS najprej preveriti, ali in kje je namestitev sončne elektrarne dovoljena. Enako velja za zunanjo in notranjo enoto toplotne črpalke.

Toplotna črpalka zemlja/voda
Toplotna črpalka zemlja/voda s pomočjo geosond črpa obnovljivo toploto iz zemlje. V globini 55 do 100 metrov je temperatura približno 12 stopinj Celzija ne glede na temperaturo zraka, zato je sistem zemlja/voda primernejši za območja z ostrejšimi zimami. Izkoristek (toplotno število oz. COP) toplotne črpalke zemlja/voda je zaradi konstantnosti vira toplote praviloma višja od sistema zrak/voda. Zemeljski vir je zelo primeren za kombinacijo gretja in hlajenja, saj pri hlajenju poleti toplotna črpalka vrača toploto v tla in pomaga preprečevati podhladitev oz. zamrzovanje tal. Naložba je zaradi zemeljskih del in namestitev geosond sicer višja kot pri toplotni črpalki

zrak/voda. Pri stavbi kulturne dediščine morate pri območni enoti ZVKDS najprej preveriti, ali in kje v okolici stavbe je namestitev zunanje enote toplotne črpalke dovoljena. Enako velja za notranjo enoto.

Daljinsko ogrevanje
Sistemi daljinskega ogrevanja so zgrajeni tam, kjer je gostejša poseljenost ali večja gostota odjema, npr. v industrijskih conah in urbanih območjih. To je trajnostni način oskrbe stavb z energijo s pomočjo vročevodnega omrežja, če je vir toplote obnovljiv. Najpogosteje se kot vir toplote uporablja lesna biomasa v obliki sekancev (kotli ali kogeneracijski sistem), v Sloveniji pa še vedno tudi kurilno olje, zemeljski plin ali premog. Emisija škodljivih delcev v ozračje je pri takšnem velikem sistemu manjša kot pri individualnih kotlih. Sistem mora biti namreč opremljen s filtri in čistilno napravo, upravljajo pa ga strokovnjaki.

Kondenzacijski kotel
Ko bo treba stari plinski kotel za ogrevanje in pripravo tople vode zamenjati, se odločite za kondenzacijski kotel. Tak kotel izkoristi tudi kondenzacijsko toploto dimnih plinov, zato je energijsko učinkovitejši. Je tudi bistveno varnejši od klasične izvedbe, saj svež zrak, ki ga kotel potrebuje za delovanje, priteka od zunaj po koaksialnem dimniku ali po dodatni cevi, torej ne iz bivalnih prostorov. Kondenzacijski kotli povečini uporabljajo zemeljski plin kot gorivo, ki je fosilne izvora in ni OVE.

Kotel na biomaso
Lesna goriva so obnovljiv vir energije in imajo nevtralno emisijo toplogrednih plinov. CO_2, sproščen pri zgorevanju lesa (iz dreves), se namreč porabi za rast novih dreves. Bilanca je nevtralna, če z gozdom ravnamo trajnostno. Lesna goriva so lahko v različni obliki: polena, sekanci ali peleti. Lesno gorivo mora biti ustrezne kakovosti in primerno posušeno, da ne poškoduje kotla in da pretirano ne obremenjuje okolja z lokalnimi emisijami kot so dušikovi ali ogljikovi oksidi in trdi delci. S toploto iz lesnih goriv lahko na trajnosten način in poceni grejemo prostore in sanitarno vodo. Sistem, ki uporablja lesna goriva za energent, potrebuje zalogovnik toplote za optimalno delovanje.

Dovod toplote v prostore

Talno ogrevanje
Talno ogrevanje je udoben in učinkovit način ogrevanja. V tla se namestijo tanke cevi, skozi katere teče vroča voda. Voda oddaja svojo toploto v tla, ki s sevanjem in prestopom toplote ogrevajo prostor. Temperaturni profil po višini prostora je enakomernejši kot pri radiatorskem dovodu toplote. Talno ogrevanje je nizkotemperaturni način dovoda toplote, podobno kot konvektorji – radiatorji z ventilatorjem za prisilno konvekcijo, in najprimernejši v kombinaciji s toplotno črpalko. Pri stavbi kulturne dediščine morate za prenovo pridobiti kulturnovarstvene pogoje. Iz njih bo razvidno, ali je vgradnja talnega ogrevanja dovoljena.

Stensko in stropno ogrevanje
Podobno kot pri talnem ogrevanju tudi ogrevanje sten in stropa sestoji iz tankih cevčic, ki se nahajajo tik pod površino. Skoznje teče topla voda, stena pa to toploto prijetno seva v prostor. Potrebna pa je kombinacija z izolacijo na zunanji strani stene, da bi se preprečilo sevanje toplote navzven. Pri stavbi kulturne dediščine morate za prenovo pridobiti kulturnovarstvene pogoje. Iz njih bo razvidno, ali je vgradnja stenskega in stropnega ogrevanja dovoljena.

Nizkotemperaturno ogrevanje

Pri nizkotemperaturnem ogrevanju segrejemo vodo v sistemu na približno 50 do 55 stopinj Celzija, lahko tudi manj. Če imate star kotel, potem taka varianta ni primerna, saj lahko pride v kurišču do kondenzacije vodne pare iz dimnih plinov in nato do korozije. Pogoj za dobro tehnično delovanje in učinkovitost takega ogrevanja je torej zamenjava starega kotla z novim, nizkotemperaturnim ali – še bolj priporočljivo - kondenzacijskim, lahko pa se odločite tudi npr. za toplotno črpalko. Pri nizkotemperaturnem ogrevanju morajo imeti grelna telesa (radiatorji) večjo površino kot pri

visokotemperaturnem ogrevanju, zato boste morali stare radiatorje najverjetneje zamenjati. Če pa stavbo hkrati dodatno toplotno izolirate in zamenjate stavbno pohištvo, bodo ti morda uporabni še naprej. Lahko se odločite tudi za namenske nizkotemperaturne radiatorje, ki so hitro odzivni in imajo veliko nazivno moč ob relativno majhnih dimenzijah. Največkrat pa nizkotemperaturno ogrevanje povezujemo s talnim, stenskim ali tudi stropnim ogrevanjem. Talno in stensko ogrevanje nudita odlično bivalno ugodje, so pa stroški izvedbe seveda višji. Na vsa vprašanja vam bo odgovoril izkušen projektant strojnih instalacij in vam pomagal do najustreznejše odločitve.

Infrardeče ogrevanje
Za razliko od ostalih sistemov pri infrardečem ogrevanju ne gre za ogrevanje vode. Podobno kot sonce infrardeče plošče uporabljajo sevalno toploto, kar pomeni, da grejejo tla, stene, ljudi in predmete, ki nato oddajajo toploto v zrak. Infrardeči sevalniki so električni uporovni grelci, ki so primerni za dodatno ogrevanja v prostorih, ki se ne uporabljajo redno (kot denimo glasbena soba, študijska soba ali kopalnica). Takšno ogrevanje ne ogreva prostora po nepotrebnem, ampak samo telo v svojem sevalnem območju, posredno v manjšem delu tudi ostale površine v prostoru. To lahko vpliva na naše bivalno ugodje, ki vključuje tudi ustrezno temperaturo notranjega zraka. Ne pozabite, da je takšna vrsta ogrevanja v primeru, da so infrardeči sevalniki vklopljeni ves čas, dražja od ogrevanja s plinom ali kurilnim oljem.

Nasvet: Zamenjajte radiatorje s konvektorji
Če je treba zamenjati vaše radiatorje, razmislite, ali jih ne bi morda zamenjali z nizkotemperaturnimi konvektorji. Konvektorji imajo prisilen tok zraka skozi grelno telo z ventilatorjem in so manjši od radiatorjev, sobo segrejejo hitreje, nekatere različice konvektorjev pa omogočajo celo hlajenje. Upoštevajte, da lahko intenzivnejše gibanje zraka v prostoru poveča dviganje prahu in pri nekaterih ljudeh zmanjša občutek toplotnega ugodja.

Nasvet: Obtočna črpalka
Če imate talno ogrevanje in/ali radiatorje, je zelo verjetno, da imate še vedno tudi staro obtočno črpalko z oznako B ali C. Obtočna črpalka vse leto nevsiljivo in komaj slišno črpa (vročo) vodo s približno enako hitrostjo. To pomeni, da se lahko raba energije poveča in doseže tudi do 10 % celotne rabe energije. Črpalka z oznako A je energijsko najučinkovitejša. Ima tri različne nastavitve, ki omogočajo, da lahko prilagodimo volumski tok ogrevne vode glede na potrebe po gretju. Tako lahko znižate stroške za energijo. Če bo treba vašo obtočno črpalko zamenjati, se odločite za tako z oznako A.

Pametna uporaba

Nadzor območja
S pomočjo nadzornega sistema ogrevanja lahko za vsak prostor posebej nastavite določeno temperaturo. Ogrevanje lahko denimo vklopite v enem prostoru in ga pustite izklopljenega v drugem. To vam omogočajo npr. sobni termostati s pametnimi funkcijami. Ta sistem lahko upravljate s pomočjo aplikacije (npr. na vašem pametnem telefonu) ali nadzorne plošče. Nadzor območja zagotavlja več udobja in prihranek energije, poleg tega pa dobro deluje s pametnim termostatom.

Pametni termostat
Pametni termostat vam lahko pomaga, kadar želite svojo stavbo segrevati na energetsko učinkovitejši način. Pametni termostat se samodejno prilagodi vašemu življenjskemu ritmu in vašim željam, kar pa je odvisno tudi od vrste termostata. Ogrevanje lahko upravljate na daljavo ali pa izberete termostat, ki je sposoben samoučenja. Nekateri termostati vam lahko celo prikažejo rabo energije, podobno kot centralni nadzorni sistem. Lahko pa tudi samodejno odčitajo meritve pametnega števca.

Nasvet: Hidravlično uravnoteženje ogrevalnega sistema
Do 75 % ogrevalnih sistemov je nastavljenih nepravilno. To povzroči neuravnovešeno razporejanje vode in neenakomerno segrevanje prostorov ali stanovanj, kar povzroči izgubo energije in nelagodje. Pri enaki nastavitvi je ponekod pretoplo, drugod pa prehladno.

Namig: Nastavljena vrednost in nočno znižanje temperature
Ogrevalni sistemi so pravilno nastavljeni le, če so prilagojeni vsem razpoložljivim notranjim in zunanjim virom toplote, kot so denimo ljudje, razsvetljava, računalniki in sonce. Nadzorovano nočno znižanje nastavljene temperature je eden od ukrepov, ki izhaja iz omenjene prilagoditve. Tako se zagotovi, da v sistemu ne prihaja do velikih nihanj in posledično tudi ne do visokih temenskih vrednosti. Ta način je uporaben tako v enodružinskih hišah kot v večstanovanjskih stavbah. Tako boste prihranili veliko denarja in energije, le paziti morate, da ohranite primerno raven bivalnega ugodja. Nastavitve naj glede na značilnosti vašega ogrevalnega sistema opravi strokovnjak.

Gretje sanitarne vode

Toplotna črpalka
Toplotna črpalka črpa toploto iz zunanjega zraka, vode ali zemlje in z njo ogreva prostore in sanitarno vodo. Toplotne črpalke so primerne za (skoraj) vse stavbe, saj omogočajo ogrevanje tudi ob zunanjih temperaturah -20 °C. Toplotna črpalka se postavi zunaj, znotraj stavbe pa sta prenosnik toplote in hranilnik za sanitarno vodo. Za štiričlansko družino naj ima prostornino približno 300 litrov. Zunanji del se lahko namesti na različne, ne preveč oddaljene lokacije zunaj stavbe.

Toplotna črpalka predstavlja poceni in okolju prijazen način oskrbe stavbe s toploto, uporablja visok delež OVE in je enostavna za upravljanje. Pri stavbi kulturne dediščine morate pri območni enoti ZVKDS najprej preveriti, ali in kje v okolici stavbe je namestitev zunanje enote toplotne črpalke dovoljena. Enako velja za notranjo enoto.

Pretočni grelnik

Obstaja več načinov za gretje sanitarne vode. Sistemi, kot so denimo električni kotli in rekuperatorji, zavzamejo razmeroma veliko prostora. Električni pretočni grelnik je kompaktna alternativna možnost in greje samo tisto vodo, ki jo dejansko porabite. Grelni element se vklopi, ko odprete pipo za toplo vodo, in nemudoma segreje vodo, ki teče skozenj. Upoštevati je treba, da električni pretočni grelnik zahteva relativno visoko priključno moč električne energije.

Skriti sončni kolektorji

Inovacija na področju ogrevanja sanitarne vode so skriti sončni kolektorji. Sestavlja jih mreža cevi, ki je vgrajena pod strešniki. Površina strehe s tem dobi dodatno funkcijo sončnega kolektorja, sistem pa z zunanje strani ni viden!

Namig: Učinkovita uporaba pralnega in pomivalnega stroja
V navodilih preverite, kateri programi so na voljo in kakšna je optimalna polnitev vašega pralnega ali pomivalnega stroja. Delovanje pri premajhni polnitvi ali previsoki temperaturi se odrazi v nepotrebno visokem računu za vodo in elektriko. S pravilno uporabo boste privarčevali tudi pri detergentih in s tem ravnali odgovorno do okolja.

5. Voda in zeleno

Zeleno okolje

Zelena streha
Že nekaj let opažamo, da so vremenski ekstremi vedno pogostejši. To velja tudi za nenadna in obilna deževja v poletnem času. Naši žlebovi in kanalizacijsko omrežje jim pogosto niso več kos. Zelena streha, prekrita z ekstenzivno ali celo intenzivno ozelenitvijo, vsrka del padavinske vode in razbremeni odtočne sisteme. Ugodno vpliva tudi na mikroklimo in znižanje temperature v neposredni okolici stavbe. Zelene strehe lahko prispevajo tudi k biotski raznovrstnosti. Obstajajo različne izvedbe, od enostavne ekstenzivno ozelenjene strehe, ki jo poraščajo nizke trajnice kot npr. homulice, do obsežnega strešnega vrta z grmovjem in drevesi, na katerem lahko gojite tudi zelenjavo. Tovrstno streho vam mora obvezno načrtovati strokovnjak, še prej pa mora statik preveriti, kakšna dodatna obremenitev sploh pride v poštev. Pri stavbi kulturne dediščine morate za prenovo pridobiti kulturnovarstvene pogoje. Iz njih bo razvidno, ali je izvedba zelene strehe dovoljena.

Fasadni vrt
Ozelenjena fasada ima podobne pozitivne učinke kot zelena streha. Rastline plezalke kot npr. divja trta in bršljan se med razraščanjem same oprijemajo fasade, kar pa pri določenih materialih ali že nekoliko poškodovani fasadi ni primerno. Pripravite lahko tudi posebno podkonstrukcijo, po kateri se bodo vzpenjale rastline, in jo točkovno pritrdite na fasado. Na voljo so tudi tovarniško pripravljeni montažni elementi, ki vsebujejo tudi zalivalni sistem. Vešč arhitekt vam bo znak predlagati še kakšno povsem samosvojo možnost. Pri stavbi kulturne dediščine bo ozelenitev fasade dovoljena le izjemoma.

Okolica stavbe

Zbiralnik deževnice
Deževnico lahko ponovno uporabite za zalivanje zelenja okrog vaše stavbe. Na vrtu se vsako leto porabi veliko pitne vode za zalivanje rastlin in trate. Če v ta namen zbirate deževnico v hranilnik, boste ravnali okolju prijazno in prihranili pitno vodo. Za hranilnik lahko uporabite star sod, lahko ga kupite v dekorativni izvedbi, lahko pa zgradite podzemni rezervoar, vendar boste v tem primeru potrebovali tudi črpalko.

Helofitni filter
Sivo odpadno vodo, tj. nekoliko onesnaženo odpadno vodo, ki denimo nastane pri prhanju ali umivanju, lahko na enostaven in naraven način očistite in ponovno uporabite s pomočjo helofitnega ali »močvirnega« filtra. Helofiti so vodne rastline, ki ustvarjajo primerno bivalno okolje za bakterije, ki razgrajujejo odpadne snovi iz sive odpadne vode. Tako prečiščeno vodo lahko nato odvedete v površinsko vodo in ne v kanalizacijo, ali pa npr. uporabite za splakovanje stranišča. Za črpanje odpadne vode skozi filter je potrebne nekaj energije.

Akvaponika
Obstaja vse več čudovitih krožnih rešitev. Starodavna rešitev je denimo akvaponika, postopek, s katerim lahko prečistimo vodo in enostavno gojimo rastline, kot so zelenjava in zelišča, pa tudi ribe. Ločeni rezervoar se lahko denimo namesti na vrt. V zaprtem sistemu se rezervoar napolni z vodo, ribami in bakterijami. Odpadne snovi, ki jih proizvedejo vodne živali, kot so denimo ribe in raki, bakterije pretvorijo v hrano za rastline. Rastline na vrhu rezervoarja tako prejemajo hrano, vlago in sončno svetlobo. Poleg tega pa tudi čistijo vodo. Sistemi za akvaponiko so na voljo v različnih oblikah in velikostih, od industrijskega obsega do akvarija, ki je povezan z nekaj pladnji za rastline.

Nasvet: Zeleno parkirišče
Parkirišču lahko dodate novo funkcijo. Priporočamo, da parkirna mesta prekrijete s polobdelanimi površinami, da bodo lepa in zelena, in bo deževnica lažje pronicala v tla. Poleg tega lahko z

namestitvijo nadstreška za avtomobile, ki ga prekrijete s fotonapetostnimi moduli, električni avtomobil napolnite z lastno elektriko. Seveda pa lahko to energijo uporabite tudi v svojem domu.

Tuš in stranišče

Varčna ročka za prho
Sodobna varčna ročka za prho porabi manj vode kot običajna ročka, pri tem pa vam ne bo treba žrtvovati udobja tuširanja. Običajne ročke za prho porabijo med 10 in 15 litrov vode na minuto, varčna izvedba pa lahko pretok vode zmanjša na le 5 litrov na minuto. Hkrati vodi doda zrak, kar pomeni, da se boste ob nižjem računu za vodo in elektriko tuširali z običajno močnim in prijetnim curkom. Enako velja tudi za t. i. dežne ali tropske prhe.

Stranišče, ki prihrani vodo
Za splakovanje stranišč porabi povprečno slovensko gospodinjstvo skoraj tretjino vse vode. Ko prenavljate kopalnico ali urejate novo, vgradite varčne, dvokoličinske splakovalnike. V povprečju boste tako s kombiniranjem porabe treh ali šestih litrov privarčevali več kot polovico vode, ki jo porabi navadni devetlitrski, kaj šele dvanajstlitrski splakovalnik. Boljša od standardnega splakovalnika je tudi izvedba s tipko »stop«, s katero sami ustavite splakovanje. Ob podatku, da je letna poraba vode na osebo v Sloveniji skoraj 60 m^3, lahko hitro izračunate svoj prihranek in prispevek k varovanju okolja.

Ponovna uporaba vode
Deževnico ali sivo odpadno vodo lahko uporabite za splakovanje stranišča. Voda se zbira v rezervoarju, se po možnosti očisti, nato pa uporabi v stranišču. V idealni situaciji tako ne uporabljate več pitne vode za splakovanje. Če vas taka možnost zanima, prosite za nasvet strokovnjaka. Ta bo najprej preveril, ali bo treba izdelati dodatno napeljavo in namestiti sistem cevi za ločevanje sive odpadne vode in deževnice od pitne vode. Predelava je lahko draga in zamudna, zato je tak sistem najprimerneje načrtovati pri novogradnji.

Nasvet: Prhanje in kopanje
Za prhanje porabite bistveno manj vode in s tem tudi energije kot za kopel v kadi. V povprečju se odrasla oseba prha od pet do osem minut in porabi približno 140 litrov vode, pri kopeli pa 250 litrov. Med prhanjem včasih kar izgubimo občutek za čas. Že najpreprostejši pripomoček kot je peščena ura vam bo pomagal nadzorovati trajanje prhanja, otroci pa lahko to vzamejo kot igro ali tekmovanje. Še mnogo več boste prihranili, če med miljenjem in šamponiranjem zaprete vodo; porabo vode lahko znižate skoraj za dve tretjini.

Omejevalnik pretoka vode
Z omejevalnikom pretoka boste med opravili kot je denimo umivanje rok porabili manj vode, pa tega sploh ne boste opazili. Ne da bi žrtvovali udobje, boste prihranili (toplo) vodo, ki teče iz pipe umivalnika. Številne pipe že imajo omejevalnik pretoka, sicer pa ga lahko za nekaj evrov kupite tudi sami. V enem letu se vam bo nakup povrnil – prava hitra zmaga!

2. Financial mechanisms included in the Slovenian Green Menu

SUBSIDIES / SUBVENCIJE

I. HEATING AND VENTILATION

1. Naziv: Subvencija za kurilne naprave na lesno biomaso

Spodbudo dajalec: Eko Sklad

Opis

Nepovratne finančne spodbude za **samostojne in skupne naložbe** občanom za nakup in vgradnjo ali za zamenjavo stare kurilne naprave, ki zagotavlja toploto centralnemu sistemu ogrevanja stavbe, z novo kurilno napravo na lesno biomaso.

Vrednost spodbude:

Samostojne naložbe: Višina nepovratne finančne spodbude znaša **od 20% do 60% , do 2.000 EUR oz. 5.000 EUR** priznanih stroškov naložbe.

Skupne naložbe: Višina nepovratne finančne spodbude znaša **do** 25% priznanih stroškov naložbe.

Višina spodbude za socialno šibke občane je 100 % priznanih stroškov naložbe glede na njegov pripadajoči delež financiranja naložbe.

Pogoji:

Na javnem pozivu lahko kot vlagatelj kandidira vsaka fizična oseba oziroma občan, ki je investitor in lastnik/solastnik/družinski član lastnika/imetnik stavbne pravice/najmnik stavbe ali stanovanja. Za skupne naložbe vlogo na javni poziv vloži pooblaščeni upravičenec oseb ali njihov predstavnik.

Nove ogrevalne naprave morajo izpolnjevati tehnične zahteve predpisov za okoljsko primerno zasnovo proizvodov, povezanih z energijo, in ustrezati zadnjemu stanju tehnike. Izpolnjevati morajo tudi emisijske zahteve[1] in imeti Izkoristek pri nazivni toplotni moči večji ali enak 90 %. [2]

Interaktivni seznam opreme primerne za pridobitev Eko sklad spodbude je na voljo na tej povazavi: https://www.ekosklad.si/prebivalstvo/informacije/orodja/seznam-opreme

Spodbuda za vgradnjo kurilne naprave za centralno ogrevanje stanovanjske stavbe ne more biti dodeljena na nekaterih območjih občin, ki so sprejele Odlok o načrtu za kakovost zraka, oziroma so določeni drugi prednostni načini ogrevanja.

Preverjanje prednostnega načina ogrevanja in omejitev spodbud za vašo stavbo je možno na tej povezavi: https://www.ekosklad.si/prebivalstvo/informacije/orodja/prednostni-nacin-ogrevanja

Vloga mora biti pravilno izpoljena in pravočasno oddana.

Rok za oddajo vloge: Samostojne naložbe - po izvedeni naložbi; Skupne naložbe – pred pričetkom del; **Prejemnik denarne pomoči – pred pričetkom del in nakupom naprave**

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/kurilne-naprave-na-lesno-biomaso

Navezava na ukrep: Ogrevanje in prezračevanje / Heating and ventilation – Biomass boiler

2. **Naziv: Subvencija za priklop na omrežje daljinskega ogrevanja**

Spodbudo dajalec: Eko Sklad

Opis:

Subvencija za **samostojne in skupne naložbe** občanov za nakup in vgradnjo toplotne postaje, ki bo priključena na sistem daljinskega ogrevanja.

Pogoji:

Na javnem pozivu lahko kot vlagatelj kandidira vsaka fizična oseba oziroma občan, ki je investitor in lastnik/solastnik/družinski član lastnika/najmnik stavbe ali stanovanja.

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[1] ki jih določa Uredba o emisiji snovi v zrak iz malih in srednjih kurilnih naprav. ali Uredbo Komisije (EU) 2015/1189

[2] vrednost emisij celotnega prahu mora biti manjša od 40 mg/m3, vrednost emisij ogljikovega monoksida pa manjša od 400 mg/m3, določene po standardu SIST EN 303-5:2012 pri računski vsebnosti kisika 13 % v suhih dimnih plinih.

Nova toplotna postaja mora imeti krmilnike z vodenjem temperature ogrevane vode glede na zunanjo temperaturo ter možnost nastavljanja ogrevalne krivulje in parametrov krmiljenja regulacijskega ventila.

Stvaba v kateri se izvaja poseg mora imeti veljavno uporabno dovoljenje.

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Samostojne naložbe - po izvedeni naložbi; Skupne naložbe – pred pričetkom del; **Prejemnik denarne pomoči - pred pričetkom del**

Vrednost spodbude:

Samostojne naložbe: Višina nepovratne finančne spodbude znaša **50%** priznanih stroškov naložbe, vendar ne več kot 3.000 EUR na posamezno stanovanje.

Skupne naložbe: Višina nepovratne finančne spodbude znaša **do** 25% priznanih stroškov naložbe

Višina spodbude za socialno šibke občane je 100 % priznanih stroškov naložbe glede na njegov pripadajoči delež financiranja naložbe.

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/priklop-na-omreje-daljinskega-ogrevanja-3/priklop-na-omrezje-daljinskega-ogrevanja-subvencija-3

Navezava na ukrep: Ogrevanje in prezračevanje – Distric Heating

3. **Naziv: Subvencija za plinske kondenzacijske kotle**

Spodbudo dajalec: Eko Sklad

Opis:

Subvencija za **samostojne in skupne naložbe** občanov za nakup in vgradnjo plinskega kondenzacijskega kotla, ki bo priklopljen na distribucijsko omrežje zemeljskega plina.

Pogoji:

Na javnem pozivu lahko kot vlagatelj kandidira vsaka fizična oseba oziroma občan, ki je investitor in lastnik/solastnik/družinski član lastnika/najmnik stavbe ali stanovanja.

Plinski kondenzacijski kotel mora izpolnjevati tehnične zahteve predpisov za okoljsko primerno zasnovo proizvodov, povezanih z energijo in zahteve vseh ostalih predpisov, ki urejajo to področje in mora imeti skupaj z napravo za uravnavanje temperature vrednost sezonske energijske učinkovitosti pri ogrevanju prostorov ηs (%) vsaj 98 % oziroma mora biti komplet plinskega kondenzacijskega kotla in naprave za uravnavanje temperature vsaj v »A+« razredu sezonske energijske učinkovitosti pri ogrevanju prostorov.

Normirani izkoristek za plinski kondenzacijski kotel v večtsanovanjskih stavbah mora biti večji ali enak 104 %.

Subvencija za naložbo vgradnje plinskega kondenzacijskega kotla za centralno ogrevanje starejše stanovanjske stavbe je lahko dodeljena le na območju občin s sprejetim Odlokom o načrtu za kakovost zraka, in sicer zgolj na tistih območjih teh občin, kjer je skladno z občinskim aktom ali lokalnim energetskim konceptom kot prednostni način ogrevanja določena uporaba zemeljskega plina.

Preverjanje prednostnega načina ogrevanja in omejitev spodbud za vašo stavbo je možno na tej povezavi: https://www.ekosklad.si/prebivalstvo/informacije/orodja/prednostni-nacin-ogrevanja

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Samostojne naložbe - po izvedeni naložbi; Skupne naložbe – pred pričetkom izvajanja del; **Prejemnik denarne pomoči - pred pričetkom izvajanja del**

Vrednost spodbude:

Samostojne naložbe: Višina nepovratne finančne spodbude znaša **50%** priznanih stroškov naložbe, vendar ne več kot 2.000 EUR na vgrajen plinski kondenzacijski kotel.

Skupne naložbe: Višina nepovratne finančne spodbude znaša do 25 % priznanih stroškov naložbe.

Višina spodbude za socialno šibke občane je 100 % priznanih stroškov naložbe glede na njegov pripadajoči delež financiranja naložbe.

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/plinski-kondenzacijski-kotli-3

Navezava na ukrep: Ogrevanje in prezračevanje – Condensing boiler

4. **Naziv: Subvencija za sisteme prezračevanje z vračanjem toplote – rekuperacija**

Spodbudo dajalec: Eko Sklad

Opis:

Subvencija za **samostojne in skupne naložbe** občanov za za nakup in vgradnjo enega centralnega sistema na stanovanje in/ali za vgradnjo naprav za lokalno prezračevanje.

Pogoji:

Na javnem pozivu lahko kot vlagatelj kandidira vsaka fizična oseba oziroma občan, ki je investitor in lastnik/solastnik/družinski član lastnika/imetnik stavbne pravice/najmnik stavbe ali stanovanja.

Prezračevalne naprave namenjene centralnemu prezračevanju, morajo dosegati toplotni izkoristek rekuperacije toplote (ηt) vsaj 80 %, razen enot z entalpijskim prenosnikom toplote, ki morajo dosegati toplotni izkoristek rekuperacije toplote vsaj 74 %. Prezračevalne naprave za lokalno prezračevanje morajo dosegati toplotni izkoristek rekuperacije toplote (ηt) vsaj 70%, vse prezračevalne naprave pa ne smejo presegati specifične vhodne moči (SPI) 0,45 W/(m3/h). Prezračevalne naprave za lokalno prezračevanje, ki izmenjujoče dovajajo zrak v prostor in odvajajo zrak iz prostora, morajo biti vgrajene v paru in med seboj sinhronizirane.

Interaktivni seznam opreme primerne za pridobitev Eko sklad spodbude je na voljo na tej povazavi: https://www.ekosklad.si/prebivalstvo/informacije/orodja/seznam-opreme

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Samostojne naložbe - po izvedeni naložbi; Skupne naložbe – pred pričetkom izvajanja del; **Prejemnik denarne pomoči - pred pričetkom izvajanja del**

Vrednost spodbude:

Samostojne naložbe: Višina nepovratne finančne spodbude znaša do 20 % priznanih stroškov naložbe, vendar ne več kot:

- 2.000 EUR za izvedbo centralnega prezračevalnega sistema v posameznem stanovanju;
- 300 EUR na prezračevalno napravo, namenjeno lokalnemu prezračevanju.

Skupne naložbe: Višina nepovratne finančne spodbude znaša do 30 % priznanih stroškov naložbe.

Višina spodbude za socialno šibke občane je 100 % priznanih stroškov naložbe glede na njegov pripadajoči delež financiranja naložbe.

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/sistemi-za-prezracevanje-z-vracanjem-toplote-rekuperacija

Navezava na ukrep: Ogrevanje in prezračevanje - Decentralised ventilation with heat recovery, Balanced ventilation

5. **Naziv: Subvencija za solarne ogrevalne sisteme**

Spodbudo dajalec: Eko Sklad

Opis:

Subvencija za **samostojne naložbe** občanov za nakup in vgradnjo solarnega ogrevalnega sistema.

Pogoji:

Na javnem pozivu lahko kot vlagatelj kandidira vsaka fizična oseba oziroma občan, ki je investitor in lastnik/solastnik/družinski član lastnika/imetnik stavbne pravice/najmnik stavbe ali stanovanja.

Spodbude se dodeljuje za nakup in vgradnjo solarnega ogrevalnega sistema s ploščatimi ali vakuumskimi sprejemniki sončne energije, za sistem s toplozračnimi sprejemniki sončne energije in za fotonapetostni sistem, ki ne bo priključen na električno omrežje in se bo uporabljal samo za direktno ogrevanje vode preko uporovnih električnih grelnikov.

Nepovratna finančna spodbuda se dodeli na osnovi aperturne (svetle) površine sprejemnika sončne energije oziroma inštalirane nazivne električne moči fotonapetostnih modulov.

Interaktivni seznam opreme primerne za pridobitev Eko sklad spodbude je na voljo na tej povazavi: https://www.ekosklad.si/prebivalstvo/informacije/orodja/seznam-opreme

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge za samostojne naložbe je po izvedeni naložbi. **Za socialno šibke občane pa pred pričetkom izvajanja del.**

Vrednost spodbude:

Višina nepovratne finančne spodbude znaša do 30 % priznanih stroškov naložbe, vendar ne več kot:

- 300 EUR na m2 aperturne (svetle) površine sprejemnikov sončne energije oziroma
- 600 EUR za 1 kVA inštalirane nazivne električne moči fotonapetostnih modulov.

Višina nepovratne finančne spodbude znaša 100% upravičenih stroškov projekta, vendar ne več kot 9.620,00 EUR z DDV.

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/solarni-ogrevalni-sistem

Navezava na ukrep: Ogrevanje in prezračevanje - Solar thermal roof and solar roof

6. **Naziv: Subvencija za toplotne črpalke**

Spodbudo dajalec: Eko Sklad

Opis:

Subvencija za **samostojne in skupne naložbe** občanov za a nakup in vgradnjo električne, plinske, sorpcijske ali hibridne toplotne črpalke za centralno ogrevanje stanovanjske stavbe.

Pogoji:

Na javnem pozivu lahko kot vlagatelj kandidira vsaka fizična oseba oziroma občan, ki je investitor in lastnik/solastnik/družinski član lastnika/imetnik stavbne pravice/najmnik stavbe ali stanovanja.

Toplotna črpalka mora dosegati predpisano mejo sezonske energijske učinkovitosti ogrevanja prostorov ηs (%) v povprečnih podnebnih razmerah, kot izhaja iz naslednje tabele:

Tip ogrevalne toplotne črpalke	Spodnja mejna vrednost sezonske energijske učinkovitosti ogrevanja prostorov ηs (%) za uporabo pri nizki temperaturi v povprečnih podnebnih razmerah			
	Električna toplotna črpalka	Plinska toplotna črpalka	Sorpcijska toplotna črpalka	Hibridna toplotna črpalka
zrak/voda	140	110	110	150
voda/voda	200	-	130	-
slanica (kot npr. zemlja)/voda	170	-	110	-

Interaktivni seznam opreme primerne za pridobitev Eko sklad spodbude je na voljo na tej povazavi: https://www.ekosklad.si/prebivalstvo/informacije/orodja/seznam-opreme

Pri vgradnji ogrevalne toplotne črpalke v večstanovanskih stavbah je obvezna vgradnja posebnega števca za merjenje proizvedene toplote ogrevalne toplotne črpalke in posebnega števca rabe električne energije ogrevalne toplotne črpalke.

Subvencija na območju občin s sprejetim Odlokom o načrtu za kakovost zraka ne more biti dodeljena, če občinski akt ali lokalni energetski koncept določa na tem območju drug prednostni način ogrevanja.

Preverjanje prednostnega načina ogrevanja in omejitev spodbud za vašo stavbo je možno na tej povezavi: https://www.ekosklad.si/prebivalstvo/informacije/orodja/prednostni-nacin-ogrevanja

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Samostojne naložbe - po izvedeni naložbi; Skupne naložbe – pred pričetkom izvajanja del; **Prejemnik denarne pomoči - pred pričetkom izvajanja del**

Vrednost spodbude:

Samostojne naložbe: Višina nepovratne finančne spodbude znaša **od 20% do 50% vrednosti naložbe, največ do 2.500 EUR oz. 5.000 EUR**

Skupne naložbe: Višina nepovratne finančne spodbude znaša do 25 % priznanih stroškov naložbe.

Višina spodbude za socialno šibke občane je 100 % priznanih stroškov naložbe glede na njegov pripadajoči delež financiranja naložbe.

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/toplotne-crpalke

Navezava na ukrep: Ogrevanje in prezračevanje - Air-water heat pump; Heat pump and solar plant, Ground/water heat pump

1. **Naziv: Subvencija za optimizacijo sistema ogrevanja v večstanovanjski stavbi**

Spodbudo dajalec: Eko Sklad

Opis

Nepovratne finančne spodbude za **skupne naložbe** občanov v stavbah z več deli, za optimizacijo sistema ogrevanja v večstanovanjski stavbi.

Vrednost spodbude:

Višina nepovratne finančne spodbude znaša do 20 % priznanih stroškov naložbe, vendar ne več kot 40 EUR na grelno telo.

Pogoji:

Na javnem pozivu lahko kot vlagatelj kandidira vsaka fizična oseba oziroma občan, ki je investitor in lastnik/solastnik/družinski član lastnika/imetnik stavbne pravice/najmnik stavbe ali stanovanja. Za skupne naložbe vlogo na javni poziv vloži pooblaščeni upravičenec oseb ali njihov predstavnik.

Pravica do nepovratne finančne spodbude se dodeli za optimizacijo sistema ogrevanja, ki zajema nakup in vgradnjo radiatorskih termostatskih ventilov in hidravlično uravnoteženje celotnega sistema ogrevanja.

Vloga mora biti pravilno izpoljena in pravočasno oddana.

Rok za oddajo vloge: pred pričetkom izvajanja del

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/optimizacija-sistema-ogrevanja-v-vecstanovanjski-stavbi/optimizacija-sistema-ogrevanja-v-vecstanovanjski-stavbi-subvencija

Navezava na ukrep: Ogrevanje in prezračevanje / Heating and ventilation - Hydronic balancing of radiators; Thermostatic valve on heaters

II. INSULATION

1. Naziv: Subvencija za izolacijo fasade v starejših stavbah

Spodbudo dajalec: Eko Sklad

Opis:

Subvencija za **samostojne in skupne naložbe** občanov za nakup in vgradnjo fasadnega sistema s toplotno izolacijo.

Pogoji:

Na javnem pozivu lahko kot vlagatelj kandidira vsaka fizična oseba oziroma občan, ki je investitor in lastnik/solastnik/družinski član lastnika/imetnik stavbne pravice/najmnik stavbe ali stanovanja.

Fasadni sistem s toplotno izolacijo mora izkazovati razmerje med toplotno prevodnostjo in debeline nove toplotne izolacije manjše ali enako 0,230 W/(m^2K) oziroma 0,280 W/(m^2K) za socialno šibka gospodinjstva.

Interaktivni seznam opreme primerne za pridobitev Eko sklad spodbude je na voljo na tej povazavi: https://www.ekosklad.si/prebivalstvo/informacije/orodja/seznam-opreme

Debelino izolacije fasade, ki je potrebna za pridobitev Eko Sklad spodbude, lahko izračunate na tej povezavi: https://www.ekosklad.si/prebivalstvo/informacije/orodja/kalkulator-potrebne-debeline-izolacije-fasade

Nepovratna finančna spodbuda je lahko dodeljena le za stanovanjske stavbe oziroma dele stanovanjskih stavb.

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Samostojne naložbe - po izvedeni naložbi; **Prejemnik denarne pomoči - pred pričetkom izvajanja del**

Vrednost spodbude:

Samostojne naložbe: Višina nepovratne finančne spodbude znaša **do 20% ozioma največ do 12 EUR na m^2 toplotne izolacije fasade.**

Skupne naložbe: Višina nepovratne finančne spodbude znaša do 20 % priznanih stroškov naložbe, vendar ne več kot 16 EUR na m^2 toplotne izolacije fasade, zunanjega zidu/tal ali zidu proti terenu.

Višina spodbude za prejemnike denarne socialne pomoči ali varstvenega dodatka je 100 % upravičenih stroškov projekta, vendar ne več kot 9.620,00 EUR z DDV.

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/izolacija-fasade

Navezava na ukrep: Izolacija - facade insluation

2. **Naziv: Subvencija za izolacijo kleti in tal**

Spodbudo dajalec: Eko Sklad

Opis:

Subvencija za **samostojne in skupne naložbe** občanov za izvedbo toplotne izolacije tal na terenu ali tal nad neogrevanim prostorom/kletjo v starejši eno- ali dvostanovanjski stavbi in v večstanovanjskih stavbah.

Pogoji:

Na javnem pozivu lahko kot vlagatelj kandidira vsaka fizična oseba oziroma občan, ki je investitor in lastnik/solastnik/družinski član lastnika/imetnik stavbne pravice/najmnik stavbe ali stanovanja.

Za skupne investicije so do subvencije upravičene tudi pravne osebe javnega prava, ki imajo stvarno premoženje v svoji lasti.

Razmerje med toplotno prevodnostjo in debelino novo vgrajene toplotne izolacije mora biti manjše ali enako 0,280 W/(m2K). Pri navedenem izračunu razmerij se morebitne obstoječe izolacije ne upošteva. Debelino izolacije tal, ki je potrebna za pridobitev Eko Sklad spodbude, lahko izračunate na tej povezavi: https://www.ekosklad.si/prebivalstvo/informacije/orodja/kalkulator-potrebne-debeline-izolacije-tal

Nepovratna finančna spodbuda je lahko dodeljena le za stanovanjske stavbe oziroma dele stanovanjskih stavb.

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Samostojne naložbe - po izvedeni naložbi; Skupne naložbe – pred pričetkom izvajanja del; **Prejemnik denarne pomoči - pred pričetkom izvajanja del**

Vrednost spodbude:

Višina nepovratne finančne spodbude znaša **do 20% ozioma največ do 12 EUR na m2 toplotne izolacije tal.**

Višina spodbude za prejemnike denarne socialne pomoči ali varstvenega dodatka je 100 % upravičenih stroškov projekta glede na njegov pripadajoči delež financiranja naložbe.

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/izolacija-kleti-in-tal

Navezava na ukrep: Izolacija - floor insulation

3. **Naziv: Subvencija za izolacijo strehe ali stropa**

Spodbudo dajalec: Eko Sklad

Opis:

Subvencija za **samostojne in skupne naložbe** občanov za izvedbo toplotne izolacije strehe ali stropa proti neogrevanemu prostoru v starejših stavbah ali stavbah z več deli.

Pogoji:

Na javnem pozivu lahko kot vlagatelj kandidira vsaka fizična oseba oziroma občan, ki je investitor in lastnik/solastnik/družinski član lastnika/imetnik stavbne pravice/najmnik stavbe ali stanovanja.

Nepovratna finančna spodbuda je lahko dodeljena le za stanovanjske stavbe oziroma dele stanovanjskih stavb.

Razmerje med toplotno prevodnostjo in debelino novo vgrajene toplotne izolacije mora biti manjše ali enako 0,140 W/(m2K). Pri navedenem izračunu razmerij se morebitne obstoječe izolacije ne upošteva. Debelino izolacije strehe, ki je potrebna za pridobitev Eko Sklad spodbude, lahko izračunate na tej povezavi: https://www.ekosklad.si/prebivalstvo/informacije/orodja/kalkulator-potrebne-debeline-izolacije-strehe

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Samostojne naložbe - po izvedeni naložbi; Skupne naložbe – pred pričetkom izvajanja del; **Prejemnik denarne pomoči - pred pričetkom izvajanja del**

Vrednost spodbude:

Samostojne investicije: Višina nepovratne finančne spodbude znaša **do 20% ozioma največ do 12 EUR na m2 toplotne izolacije** strehe ali stropa proti neogrevanemu prostoru.

Skupne investicije: Višina nepovratne finančne spodbude znaša do 20 % priznanih stroškov naložbe, in največ 16 EUR na m2 toplotne izolacije.

Višina spodbude za prejemnike denarne socialne pomoči ali varstvenega dodatka je 100 % upravičenih stroškov projekta glede na njegov pripadajoči delež financiranja naložbe.

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/izolacija-kleti-in-tal

Navezava na ukrep: Izolacija - roof insulation

4. **Naziv: Subvencija za zamenjavo zunanjega stavbenga pohištva**

Spodbudo dajalec: Eko Sklad

Opis:

Subvencija za **samostojne naložbe** občanov za zamenjavo obstoječih vertikalnih in strešnih oken, balkonskih vrat in fiksnih zasteklitev z novimi energijsko učinkovitimi lesenimi okni.

Pogoji:

Na javnem pozivu lahko kot vlagatelj kandidira vsaka fizična oseba oziroma občan, ki je investitor in lastnik/solastnik/družinski član lastnika/imetnik stavbne pravice/najmnik stavbe ali stanovanja.

Nepremičnina, stanovanjska stavba oziroma stanovanje v večstanovanjski stavbi, kjer bo izveden ukrep, ki je predmet tega javnega poziva, mora biti v izključni lasti fizične osebe/oseb.

Lastnosti novih lesenih oken morajo biti določene na podlagi standarda SIST EN 14351-1:2006+A2:2016. Okna morajo imeti toplotno prehodnost UW ≤ 1,1 W/m2K (U ≤ 1,2 W/m2K za prejemnike denerane pomoči), trojno zasteklitev in energijsko učinkovit distančnik s ψ ≤ 0,060 W/mK.

Interaktivni seznam opreme primerne za pridobitev Eko sklad spodbude je na voljo na tej povazavi: https://www.ekosklad.si/prebivalstvo/informacije/orodja/seznam-opreme

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Samostojne naložbe - po izvedeni naložbi; **Prejemnik denarne pomoči - pred pričetkom izvajanja del**

Vrednost spodbude:

Samostojne investicije: Višina nepovratne finančne spodbude znaša **do 20% ozioma največ 150 EUR na m2 zamenjanih oken**.

Višina spodbude za prejemnike denarne socialne pomoči ali varstvenega dodatka je 100 % upravičenih stroškov projekta, vendar ne več kot 9.620,00 EUR z DDV.

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/zunanje-stavbno-pohistvo

Navezava na ukrep: Zunanje stavbno pohištvo – windows, door or other furniture related measures

III. ENERGY GENERATION

1. Naziv: Subvencija za mikro sončne elektrarne

Spodbudo dajalec: Eko Sklad

Opis:

Subvencija za **samostojne in skupinske naložbe** občanov za nove naložbe nakupa in vgradnje naprav za individualno in skupnostno samooskrbo gospodinjskih odjemalcev ali malih poslovnih odjemalcev z električno energijo proizvedeno iz sončne energije.

Pogoji:

Na javnem pozivu lahko kot vlagatelj kandidira vsaka fizična oseba oziroma občan, ki je investitor in lastnik/solastnik/družinski član lastnika stavbe kjer bo izvedena investicija.

Do nepovratne finančne spodbude po tem javnem pozivu so upravičene tudi pravne osebe zasebnega prava, samostojni podjetniki posamezniki ter fizične osebe, ki samostojno opravljajo dejavnost kot poklic.

Nepovratna finančna spodbuda se lahko dodeli le za nove naprave za samooskrbo z električno energijo.

Naprava za samooskrbo z električno energijo mora biti skladna z zahtevami iz soglasja za priključitev, izdanega na podlagi 147. člena EZ-1 in Pravilnika o tehničnih zahtevah naprav za samooskrbo z električno energijo iz obnovljivih virov energije (Uradni list RS, št. 1/16 in 46/18).

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Samostojne naložbe - **pred pričetkom del; Skupinske naložbe - pred zaključkom del in pred začetkom obratovanja naprave.**

Vrednost spodbude:

Višina nepovratne finančne spodbude znaša 180 EUR za 1kVA **do 80% vsote priključnih moči odjemnih mest.**

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/mikro-soncne-elektrarne

Navezava na ukrep: Proizvodnja energije - Solar PV panels; Energy cooperative: Remote solar

IV DEEP RENOVATION

1. **Naziv: Subvencija za celovito obnovo stanovanjske stavbe**

Spodbudo dajalec: Eko Sklad

Opis:

Subvencija za **samostojne naložbe** občanov za celovito obnovo starejših eno- ali dvostanovanjskih stavb.

Pogoji:

Na javnem pozivu lahko kot vlagatelj kandidira vsaka fizična oseba oziroma občan, ki je investitor in lastnik/solastnik/družinski član lastnika stavbe kjer bo izvedena investicija.

Pravica do nepovratne finančne spodbude se dodeli za celovito obnovo dokončane in vsaj minimalno komunalno opremljene starejše eno- ali dvostanovanjske stavbe, za katero je bilo gradbeno dovoljenje pred 1.7.2010.

Celovita obnova starejše stavbe mora biti načrtovana in izvedena tako, da se ohrani večinski ogrevani del starejše stavbe.

Ustreznost celovite obnove starejše stavbe se preverja na podlagi izračunov in dokazil iz Elaborata, izračunov PHPP za novo in obstoječe stanje, dokumentacije za izvedbo celovite prenove PZI ter DGD.

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge je pred pričetkom del.

Vrednost spodbude:

Nepovratna finančna spodbuda je določena glede na računsko rabo energije za ogrevanje stavbe opredeljene v PZI:

Celovita obnova sNES		Spodbuda v EUR/m2 neto ogrevane površine stavbe	
Energija za ogrevanje stavbe QH [kWh/(m2a)]	Energija za pohlajevanje stavbe QK [kWh/(m2 a)]	I. skupina	II. skupina
≤ 25	≤ 15	200	170

Nepovratna finančna spodbuda lahko znaša do 50 % priznanih stroškov naložbe. Dodeljena je lahko le za neto ogrevano površino stavbe pred obnovo (oziroma po obnovi, če je ta manjša), in sicer za največ:

200 m2 neto ogrevane površine stavbe za samostojno stoječo enostanovanjsko stavbo;

150 m2 neto ogrevane površine stavbe za vrstno , dvojčka ali dvostanovanjsko stavbo

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/celovita-obnova-stanovanjske-stavbe

Navezava na ukrep: Celovita obnova stavbe - general reovation of older buildings –link to - insluation &ventilation; windwos; space heating

LOANS / KREDIT (public call/ javni poziv 65OB19)

IV. HEATING AND VENTILATION

Naziv: Kredit za kurilne naprave na lesno biomaso

Spodbudo dajalec: Eko Sklad

Opis

Ugodno kreditiranje občanov za nakup in vgradnjo ali za zamenjavo stare kurilne naprave, ki zagotavlja toploto centralnemu sistemu ogrevanja stavbe, z novo kurilno napravo na lesno biomaso.

Vrednost spodbude:

Obrestna mera: Trimesečni EURIBOR + 1,3%

Minimalni znesek kredita je 1.500,00 EUR

Odplačilna doba znaša največ 10 let

Priznani stroški naložbe se ugotovijo na podlagi predračuna izvajalca oziroma dobavitelja in vključujejo tudi DDV, zakonsko predpisane takse in prispevke.

Pogoji:

Do pridobitve kredita so upravičene fizične osebe, s stalnim prebivališčem v Sloveniji, kreditno sposobnostjo skladno z merili podanimi v prilogi poziva in so lastniki/solastniki stavb oziroma stanovanj kjer bo naložba izvedena.

Kotel na lesno biomaso mora biti skladen z Uredbo Komisije (EU) 2015/1189. Kotel mora biti namenjen centralnemu ogrevanju stavbe.

Peletna peč z vodnim toplotnim prenosnikom (kamin), ki bo priklopljena na centralno ogrevanje mora izpolnjevati naslednje zahteve po standardu SIST EN 14785:2006[3].

Interaktivni seznam opreme primerne za pridobitev Eko sklad spodbude je na voljo na tej povazavi: https://www.ekosklad.si/prebivalstvo/informacije/orodja/seznam-opreme

Kredit ne more biti dodeljen na tisti območjih občin, kjer občinski akt ali lokalni energetski koncept določa drug prednostni način ogrevanja (npr. daljinsko ogrevanje, uporaba zemeljskega plina).

Preverjanje prednostnega načina ogrevanja in omejitev spodbud za vašo stavbo je možno na tej povezavi: https://www.ekosklad.si/prebivalstvo/informacije/orodja/prednostni-nacin-ogrevanja

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Pred zaključkom del

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/kurilne-naprave-na-lesno-biomaso/kurilne-naprave-na-lesno-biomaso-kredit

Navezava na ukrep: Ogrevanje in prezračevanje / Heating and ventilation - – Biomass boiler

1. **Naziv: Kredit za priklop na omrežje daljinskega ogrevanja**

Spodbudo dajalec: Eko Sklad

Opis:

[3] izkoristek pri nazivni toplotni moči mora biti večji ali enak 91,0 %, vrednost emisij celotnega prahu mora biti manjša od 18,0 mg/m3, vrednost emisij ogljikovega monoksida pa manjša od 250,0 mg/m3, določeno

Kredit za naložbe občanov za nakup in vgradnjo toplotne postaje, ki bo priključena na sistem daljinskega ogrevanja.

Vrednost spodbude:

Obrestna mera: Trimesečni EURIBOR + 1,3%

Minimalni znesek kredita je 1.500,00 EUR

Odplačilna doba znaša največ 10 let

Priznani stroški naložbe se ugotovijo na podlagi predračuna izvajalca oziroma dobavitelja in vključujejo tudi DDV, zakonsko predpisane takse in prispevke.

Pogoji:

Do pridobitve kredita so upravičene fizične osebe, s stalnim prebivališčem v Sloveniji, kreditno sposobnostjo skladno z merili podanimi v prilogi poziva in so lastniki/solastniki stavb oziroma stanovanj kjer bo naložba izvedena.

Pravica do kredita se dodeli za vgradnjo toplotnih postaj ali podpostaj za priklop na omrežje daljinskega ogrevanja.

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Pred zaključkom del

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/priklop-na-omreje-daljinskega-ogrevanja-3/priklop-na-omrezje-daljinskega-ogrevanja-kredit-3

Navezava na ukrep: Ogrevanje in prezračevanje - Distric Heating

2. **Naziv: Kredit za plinske kondenzacijske kotle**

Spodbudo dajalec: Eko Sklad

Opis:

Ugodno kreditiranje občanov za nakup in vgradnjo plinskega kondenzacijskega kotla, ki bo priklopljen na distribucijsko omrežje zemeljskega plina.

Vrednost spodbude:

Obrestna mera: Trimesečni EURIBOR + 1,3%

Minimalni znesek kredita je 1.500,00 EUR

Odplačilna doba znaša največ 10 let

Priznani stroški naložbe se ugotovijo na podlagi predračuna izvajalca oziroma dobavitelja in vključujejo tudi DDV, zakonsko predpisane takse in prispevke.

Pogoji:

Do pridobitve kredita so upravičene fizične osebe, s stalnim prebivališčem v Sloveniji, kreditno sposobnostjo skladno z merili podanimi v prilogi poziva in so lastniki/solastniki stavb oziroma stanovanj kjer bo naložba izvedena.

Pravica do kredita se dodeli za vgradnjo ogrevalne naprave s kondenzacijo, ki kot energent uporablja zemeljski ali naftni plin, z izkoristkom 92 % ali več.

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Pred zaključkom del

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/plinski-kondenzacijski-kotli-3

Navezava na ukrep: Ogrevanje in prezračevanje - Condensing boiler

3. **Naziv: Kredit za prezračevanje z vračanjem toplote**

Spodbudo dajalec: Eko Sklad

Opis:

Ugodno kreditiranje občanov za nakup in vgradnjo sistema za prezračevanje z vračanjem toplote.

Vrednost spodbude:

Obrestna mera: Trimesečni EURIBOR + 1,3%

Minimalni znesek kredita je 1.500,00 EUR

Odplačilna doba znaša največ 10 let

Priznani stroški naložbe se ugotovijo na podlagi predračuna izvajalca oziroma dobavitelja in vključujejo tudi DDV, zakonsko predpisane takse in prispevke.

Pogoji:

Do pridobitve kredita so upravičene fizične osebe s stalnim prebivališčem v Sloveniji, kreditno sposobnostjo skladno z merili podanimi v prilogi poziva in so lastniki/solastniki stavb oziroma stanovanj kjer bo naložba izvedena.

Pravica do kredita se dodeli za vgradnjo:

- Stanovanjske prezračevalne naprave, namenjene centralnemu prezračevanju, morajo dosegati toplotni izkoristek rekuperacije toplote (ηt) vsaj 80 %, razen naprav z entalpijskim prenosnikom toplote, ki morajo dosegati toplotni izkoristek rekuperacije toplote vsaj 74 %;
- Stanovanjske prezračevalne naprave za lokalno prezračevanje morajo dosegati toplotni izkoristek rekuperacije toplote (ηt) vsaj 70% (naprave, ki izmenjujoče dovajajo zrak v prostor in odvajajo zrak iz prostora, morajo biti vgrajene v paru in med seboj sinhronizirane);

Prezračevalne naprave ne smejo presegati specifične vhodne moči (SPI) 0,45 W/(m3/h).

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Pred zaključkom del

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/sistemi-za-prezracevanje-z-vracanjem-toplote-rekuperacija/sistemi-za-prezracevanje-z-vracanjem-toplote-rekuperacija-kredit

Navezava na ukrep: Ogrevanje in prezračevanje - Decentralised ventilation with heat recovery, Balanced ventilation

4. **Naziv: Kredit za solarne ogrevalne sisteme**

Spodbudo dajalec: Eko Sklad

Opis:

Ugodno kreditiranje občanov za nakup in vgradnjo solarnega ogrevalnega sistema.

Vrednost spodbude:

Obrestna mera: Trimesečni EURIBOR + 1,3%

Minimalni znesek kredita je 1.500,00 EUR

Odplačilna doba znaša največ 10 let

Priznani stroški naložbe se ugotovijo na podlagi predračuna izvajalca oziroma dobavitelja in vključujejo tudi DDV, zakonsko predpisane takse in prispevke.

Pogoji:

Do pridobitve kredita so upravičene fizične osebe s stalnim prebivališčem v Sloveniji, kreditno sposobnostjo skladno z merili podanimi v prilogi poziva in so lastniki/solastniki stavb oziroma stanovanj kjer bo naložba izvedena.

Pravica do kredita se dodeli za vgradnjo solarnega ogrevalnega sistema.

Interaktivni seznam opreme primerne za pridobitev Eko sklad spodbude je na voljo na tej povazavi: https://www.ekosklad.si/prebivalstvo/informacije/orodja/seznam-opreme

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Pred zaključkom del

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/solarni-ogrevalni-sistem/solarni-ogrevalni-sistem-kredit

Navezava na ukrep: Ogrevanje in prezračevanje - Solar thermal roof and solar roof

5. **Naziv: Kredit za toplotne črpalke**

Spodbudo dajalec: Eko Sklad

Opis:

Ugodno kreditiranje občanov za nakup in vgradnjo toplotne črpalke za centralno ogrevanje ali toplotne črpalke za pripravo sanitarne tople vode.

Vrednost spodbude:

Obrestna mera: Trimesečni EURIBOR + 1,3%

Minimalni znesek kredita je 1.500,00 EUR

Odplačilna doba znaša največ 10 let

Priznani stroški naložbe se ugotovijo na podlagi predračuna izvajalca oziroma dobavitelja in vključujejo tudi DDV, zakonsko predpisane takse in prispevke.

Pogoji:

Do pridobitve kredita so upravičene fizične osebe s stalnim prebivališčem v Sloveniji, kreditno sposobnostjo skladno z merili podanimi v prilogi poziva in so lastniki/solastniki stavb oziroma stanovanj kjer bo naložba izvedena.

Kredit lahko pridobite za vgradnjo toplotne črpalke za pripravo sanitarne tople vode, ki dosega najmanj razred energijske učinkovitosti A ali za nakup in vgradnjo toplotne črpalke za centralno ogrevanje po naslednjih pogojih:

Tip ogrevalne toplotne črpalke	Spodnja mejna vrednost sezonske energijske učinkovitosti ogrevanja prostorov η_s (%) za uporabo pri nizki temperaturi v povprečnih podnebnih razmerah			
	Električna toplotna črpalka	Plinska toplotna črpalka	Sorpcijska toplotna črpalka	Hibridna toplotna črpalka

zrak/voda	140	110	110	150
voda/voda	200	-	130	-
slanica (kot npr. zemlja)/voda	170	-	110	-

Interaktivni seznam opreme primerne za pridobitev Eko sklad spodbude je na voljo na tej povazavi: https://www.ekosklad.si/prebivalstvo/informacije/orodja/seznam-opreme

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Pred zaključkom del

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/toplotne-crpalke/toplotne-crpalke-kredit-2

Navezava na ukrep: Ogrevanje in prezračevanje - - Air-water heat pump; Heat pump and solar plant, Ground/water heat pump

V. INSULATION

5. Naziv: Kredit za izolacijo fasade v starejših stavbah

Spodbudo dajalec: Eko Sklad

Opis:

Ugodno kreditiranje občanov za nakup in vgradnjo fasadnega sistema s toplotno izolacijo.

Vrednost spodbude:

Obrestna mera: Trimesečni EURIBOR + 1,3%

Minimalni znesek kredita je 1.500,00 EUR

Odplačilna doba znaša največ 10 let

Priznani stroški naložbe se ugotovijo na podlagi predračuna izvajalca oziroma dobavitelja in vključujejo tudi DDV, zakonsko predpisane takse in prispevke.

Pogoji:

Do pridobitve kredita so upravičene fizične osebe s stalnim prebivališčem v Sloveniji, kreditno sposobnostjo skladno z merili podanimi v prilogi poziva in so lastniki/solastniki stavb oziroma stanovanj kjer bo naložba izvedena.

Kredit lahko pridobite za izvedbo toplotne izolacije fasade kjer je izkazano razmerje med toplotno prevodnostjo (λ) in debelino (d) nove toplotne izolacije $\lambda/d \leq 0{,}280$ W/(m^{2}K).

Interaktivni seznam opreme primerne za pridobitev Eko sklad spodbude je na voljo na tej povazavi: https://www.ekosklad.si/prebivalstvo/informacije/orodja/seznam-opreme

V primeru, da je na stavbi že vgrajen fasadni sistem s toplotno izolacijo, katerega toplotna prevodnost znaša $\lambda \leq 0{,}045$ W/m^{2}K, se lahko izvede naložba za dodatno toplotno izolacijo. Pri izračunu potrebne dodatne izolacije se obstoječa upošteva s toplotno prevodnostjo $\lambda = 0{,}045$ W/m^{2}K in z izmerjeno debelino, ki je razvidna iz k vlogi priložene fotografije obstoječega stanja, posnetega z merilnim trakom.

Debelino izolacije fasade, ki je potrebna za pridobitev Eko Sklad spodbude, lahko izračunate na tej povezavi: https://www.ekosklad.si/prebivalstvo/informacije/orodja/kalkulator-potrebne-debeline-izolacije-fasade

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Pred zaključkom del

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/izolacija-fasade/izolacija-fasade-kredit

Navezava na ukrep: Izolacija - facade insulation

6. **Naziv: Kredit za izolacijo kleti in tal**

Spodbudo dajalec: Eko Sklad

Opis:

Ugodno kreditiranje občanov za izvedbo toplotne izolacije tal na terenu ali tal nad neogrevanim prostorom/kletjo.

Vrednost spodbude:

Obrestna mera: Trimesečni EURIBOR + 1,3%

Minimalni znesek kredita je 1.500,00 EUR

Odplačilna doba znaša največ 10 let

Priznani stroški naložbe se ugotovijo na podlagi predračuna izvajalca oziroma dobavitelja in vključujejo tudi DDV, zakonsko predpisane takse in prispevke.

Pogoji:

Do pridobitve kredita so upravičene fizične osebe s stalnim prebivališčem v Sloveniji, kreditno sposobnostjo skladno z merili podanimi v prilogi poziva in so lastniki/solastniki stavb oziroma stanovanj kjer bo naložba izvedena.

Kredit lahko pridobite za izvedbo toplotne izolacije kleti, tal na terenu ali tal nad neogrevanim prostorom/kletjo, kjer je izkazano razmerje med toplotno prevodnostjo (λ) in debelino (d) nove toplotne izolacije λ/d ≤ 0,30 W/(m2K). Navedeno razmerje λ/d mora biti izkazano tudi v primeru vgradnje naravnih toplotno izolacijskih materialov ne glede na vrednost toplotne prevodnosti (λ).

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Pred zaključkom del

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/izolacija-kleti-in-tal/izolacija-kleti-in-tal-kredit

Navezava na ukrep: Izolacija - floor insulation

7. **Naziv: Kredit za izolacijo strehe ali stropa**

Spodbudo dajalec: Eko Sklad

Opis:

Ugodno kreditiranje občanov za izvedbo toplotne strehe ali stropa proti neogrevanemu prostoru.

Vrednost spodbude:

Obrestna mera: Trimesečni EURIBOR + 1,3%

Minimalni znesek kredita je 1.500,00 EUR

Odplačilna doba znaša največ 10 let

Priznani stroški naložbe se ugotovijo na podlagi predračuna izvajalca oziroma dobavitelja in vključujejo tudi DDV, zakonsko predpisane takse in prispevke.

Pogoji:

Do pridobitve kredita so upravičene fizične osebe s stalnim prebivališčem v Sloveniji, kreditno sposobnostjo skladno z merili podanimi v prilogi poziva in so lastniki/solastniki stavb oziroma stanovanj kjer bo naložba izvedena.

Kredit lahko pridobite za izvedbo toplotne izolacije strehe ali stropa proti neogrevanemu prostoru, kjer je izkazano razmerje med toplotno prevodnostjo (λ) in debelino (d) nove toplotne izolacije λ/d ≤ 0,180 W/(m2K).

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Pred zaključkom del

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/izolacija-strehe-ali-stropa-proti-neogrevanemu-prostoru/izolacija-strehe-ali-stropa-proti-neogrevanemu-prostoru-kredit

Navezava na ukrep: Izolacija - roof insulation

8. **Naziv: Kredit za zamenjavo zunanjega stavbnega pohištva**

Spodbudo dajalec: Eko Sklad

Opis:

Ugodno kreditiranje občanov za zamenjavo zunanjega stavbnega pohištva za zamnjšanje toplotnih izgub stvabnega ovoja.

Vrednost spodbude:

Obrestna mera: Trimesečni EURIBOR + 1,3%

Minimalni znesek kredita je 1.500,00 EUR

Odplačilna doba znaša največ 10 let

Priznani stroški naložbe se ugotovijo na podlagi predračuna izvajalca oziroma dobavitelja in vključujejo tudi DDV, zakonsko predpisane takse in prispevke.

Pogoji:

Do pridobitve kredita so upravičene fizične osebe s stalnim prebivališčem v Sloveniji, kreditno sposobnostjo skladno z merili podanimi v prilogi poziva in so lastniki/solastniki stavb oziroma stanovanj kjer bo naložba izvedena.

Kredit lahko pridobite za zamenjavo zunanjega stavbnega pohištva (oken, balkonskih vrat, fiksnih zasteklitev, vhodnih in garažnih vrat), z novim energijsko učinkovitim zunanjim stavbnim pohištvom, pri čemer vrednosti toplotne prehodnosti novega stavbnega pohištva ne smejo presegati vrednosti1,20W/(m2K).

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Pred zaključkom del

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/zunanje-stavbno-pohistvo

Navezava na ukrep: Izolacija - windows, doors

9. **Naziv: Kredit za prekritje objektov z rastlinsko odejo**

Spodbudo dajalec: Eko Sklad

Opis:

Ugodno kreditiranje občanov za prekritje stavbz rastlinsko odejo(npr. zelena streha ali fasada) za zmanjšanje toplotnih izgub in zmanjšanje koeficienta odtoka padavinskih voda.

Vrednost spodbude:

Obrestna mera: Trimesečni EURIBOR + 1,3%

Minimalni znesek kredita je 1.500,00 EUR

Odplačilna doba znaša največ 10 let

Priznani stroški naložbe se ugotovijo na podlagi predračuna izvajalca oziroma dobavitelja in vključujejo tudi DDV, zakonsko predpisane takse in prispevke.

Pogoji:

Do pridobitve kredita so upravičene fizične osebe s stalnim prebivališčem v Sloveniji, kreditno sposobnostjo skladno z merili podanimi v prilogi poziva in so lastniki/solastniki stavb oziroma stanovanj kjer bo naložba izvedena.

Kredit lahko pridobite za prekritje stavbe z rastlinsko odejo(npr. zelena streha ali fasada).

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Pred zaključkom del

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/zunanje-stavbno-pohistvo

Navezava na ukrep: Zelena streha – green roof

VI. ENERGY GENERATION

2. Naziv: Kredit za male sončne, vetrne in vodne elektrarne

Spodbudo dajalec: Eko Sklad

Opis:

Ugodno kreditiranje občanov za namestitev oziroma izgradnjo malih elektraren za pridobivanje električne energije s pomočjo sonca, vode ali vetra.

Vrednost spodbude:

Obrestna mera: Trimesečni EURIBOR + 1,3%

Minimalni znesek kredita je 1.500,00 EUR

Odplačilna doba znaša največ 10 let

Priznani stroški naložbe se ugotovijo na podlagi predračuna izvajalca oziroma dobavitelja in vključujejo tudi DDV, zakonsko predpisane takse in prispevke.

Pogoji:

Do pridobitve kredita so upravičene fizične osebe s stalnim prebivališčem v Sloveniji, kreditno sposobnostjo skladno z merili podanimi v prilogi poziva in so lastniki/solastniki stavb oziroma stanovanj kjer bo naložba izvedena.

Kredit lahko pridobite za namestitev naprav oziroma izgradnjo objektov za pridobivanje električne energije s pomočjo sonca, vode ali vetra z nazivno močjo do 50 kW.

Naprave, namenjene samooskrbi z električno energijo, morajo izpolnjevati zahteve Uredbeo samooskrbi z električno energijo iz obnovljivih virov energije (Uradni list RS, št.17/19) in Pravilnika o tehničnih zahtevah za samooskrbo z električno energijo iz obnovljivih virov energije (Uradni list RS, št.1/16, 46/18).

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Pred zaključkom del

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/male-soncne-vetrne-in-vodne-elektrarne/male-soncne-vetrne-in-vodne-elektrarne-kredit

Navezava na ukrep: Električna samooskrba – Solar PV panels;

3. **Naziv: Kredit za mikro soproizvodnja toplote in električne energije**

Spodbudo dajalec: Eko Sklad

Opis:

Ugodno kreditiranje občanov za namestitev naprav za mikro soproizvodnjo toplote in električne energije.

Vrednost spodbude:

Obrestna mera: Trimesečni EURIBOR + 1,3%

Minimalni znesek kredita je 1.500,00 EUR

Odplačilna doba znaša največ 10 let

Priznani stroški naložbe se ugotovijo na podlagi predračuna izvajalca oziroma dobavitelja in vključujejo tudi DDV, zakonsko predpisane takse in prispevke.

Pogoji:

Do pridobitve kredita so upravičene fizične osebe s stalnim prebivališčem v Sloveniji, kreditno sposobnostjo skladno z merili podanimi v prilogi poziva in so lastniki/solastniki stavb oziroma stanovanj kjer bo naložba izvedena.

Kredit lahko pridobite za namestitev naprav za mikro soproizvodnjo toplote in električne energije z visokim izkoristkom in nazivno močjo naprave do 50 kW, katerih sezonska energijska učinkovitost ogrevanja ne sme biti manjša od 86 %.

Naprave, namenjene samooskrbi z električno energijo, morajo izpolnjevati zahteve Uredbeo samooskrbi z električno energijo iz obnovljivih virov energije (Uradni list RS, št.17/19) in Pravilnika o tehničnih zahtevah za samooskrbo z električno energijo iz obnovljivih virov energije (Uradni list RS, št.1/16, 46/18).

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Pred zaključkom del

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/mikro-soproizvodnja-toplote-in-elektrine-energije/mikro-soproizvodnja-toplote-in-elektricne-energije-kredit

Navezava na ukrep: Električna samooskrba - Energy cooperative: Remote solar

Naziv: Kredit za nakup gospodinjskih aparatov A+ ali višjega razreda.

Spodbudo dajalec: Eko Sklad

Opis

Ugodno kreditiranje občanov za nakup gospodinjskih aparatov A+ ali višjega razreda.

Vrednost spodbude:

Obrestna mera: Trimesečni EURIBOR + 1,3%

Minimalni znesek kredita je 1.500,00 EUR

Odplačilna doba znaša največ 10 let

Priznani stroški naložbe se ugotovijo na podlagi predračuna izvajalca oziroma dobavitelja in vključujejo tudi DDV, zakonsko predpisane takse in prispevke.

Pogoji:

Do pridobitve kredita so upravičene fizične osebe, s stalnim prebivališčem v Sloveniji in kreditno sposobnostjo skladno z merili podanimi v prilogi poziva.

Nakup velikih gospodinjskih aparatov (štedilniki, hladilniki in zamrzovalniki ali njihove kombinacije, pralni, sušilni in pomivalni stroji, nape idr.), ki so po porabi energije razvrščeni v energijski razred A+ ali višje.

Vloga mora biti pravilno izpoljena in pravočasno oddana. Rok za oddajo vloge: Pred zaključkom del

Povezava: https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/gospodinjski-aparati-a-ali-visjega-razreda/gospodinjski-aparati-a-ali-visjega-razreda-kredit

Navezava na ukrep: Električne naprave – Replace energy guzzlers and any other measures connected to electrical appliances

3. Policies related and referred to in the Slovenian Green Menu

- Stanovanjski zakon:
  http://www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO2008
- Pravilnik o upravljanju večstanovanjskih stavb:
  http://www.pisrs.si/Pis.web/pregledPredpisa?id=PRAV8674
- Pravilnik o standardih vzdrževanja stanovanjskih stavb in stanovanj:
  http://www.pisrs.si/Pis.web/pregledPredpisa?id=PRAV5263
- Pravilnik o učinkoviti rabi energije v stavbah:
  http://www.pisrs.si/Pis.web/pregledPredpisa?id=PRAV10043
- Tehnična smernica Učinkovita raba energije:
  http://www.arhiv.mop.gov.si/fileadmin/mop.gov.si/pageuploads/zakonodaja/prostor/graditev/TSG-01-004_2010.pdf
- Pravilnik o prezračevanju in klimatizaciji stavb:
  http://www.pisrs.si/Pis.web/pregledPredpisa?id=PRAV4223
- Gradbeni zakon:
  http://www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO7108
- Energetski zakon:
  http://www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO6665
- Smernice s področja požarnega varstva:
  http://www.szpv.si/smernice/
- Zakon o varstvu kulturne dediščine:
  http://pisrs.si/Pis.web/pregledPredpisa?id=ZAKO4144

- Priročnik pravnih režimov varstva, ki jih je treba upoštevati pri pripravi planov in posegih v območja kulturne dediščine:
  https://gis.gov.si/MK_eVRDpredpis/P_11_11_02.htm

- Zakon o varstvu potrošnikov:
  https://www.uradni-list.si/glasilo-uradni-list-rs/vsebina/51154

- Obligacijski zakonik:
  https://zakonodaja.com/zakon/oz

Deliverable Proof – “Other document” - EIT-BP2020

Name of KIC project the report results from that contributed to/ resulted in the deliverable	Pan-European Approach on Sustainable Heritage: Regeneration by a retrofitting economy
Name of document	Appendix 1 F List of new measures for Portuguese context
Summary/brief description of document	This document contains the list of new sustainable measures for the Green Menu in Portugal including the explanatory text per measure.
Date of document	31/12/2020

Supporting Documents: attach in pdf format

Climate-KIC is supported by the EIT, a body of the European Union

Appendix 1 F – Selected examples of new measures created for Portuguese Green Menu

1. Point of attention: Avoiding damage

Historical buildings often present damage such as peeled paint and cracks in the caulking material. These leave the house vulnerable to weather and water damage that can make it rotten to the core. Early low-cost investments to apply a fresh coat of paint or remove and reapply the caulking material (especially around windows and doors) can save you expensive repairs later on. Nevertheless, if your building needs more extensive renovation works, make sure you do not just hide the damage and actually implement a thorough retrofitting project.

2. Double glazing windows with low-E coating

Low-E, or low-emissivity, glass minimizes the amount of infrared and ultraviolet radiation that comes through the glass, without minimizing the amount of light that enters your home. When the interior heat tries to escape to the colder outside during the winter, the low-e coating reflects it back to the inside. The reverse happens during the summer. By replacing your single glazing glass with double glazing low-E coating glass, you can save on your energy bill and improve your thermal comfort both in winter and summer. In addition to an insulating effect, it also reduces noise pollution from outside. The glass coating is extremely thin and does not cause a visible difference in color, being appropriate for buildings with a historical value.

3. Electric boiler

While traditional boilers use fuel to generate heat, an electrical boiler uses only electricity with an almost 100% efficiency rate (for modern gas boilers is around 90%). Electric boilers do not emit greenhouse gases. However, it is crucial to note that the overall efficiency and carbon footprint will depend on how the electricity is generated — whether it is efficient or not and whether it is renewable or not. An electric boiler can be a good solution for historical houses that are not connected to the gas network or with a low demand for heating. However, they may be unable to meet higher demands and it is important to consider the running costs, since electricity is usually more expensive than gas. A good solution may be to install an electrical boiler using electricity generated with solar panels. Do not forget that there are several technologies for space heating and that the optimal solution may vary with each home.

4. Fireplace with heat exchanger

Historical buildings often have old-fashioned fireplaces for space heating and cooking that were mostly decommissioned during the last century. Apart from providing a pleasant environment in cold winter days, these fireplaces can also be used to offset some utility costs associated with heating. However, traditional fireplaces have an efficiency rate of only 5-20%, losing most heat through the chimney and being an entry point for cold air. Fireplace inserts are advanced wood-burning metal appliances, usually with insulated glass allowing a view of the fire, which can be placed inside a masonry fireplace. They use a heat exchange chamber, increasing fireplace efficiency 5-10 times. Estimated costs for this retrofitting measure are 800-3400€, depending on system size and installation. Nowadays, it is also possible to transform your fireplace into a whole house smart heating system. Please make sure you have your fireplace retrofitted by a professional.

Tip: The damper is the hinged metal plate just above the chimney's throat that closes when the fireplace is not in use. If it is not effective enough, you can get an additional chimney cap damper which closes at

the top of the chimney. Both dampers together do a very effective job at keeping cold air out in the winter and hot air out in the summer, thus reducing both heating and cooling costs.

Tip: Another way to improve fireplace efficiency is to burn the right type of firewood. Make sure it is dry. Green wood produces a lot of smoke, but not much heat.

Tip: Having your fireplace and chimney cleaned will improve efficiency.

5. Thermal insulation of heating pipes

Heating pipes often lose a lot of heat. By insulating these pipes in the unheated areas, such as crawl spaces, central heating cabinets and attic, the heat is only dissipated where it is needed. Split-foam insulation can be purchased in most hardware stores and installed easily. Measure costs are estimated at between 50-90 €/m and it can reduce heating energy consumption by 3-4% annually. It is often easy to insulate the pipes yourself, but they must remain easily accessible. It is important not to insulate drinking water pipes to avoid the risk of legionella.

6. Electric instantaneous water heater

An electric instantaneous water heater uses electricity to provide hot water only when it is needed and for as long as required. These tankless units can reduce energy use by 24-34% compared to traditional water heater tank by eliminating standby energy losses. Although it supplies a continuous never-ending flow of hot water, it may not be able to provide enough water to sufficiently cover all usage at once. For houses with large hot water needs, installing a point-of-use system for specific faucets can be a good solution that can also lead to greater energy savings of 27-50%. Electric tankless water heaters tend to have lower flow rates than gas-fired ones, but do not have a constantly burning pilot light which further reduces energy losses. The initial cost of a tankless water heater is usually greater than that of a storage water heater, but they will typically last longer and have lower operating and energy costs, which could offset its higher purchase price. If your storage tank water heater is nearing the end of its useful life, an electric tankless water heater can be a good solution to save space and energy.

7. Efficient gas-fired condensing boiler

In conventional boilers, the combustion gases are released into the atmosphere through the flue. Heat is lost when the steam that forms during the burning process is being pushed out. Modern boilers are more efficient for several reasons, but their main advantage is that they are all condensing boilers. A condensing boiler has a larger heat exchanger, so it recovers more heat, sends cooler gases up the flue and is more efficient. Boilers that are more than 20 years old can be as little as 60% efficient, while modern condensing boilers are between 89-94% efficient. If your historical house needs to replace an old boiler, swapping for a new efficient condensing boiler can be a simple but profitable action.

8. Thermal insulation of warm water tanks

While modern hot water storage tanks are usually already well insulated, older models often lose a lot of heat. If you have an older hot water tank, check to see if it is warm to the touch, thus indicating that it needs additional insulation. Insulating your water tank could reduce standby heat losses by 25-45% and save about 7-16% in water heating costs. A pre-cut jacket or blanket is available from around 25€ in most hardware stores, it is easy to install and should pay for itself in about a year. For an electric water heater, you also might consider insulating underneath the tank which could save you another 4-9% of water heating energy.

9. Tip: Water heater temperature

Reducing your water heater temperature setpoint is an easy and free efficiency measure than can lead to savings of 4-22% in hot water energy consumption. Although some manufacturers set thermostats at 60ºC, most households usually only require them to be set at 48ºC, which also slows mineral buildup and corrosion. Especially during summertime, you can experiment lowering your water heater temperature to 48ºC and check if your desired level of comfort is achieved. Even if 48ºC is considered safe for most of the population, those with a suppressed immune system or chronic respiratory disease may want to consider keeping the hot water tank at 60ºC. If you plan to be away from home for at least 3 days, you can completely turn off the water heater.

10. Point of attention: Water heater maintenance

Whichever kind of water heater is present in your historical house, it is important to ensure regular maintenance. Water heaters often work perfectly for a decade or more without any care, but a few minutes of maintenance once a year can extend its life span and maintain efficiency and safety. Test the pressure-relief valve by placing a bucket below the discharge pipe and lifting the lever on the valve. If the valve does not release water when you lift the lever, replace it. Drain the tank to flush out sediments that have settled to the bottom of the tank. Sediment buildup shortens the life of the water heater and reduces efficiency.

11. Single room air conditioning

If only one division of your historical house needs to be cooled, a single-split air conditioner (air-source heat pump) can be the optimal solution for targeted air conditioning. A single-split air conditioner has only one indoor unit connected with the outdoor compressor. Air conditioning units have high efficiency ratings and can provide excellent cooling when there is warm air outside. A well-maintained air-source heat pump can deliver three times the heat energy as the electric power that goes into it. Air conditioners have the additional advantage of being able to provide both space cooling and space heating. Beware that installation of outdoor units is usually not allowed on historical buildings façades and that you might have to find an out-of-sight location for it.

12. Multi-split air conditioning

If several divisions of your historical house need to be cooled a multi-split air conditioner (air-source heat pump) can be the optimal solution for targeted air conditioning with individual temperature control. Multi split air conditioner systems can easily have four interior units linked to one outside unit. Air conditioning units have high efficiency ratings and can provide excellent cooling when there is warm air outside. A well-maintained air-source heat pump can deliver three times the heat energy as the electric power that goes into it. Air conditioners have the additional advantage of being able to provide both space cooling and space heating. Beware that installation of outdoor units is usually not allowed on historical buildings façades and that you might have to find an out-of-sight location for it.

13. Portable air conditioning

Portable air conditioners work a lot like any other kind of air conditioner for space cooling. The main difference is that in conventional air conditioners the heat is released by the outdoor unit, while in portable units the warm air is guided outdoors through a hose. A portable device will typically come with a single hose and a window kit that allows you to set up the system quickly and easily. However, portable air conditioners are usually much less efficient than conventional units (energy consumption can be two times higher), may release waste heat indoors and compromise room insulation, and are also louder.

Nevertheless, this equipment can be a solution for historical homes without a suitable location for the outdoor unit in the building exterior.

14. Tip: Ceiling fans

An easy and low-cost solution for cooling is installing a ceiling fan. It will help circulate cool air while using only 1/10 of the electricity of an air conditioner. During winter, fan blades should turn in a clockwise motion to push warm air down; in summer, blades should rotate in a counterclockwise motion to pull hot air up. The cooling effect of a fan enables increasing the thermostat by 1°C, saving energy without any loss of comfort. The installation of a ceiling fan with a diameter below 92 centimeters can cost between 280 and 750 euros and may reduce cooling needs up to 40%, depending on existing situation. You can also install an attic fan to keep hot air from making its way downstairs.

15. Tip: Cooling temperature

In the summer indoor comfort temperature for Portugal is recommended at 25ºC, any extra cooling below that may not be necessary and will significantly increase your energy bill. Install a programmable thermostat so you can strategically schedule heating and cooling to follow your daily routines.

16. Point of attention: Air conditioning maintenance

Proper maintenance of your air conditioning units through simple actions can increase their efficiency and useful lifetime, while making it easier to reach thermal comfort. Make sure nothing is clogging pipes or drains. Inspect seals on room air-conditioners or between window units and window frames and replace any that show signs of damage. Clean your air conditioner's filter once a month; dust can reduce air flow by 1% per week. Make sure that heat generated by appliances does not trick a nearby thermostat making the air conditioner work more than necessary and that your air conditioner is not under direct sunlight (covering it with tarp or building a shelter can boost efficiency by 5% to 10%).

17. Point of attention: Circuit breakers

Over time, circuit breaker contacts can corrode, creating potential for serious electrical damage. Keep your power connections in prime condition by periodically turning the breaker switches off and back on and avoid costly repairs later.

18. Tip: Task lighting

Use task lighting to stay focused and save energy by switching from ceiling lights to table lamps, track and under-counter lighting in work areas and kitchens. The major advantage of an adjustable task light is gaining immediate control of your work or living environment and suiting the light to your needs.

19. Tip: Natural light

Do not overlook the power of natural light. A single south-facing window can illuminate 20 to 100 times its area. Also consider painting your walls with light colors, especially in rooms that receive little natural light. The energy savings from turning off light bulbs and using natural light can be very significative. Research has proven that natural lighting helps people be more productive, happier, healthier and calmer.

20. Tip: Efficient oven use

Simple actions can save energy while cooking with the oven. Ten minutes is all it takes to sufficiently preheat most ovens and, unless baking breads or cakes, you may not need to preheat at all. Turn off the oven before the full cooking time has elapsed – the retained heat will finish the cooking process. Ovens work most efficiently when the air inside circulates freely so avoid laying foil on oven racks or staggering multiple pans and allow at least 2.5 cm of space on all sides. If you are planning to self-clean the oven, get started while it is still warm from cooking.

21. Tip: Gas stovetop flames

When cooking with gas, stovetop flames should be blue. A yellow flame may indicate inefficient burning of fuel and the stovetop may require maintenance.

22. Tip: Efficient pans

In the oven, glass and ceramic pans heat more efficiently than metal. In the stovetop, copper and copper-bottomed pans heat quickly and help save energy on every use. When possible, use a pressure cooker to reduce cooking times and energy use by 50% or more. As soon as water boils turn down the heat to maintain the boiling point. Match the pot to the portion being cooked and choose the best-sized burner to avoid wasting energy and releasing heat into the kitchen.

23. Efficient refrigerator and freezer

The refrigerator is usually the top electricity consuming appliance in a Portuguese household, representing 30% of electricity use. If your historical house has an old fridge or freezer (more than 15 years old), it is probably using much more energy than necessary to keep food fresh. Modern fridges and freezers have a much higher efficiency, particularly those with a A+++ energy label. The investment cost to replace an old equipment will pay for itself with the resulting energy savings. If you are buying a new fridge or freezer, make sure to select an efficient equipment since the difference in initial costs will be rewarded by the lower electricity running costs. Modern refrigeration equipment also produces much less noise.

24. Efficient washing machines

If your historical house has an old dishwasher or an old laundry washing machine (more than 15 years old), it is probably using much more energy and water than necessary. Modern washing machines have a much higher efficiency, both in energy and water consumption, particularly those with a A+++ energy label. The investment cost to replace an old equipment will pay for itself with the resulting energy savings. If you are buying a new washing machine, make sure to select an efficient equipment since the difference in initial costs will be rewarded by lower electricity and water running costs. Additionally, modern washing machines have a broader range of programs available, including “eco” functions that spend even less water and energy, and produce much less noise than older models.

25. Stand-by consumption and phantom load

Standby consumption is electricity used by appliances and equipment while they are switched off or not performing their primary function. Phantom loads are caused by circuits that continue to be energized even when the device is “off”. That power is consumed by power supplies, circuits and sensors needed to receive a remote signal, soft keypads and displays including miscellaneous LED status lights. All small devices added together, standby power and phantom loads can represent 11% of a household annual electricity consumption. To eliminate your historical house’s standby consumption and phantom loads

make sure you unplug devices you do not use frequently, unplug before going on holidays, and completely switch off devices that have standby mode. You can also buy a multi socket switched power strip for clusters of devices to turn them all off with a simple routine action. Nowadays, you can also find automatic and programmable power strips.

26. Tip: Refrigerator and freezer

A few quick and low-cost actions can ensure that your fridge or freezer works efficiently, lasts longer and keeps food fresher. Dust or vacuum coils on the back and bottom regularly. Create a 5cm buffer of clear space on all sides, especially around coils and compressor. Place your refrigerator out of direct sunlight and away from hot appliances; a 5-degree increase in surrounding air can bump energy consumption by 20%. Make sure your refrigerator door closes and seals properly; if it does not, replace the rubber seals. Remove ice layers from the walls of the fridge or freezer. Regulate the thermostat temperature of your fridge to 3-5ºC and of your freezer to -18ºC; colder temperatures can boost consumption by 10% and may spoil some food. If you can, turn off the equipment before going on long holidays (keep the doors open). Avoid overloading one shelf since poor air circulation makes it harder to keep everything cool. Let hot food cool outside before putting it in the fridge and keep it covered in reusable containers once inside. Finally, open the door as little as possible so that less cold air escapes.

27. Tip: Dishwasher maintenance

Up to 90% of a dishwasher's energy consumption is for water heating; if you can opt for low-temperature programs it will save a lot of energy. Check dishwasher drains, hoses, and filters regularly, and clean out any obstructions. If waste accumulates in the machine, its efficiency will go down and it might not clean properly. Unless dishes are extremely dirty or food has dried on, you can put them directly in the washing machine and skip the pre-wash by hand, saving both water and energy. Additionally, always fill your dishwasher before starting a cleaning cycle. Finally, you can also cut drying time to the minimum and let the plates air-dry.

28. Tip: Clothes washing

Depending on water temperature, 40-90% of energy consumption in a washing machine can go to water heating. Thus, make sure that you use low temperature programs with shorter wash cycles as much as possible (today's laundry soaps wash just as effectively in cold water as in hot water). Lowering the temperature from 60ºC to 30ºC can reduce energy consumption by half to a quarter. Clean the filters regularly and use a softener to remove calcium from the machine and pipes. For dryers, clean the lint trap before or after every load to maintain an optimal airflow. Always wait until you have enough laundry to fill your washing machine or dryer and consider line-drying your clothes whenever possible. Finally, calculate well the amount of detergent needed, since an excessive amount makes the machine less efficient.

29. Point of attention: Water leaks

A small water leak may seem irrelevant but over time it adds up to a significant waste of potable water. If the water leaked is part of the warm water circuit, you are also wasting energy and increasing your energy bill. Check your historical house faucets, showers and toilets for any leaks or dripping and act quickly to fix them. A single faucet leaking at the rate of 10 drips per minute can waste more than 1300 liters per year.

Appendix 3 A – PAS2020 Customer Journey Map

PAS2020 Customer Journey Map (PAS2020 Customer Journey • DGG (mural.co))

A. Jobs-to-done

Jobs-to-be-done are here perceived as the main reasons of why a customer would need to visit the platform The Green Menu (independently of the country/region).

The Green Menu Platform provides information on 5 key main areas: orientation, advise, finance, implementation and inspiration.

A.1. Orientation

- Searching for sustainable improvements for buildings
- Get the confirmation that sustainable measures are "worth it"
- Get an insight into the process, which steps to take
- Searching for solutions for renovation and home improvements for a historic house
- Getting integrated Information on what is possible and what is viable for historic buildings
- searching for information on co-financing of sustainable measures for renovation for historic buildings
- Exploring what renovation options are possible/allowed for heritage buildings
- Awareness of possibilities for energy savings, electricity production and/or increase in comfort
- Awareness of need for retrofitting and of the household's problems

- Searching for sustainable measures possibilities
- Identifying priorities
- Get an insight into the process, which steps to take and how to start

A.2. Advise

- Scan and filter the best measures for the situation
- Get information on applicable regulations
- Searching for comprehensive and easy to navigate information on possible measures
- Get information about the costs of a retrofitting work
- Articulating problems in the house and motivations for sustainable measures
- Get information about the renovation process
- Searching for trusted sources of information (energy agencies, consumer protection agencies)
- Searching for retrofitting companies and renewables installers
- Searching for specific local regulation
- Filter the best measures for the situation - cost-benefit analysis
- Prepare the energy advise by collecting information (such as plans, pictures, energy bills, and other documentation)
- Answer the question: what to expect from an energy adviser
- Looking for an expert that can give tailored advice
- Find an energy advisor with knowledge about historical buildings
- Get information about suitable advisors with knowledge on historic buildings
- Find an independent source of information on renovation of historic buildings
- Get information on available support (agencies, funds)
- Get info on service suppliers (companies, installers)
- Find info/advice on how to start planning the renovation
- Prepare the energy advise by collecting information (such as plans, pictures, energy bills, and other documentation)

A.3. Finance

- Allocating funds to the retrofitting project
- Get financial advice from a financial expert
- Get an insight in the costs of the retrofitting project
- Apply for grants and/or financing
- Get information on the cost for various measures of a retrofitting project
- Searching for public/private funding possibilities and their conditions
- Negotiating bank loans or payments in parcels if necessary
- Evaluating prices for different options and companies, estimating total costs
- Get financial advice from a financial expert
- Get information on accessing grants, loans

A.4. Implementation

- Apply for a permit
- Find a contractor with expertise of historical buildings
- Prepare the building for the constructions
- Oversee retrofitting works

- Check the implemented measures
- Understand the process (steps) of renovation project implementation
- Get info on required permits or conditions for a renovation project
- What to look for when choosing a contractor
- Info on how to assess offers
- Find a contractor with expertise of historical buildings
- Prepare the building for the constructions
- Oversee retrofitting works
- Monitoring results after implementation
- Sign a contractor with expertise of historical buildings
- Manage requirements to apply to funding programs and to show complement to regulation
- Guarantee correct implementation of measures
- Control budget and timelines

A.5. Inspiration

- Inspire others with your story
- Share lessons learned (ups and downs)
- Raise awareness
- Raise awareness in family members, friends and neighbourhoods about energy retrofitting
- Recommend trusted companies
- Recommended successful retrofitting measures
- Recommend good financial mechanisms
- Warn about regulation limitations and solutions
- Warn about possible problems and setbacks

B. Touchpoints

Touchpoints refer to the ways and time that a customer enter in contact with The Green Menu before, during or after making use of the knowledge shared.

B1. Orientation

- Channels from municipality: social media, (e-)mail, websites, flyers, or folders
- Social media
- Google Search
- Meetings/ events about sustainability and historical buildings
- Websites focused on historical buildings
- Websites focused on sustainable measures for buildings
- Websites about funding for renovating and sustainable measures
- Energy service desks
- Monuments service desks
- Suppliers websites
- aggregate suppliers' websites
- Association for cultural heritage website, publications, meetings
- Dissemination events to different audiences

- Condominium enterprises NGOs
- Website of consumers protection association
- Websites on cultural heritage and other partners
- Websites of funding programmes
- Scientific, technical, and non-technical magazines and newspapers
- Websites of the municipality and city energy agency
- Websites of relevant civil parishes - local authorities
- Websites of relevant national, regional, and local associations

B.2. Advice

- Energy Service Desk
- Channels from municipality: social media, (e-)mail, websites, flyers or folders
- Maintenance organisation for monumental buildings
- Google Search
- Meetings/ events about sustainability and historical buildings
- Websites focused on historical buildings
- Google, social media, municipal websites, regional energy agencies
- Website of retrofitting companies and renewables installers
- national energy advisory service websites
- national heritage association
- condominium association and enterprises
- Dissemination events to different audiences
- Website of trusted sources of information (energy agencies, consumer protection agencies)
- Website of retrofitting companies and renewables installers
- Website of the municipality and city energy agency

B.3. Finance

- Energy Service Desk
- Channels from municipality: social media, (e-)mail, websites, flyers or folders
- Google Search
- TV/Radio Channels
- National Restoration Fund
- Banks
- national EE fund
- national heritage association
- Meetings/ events about sustainability and historical buildings
- Google, social media, municipal websites, regional energy agencies
- Financial advisors
- Website of retrofitting companies and renewables installers
- condominium association and enterprises
- Portal for housing (Portal da habitação)
- Website of funding programmes
- Website of trusted sources of information (energy agencies, consumer protection agencies)
- Website of banks that offer loans for energy retrofitting

- Social media
- Website of retrofitting companies
- Financial advisors
- Google search
- Condominium enterprises

B.4. Implementation

- Energy Service Desk
- Channels from municipality: social media, (e-)mail, websites, flyers or folders
- Google Search
- national energy advisory service websites
- national EE fund
- national heritage association
- aggregate Website of retrofitting companies and renewables installers

B.5. Inspiration

- Energy service desk
- Channels from municipality: social media, (e-)mail, websites, flyers or folders
- Social media
- Google Search
- Video platforms such as Youtube
- Sustainable open house route
- Meetings/ events about sustainability and historical buildings
- national heritage association
- Technical and non-technical magazines and newspapers
- Websites of other partners
- Condominium enterprises
- Websites of relevant national, regional and local associations
- Website of civil parishes - local government
- Website of the municipality

C. Pains

This section list the pains/problems that a customer has when searching for information about sustainable retrofitting works.

C1. Orientation

- A lot of information about sustainability but not for historical buildings
- Not knowing which information is trustworthy - Lack of expertise
- The information is spread out over different organisations and websites
- A lot of information about historical buildings (maintenance, renovating) but not integrated with sustainability
- No time (or no priority)
- Lack of integrated info for historic building retrofit
- A lot of information about historical buildings (maintenance, renovating) but not integrated with sustainability

- Lots of info on measures lack of info on how to plan, deliver and assess retrofit
- Lack of tools to assess savings for various measures
- Process of searching, getting informed and implementing is too effortful
- Cultural aspects
- Inertia, choosing priorities, not knowing what to do
- Lack of energy literacy - doubts in benefits of measures
- Energy poverty
- No available information specifically for historic/old buildings
- Lack of awareness

C2. Advice

- Not knowing which energy advisor is trustworthy
- Lack of expertise: Difficulty in finding and understanding some information
- Feeling overwhelmed with all the information
- Not knowing where to go for next steps such as applying for a permit
- Not knowing if the energy advisor has the right knowledge about historical buildings
- Complex information
- Uncertainty about plans from governments that can affect your plans
- Lack of expertise: Difficulty in finding and understanding some information
- Not sure how to start planning the renovation project
- Lack of trust in supplier/installer information
- Assuming high cost for retrofit
- Not knowing what to prioritise
- Not knowing where to get comprehensive advice on unsustainable historic buildings
- Not sure on requirements/permitting for historic buildings
- Not knowing which technology to choose
- Feeling overwhelmed with all the information
- Not knowing where to go for next steps such as applying for a permit
- Not knowing what to prioritise
- Difficulty in finding and understanding some information
- Not knowing who to contact for advice
- Not knowing whose advice to trust
- Complex regulation that is not citizen friendly
- Lack of trust in energy companies

C3. Finance

- Lack of financial means
- Not knowing about funding opportunities
- Sustainable measures don't fit the retrofitting requirements
- Cost of measures for historical buildings are high
- Afraid to miss out on funding opportunities such as grants
- A lot of different organisations offer funding
- Uncertain about financial gains from sustainable measures
- Uncertain about effects on value of the building

- Lack of money to invest in energy retrofitting and other financial priorities
- COVID-19 causes uncertainty about income
- Lack of financial means
- Lack of benefits for energy efficient houses
- Energy retrofit in old buildings might not increase house value in the current market
- High market price of buildings in historical areas, which favours the sale of the building
- Perception of insufficient return of investment and of high costs
- Not knowing about funding opportunities
- Funding opportunities are too complex and with excessive bureaucracy
- Unavailability of adequate bank loans for energy retrofitting
- Unwillingness to incur in (another) bank loan

C4. Implementation

- Need to consult with neighbours and get their approval
- Condominiums require approval from 2/3 of households and condominium enterprises are not aware of benefits
- Need to change electricity connection to grid
- Implementing some measures incorrectly may lead to other problems
- Results might not be as good as expected
- House may become unhabitable during renovation works
- Construction noise and waste
- Works can go over budget and over time
- Companies may do a poor job and contractors are busy and unavailable
- Funding opportunities may not work out
- The permit application process takes a long time
- Need to change piping and/or cabling
- Historical buildings are under strict regulations when it comes to altercations to the building
- Lack of expertise about sustainable measures in historic buildings and quality implementation of those
- Permits require technical drawings and other documents which need to be drawn by an expert
- Lack of knowledge on planning, implementation and assessment process (added cost if hiring a project manager)
- Condominiums require approval from 2/3 of households and condominium enterprises are not aware of benefits
- Historical buildings are under strict regulations when it comes to altercations to the building
- Works can go over budget and time
- Contractors are busy so it takes a long time for they can start

C5. Inspiration

- No interest in being displayed with your picture and name
- Not finished with the retrofitting works
- Being an active ambassador is time consuming
- No interest and or time in sharing experience

- worried about privacy of info
- Not interested in sharing information on suppliers. etc.
- Lack of time to share retrofitting experience with others
- Individualism and disconnected communities
- Distance from city and local authorities, as well as from energy agencies
- Distance from the media
- Other might not be interested unless they are already planning to retrofit their own house

D. Gains

In this section the preferences and opportunities customers may have or wish to have when consulting a knowledge sharing platform such as The Green Menu.

D1. Orientation

- Getting motivated by positive reviews from others
- Easy way to get the information needed: online and free
- Getting motivated by insights into possible gains such as energy saving
- Getting better equipped to plan, cost, implement and assess the retrofit project
- easier to prioritise and plan
- gaining integrated information on renovation options
- Building courage and motivation by starting with Quick Wins implementation
- Gaining awareness on the topic of energy retrofitting
- Gaining knowledge on energy saving, electricity production and comfort increase opportunities
- Implement some Quick Wins
- Plan next steps and prioritise

D2. Advice

- Get relevant information tailored to your situation
- Finding all information needed on one platform
- Get redirected to the next steps
- Get a report with all information so you can read it later of send it to other parties
- Getting better equipped to plan, cost, implement and assess the retrofit project
- Get relevant information for your situation
- Finding all information needed on one platform (Tech, fin, reg)
- Finding information that specifically applied to historic buildings
- Get info on next steps
- Get a report with all information so you can read it later of send it to other parties
- Gaining a deeper insight on home energy consumption and possibilities for savings
- Finding trustworthy advice
- Finding trustworthy companies
- Deeper knowledge of the municipality work and regulation
- Get redirected to the next steps

D3. Finance

- Taking advantage of grants and other financing opportunities
- Positive return on investment
- Lower monthly expenses because of energy saving
- getting an insight into cost vs benefits
- working out your approx. investment range and your return
- becoming aware and taking advantage of financing opportunities
- Lower monthly expenses because of energy saving
- Boosting the local and national economy
- Raise the market value of the house
- Investing money in a beneficial way with a positive return on investment
- Taking advantage of funding opportunities

D4. Implementation

- Positive results such as improved comfort level
- Improved comfort
- healthier living environment
- reducing negative environmental impact
- Boosting the local and national economy
- Reduced moisture problems
- Improving indoor air quality
- Reduced CO_2 emissions
- Noise reduction
- Increased market value of the house
- Saving money in the long-term
- Production of own electricity through renewable sources
- Increased thermal comfort and reduction of energy poverty
- Better health and life quality
- Energy and water savings
- Increased durability and reduced maintenance
- Reduced dependence on the energy grid

D5. Inspiration

- Others are inspired and activated by the success stories
- Contribute to a more sustainable environment
- Create social cohesion through sustainable cooperative works
- inspire followers - cascading effect
- peer to peer network for quality assurance
- Media attention, possibly financial gains
- Promoting companies that do a good job
- Share information on increased comfort with others
- Activate other stakeholders
- Media attention to energy retrofitting
- Share retrofitting experience so others can also renovate their house

- Create social cohesion in the community
- Opportunity to retrofit more buildings in the same area, raising its sustainability, quality of life and value
- Recognizing companies that do a good job
- Increased market value of the house

E. Possible Solutions

E1. Orientation

- The Green Menu combines all the information
- The cooperation between the Green Menu and municipalities gives trust
- The Green Menu is easily accessible (online and free)
- The Green Menu is user friendly with navigation through the 3D animated house
- The Green Menu gives an insight in the steps that are needed
- Tool that combines integrated info for a comprehensive retrofit
- Tool that provide comprehensive info about the whole process of renovation
- tool that combines info on tech, fin and reg aspects
- tool that helps to assess cost of measures
- visual, clear, easy to read and understandable information in one spot
- Trustworthy source of information
- 3D models for clearer visualisation and to ease the understanding of measures
- User friendliness, attractive layout
- tool that enables a tailor-made measures report creation
- The Green Menu provides information online, obliging by Covid-19 social distance rules and lockdowns
- The Green Menu has information on measures ranging all end uses, with various options, tips, points of attention and innovations
- The Green Menu is a trustworthy source of information with recognized national and European partners
- The Green Menu has an attractive layout
- International tool - aggregation of expertise
- The Green Menu has measures ranging from Quick Wins to more complex interventions

E2. Advice

- The Green Menu provides information about what to expect from an good energy advise
- The Green Menu provides information about measures that is tailored to the location and building type of the user.
- The calculation tools on The Green Menu provide information about costs and wins.
- The Green Menu refers to relevant websites for the right steps
- The Green Menu explains sustainable measures in language that is understandable
- The Green Menu has a "save" function to save measures and download them in an report
- The Selfscan filters information through questions
- The Selfscan combines information from The Green Menu and National Restoration Fund.

- The outcome of the selfscan is summarized in a report.
- The Green Menu and Selfscan link to websites with good energy advisors
- The Green Menu and Selfscan show regulations and refer to the desk that is responsible for permits.
- De Groene Grachten offers energy advise
- well structured & easy to understand information on measures per building type (with 3-d visuals and photos)
- well-structured and easy to understand information on renovation process how to, including relevant links
- well-structured and easy to understand information on financing and regulation with relevant links
- The calculation tools on The Green Menu provide information about costs and wins.
- The Green Menu has a "save" function to save measures and download them in a report
- The Green Menu provides trustworthy advice (expertise from across EU)
- The Green Menu opens the possibility for more detailed and tailored advice
- The Green Menu has information on relevant regulation connected with specific measures

E3. Finance

- The Green Menu combines funding opportunities from different organisations
- The Green Menu combines funding for historical buildings with funding for sustainable measures
- The Green Menu refers to the right information on websites of funding organisations
- Calculation tools give insight into the possible financial gains
- Calculation tools give insight into the possible costs of the retrofitting works
- The Green Menu has easily accessible information on available funding opportunities
- Information on funding opportunities is connected with the specific measures
- The Green Menu provides links for the funding programs websites
- Calculation tools give insight into the possible costs of the retrofitting works
- The Green Menu provides estimates on investment and savings
- The Green Menu has easily accessible information on available funding opportunities
- The Green Menu combines funding opportunities from different organisations
- Information on funding opportunities is connected with the specific measures
- The Green Menu provides links for the funding programs websites
- The Green Menu provides estimates on investment and savings

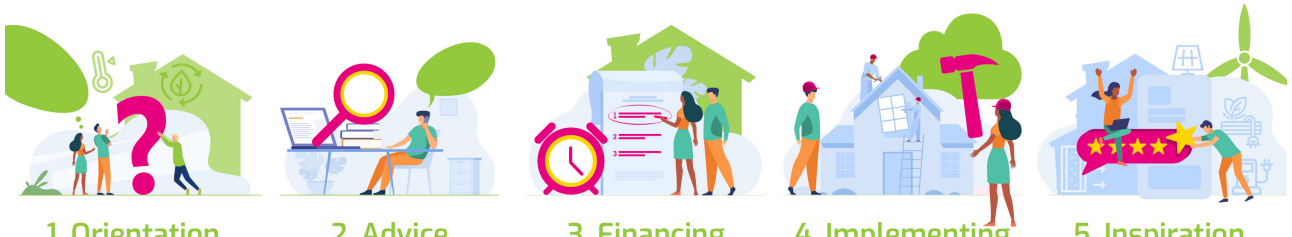
E4. Implementation

- Some municipalities offer free permits for sustainable measures
- The Green Menu refers to local and national energy service desks, they have a list of trustworthy contractors.
- De Groene Grachten offers guidance in the implementation process
- The Green Menu offers information and tips for the permit application process
- The Green Menu provides insights in the possible regulations with information about measures

- The Green Menu provides information about what a good bid from a contractor should look like
- The Green Menu provides information about how to prepare your building for a renovation
- The Green menu helps homeowners with the questions they should ask and what to look for during the renovation works
- Municipalities invite home owners to involve them in early stages of the design process for a smooth permit application process
- the tool provides info on the implementation process
- Info on what to look for from a contractor
- Tool provides information about what a good bid from a contractor should look like
- what to pay attention to when attempting implementation of a historic building renovation
- The Green menu helps homeowners with the questions they should ask and what to look for during the renovation works
- The Green Menu refers to local and national energy service desks
- Tool helps homeowner with advice on how to assess the implemented works
- The Green Menu provides information about what a good bid from a contractor should look like
- The Green Menu provides information about how to prepare your building for a renovation
- what to pay attention to when attempting implementation of a historic building renovation
- The Green Menu has photos of each measure showing their visual aspect
- The Green Menu provides estimates on investment, savings, and comfort increase
- The Green menu provides information to assist the correct implementation of measures
- The Green Menu offers information and tips for the permit application process
- The Green menu helps homeowners with the questions they should ask and what to look for during the renovation works

E5. Inspiration

- The Green Menu offers a platform to owners that want to share success stories
- Partners within the Green Menu network share the stories of the Green menu on their communication channels
- share stories via green menu, other websites, and other media channels
- embedding green menu site within other key websites that offer sustainable advice for building renovation
- make green menu visible so that it becomes a "talking item" (point of reference)
- The Green Menu shares success stories
- Through social media, magazines and newspapers, the Green Menu partners can share retrofitting projects, new developments, and impacts
- embedding green menu site within other key websites that offer sustainable advice for building renovation



1. Orientation 2. Advice 3. Financing 4. Implementing 5. Inspiration

De Groene Grachten

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eit Climate-KIC

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