MEDNICE
MED programme Network for an Innovative Cooperation in Energy Efficiency

D. 4.4.1 Policy paper on information: communication, education and capacity building for energy efficiency in public buildings

Project co-financed by the European
Regional Development Fund

Authors:

Andrea Bigano, Giulia Galluccio, Eugenio Sini (CMCC)

Task: 4.4.

Deliverable 4.4.1

Document control

Document version	Date	Modifications
V1	02/10/2019	
V2		

Quality Assurance

Reviewers		Validation date
Responsible partner	IREC	

Consortium

Partner No	Institution
LP1	City of Nice
PP1	Energy Cities
PP2	Euro-Mediterranean University – EMUNI
PP3	Catalonia Institute for Energy Research - IREC
PP4	Euro-Mediterranean Center on Climate Change Foundation - CMCC
PP5	Region of North Aegean – RNA

Disclaimer

This report considers the Modular Project deliverables available up to July 2019.

TABLE OF CONTENTS

1 Introduction

Buildings are one of the main users of energy in the EU: they make up to 40% of overall current energy consumption of the EU and are responsible for 36% of CO_2 emissions in the EU[1] .Overall, public buildings in the EU have a non-negligible role as energy consumers[2], and **play a very significant role in terms of policy relevance**: the revised EED Directive, for instance, gives to public buildings the task of setting the example, by setting strict energy efficiency improvement targets[3].

The policy relevance of energy efficiency in public buildings, and the related exemplary role that public administration can play in fostering energy efficiency are the motivations behind the choice of EU Interreg Med program to include energy efficiency in public buildings among its key thematic areas. Interreg Med is a major transnational cooperation activity of the EU, started in 2014, gathering together 13 Member States for seven years, with the common aim of fostering sustainable growth in the Mediterranean region. Energy efficiency is a primary ingredient of any sustainable policy, given the priority role of climate change mitigation and the effectiveness of energy efficiency in promoting it.

The ten modular projects in the EB thematic area have generated in the past years an impressive amount of output, by collecting tools, best practices and case studies relevant for energy efficiency in public buildings in the MED area.

The present policy paper looks at the lessons learnt by modular projects about the role of information-based actions. This encompasses a wide range of measures ranging from disseminating specific recommendations to EU citizens to setting up training programs for local administrators, to engaging with the local student population, their teachers and their families, in an interactive program of educational experiences related to energy efficiency.

While for the policy paper on financing energy efficiency we were able to single out four projects in the EB thematic area focusing on that specific topic, the situation is more nuanced in the case of the present paper, as there are projects

[1] Source: Eurostat https://ec.europa.eu/eurostat/web/environmental-data-centre-on-natural-resources/resource-efficiency-indicators/resource-efficiency-scoreboard/thematic-indicators/key-areas/improving-buildings

[2] As discussed in the previous Policy Paper, the share of public buildings in EU Member States energy consumption is not easily quantifiable, but surely is not one of the largest one, which belongs to private residential consumers, followed by private commercial users.

[3] The next section provides the big picture of the policy and regulatory framework for energy efficiency in public buildings in the EU

with a clear focus on education, and others which carried out training or communication activities within a broader set of activities. Ultimately, all modular projects carried out communication and dissemination activities, which may have led to significant policy lessons. We recall that one of the main conclusions of the first policy paper was indeed to stress the key role of clear and transparent information on financial matters, coupled with adequate training of local administrators in order to allow them to take full advantage of the available options and tools for financing EE interventions.

The present report opens by summarising the relevant policy backdrop in Section 2. Section 3 will then illustrate in the main information-related issues discussed in the energy efficiency policy literature. In Section 4 the contributions of the modular projects are reviewed in the light of the content of the two previous sections. Conclusions and policy recommendations close this report.

2 Communication, education and capacity building in the current EU policy framework for energy efficiency.

Highlights:

- Current EU targets for EE are set at 32.5% improvement compared to 1990 consumption levels. Long term strategy "a Clean Planet for All" envisages energy efficiency as one of the key levers for decarbonization of EU economy although it warns that full decarbonisation will require the use of all possible levers and substantial efforts to generate negative emissions.
- The Clean Planet for All strategy calls for a very prominent role of energy efficiency in buildings, in the light of the need of implement substantial energy efficiency upgrades and fuel switching in the long-lived European housing stock
- Information-related regulations currently in place in the EU entail the obligation to provide energy performance certificates each time a dwelling unit is sold or rented, the inclusion of energy performance information in energy bills, the consumers' access to data collected by smart meters.
- The EU legislation has specific provisions for public buildings: for instance energy performance certificates should be displayed in a prominent position if they include a floor area larger than 250m^2 frequently used by the public.

2.1 The EU vision for Energy efficiency policy

The 2020 climate and energy package has been the main framework for EU climate policy over the last ten years. The package is instrumental to the attainment of EU's 2020 targets, i.e. reaching a 20 % improvement in energy efficiency, a 20 % cut in greenhouse gas (GHG) emissions from 1990 levels, and a 20 % share of renewable energy sources. EU appears to be well on track to fulfilling these goals, according to the EEA[4].

In the medium-term, the 2030 climate and energy framework aims to further cut GHG emissions by 40 %, The targets on RES and energy efficiency have been recently revised based on a political agreement between the European Parliament, Commission and Council, and increased to 32 % for RES and 32.5% for energy efficiency.

[4] https://www.eea.europa.eu/themes/climate/trends-and-projections-in-europe/trends-and-projections-in-europe-2017/overall-progress-towards-the-european

In the long term, the EU vision is detailed GHG reduction strategy 'A Clean Planet for All' issued at the end of 2018. The strategy, without fixing explicit targets, draws on eight possible pathways for EU GHG emissions that should ensure compatibility with the 'well beyond 2 °C' temperature stabilization target of the Paris Agreement and lead to a virtually decarbonised future by 2050 in the EU.

According to the strategy, substantial decarbonization can result from following alternate pathways, whose focus ranges from energy efficiency to renewables, to smart infrastructures, to electric transportation, to carbon-neutral technologies, to increased circularity of the productive sectors.

None, of them however, if followed exclusively, would guarantee reaching the 'well beyond 2 °C' Paris stabilization target, moreover, bringing the EU economy within reach of the 1.5 °C target, would require pursuing all the above options simultaneously, and an extra effort to achieve negative emissions.

Energy efficiency in buildings plays a very prominent role in this strategy. In the wording of the strategy Communication (EC, 2018), since *"most of the housing stock of 2050 exists already today, this will require higher renovation rates, fuel switching with a large majority of homes that will be using renewable heating (electricity, district heating, renewable gas or solar thermal), diffusion of the most efficient products and appliances, smart building/appliances management systems, and improved materials for insulation*. Again, this effort will require an "*integrated approach and consistency across all relevant policies will be necessary for the modernisation of the built environment and mobilisation of all actors. Consumer engagement, including through consumer associations, will be a key element in this process*".

Information, in particular through the recent progress in terms of digitalisation and computerisation of knowledge, is seen as an important facilitating factor in this process. The increasing familiarity of the general public with IT tools is also welcome as factor that will facilitate the transition towards a zero-emission future. The strategy recalls the need to provide "more transparent information to consumers about carbon and environmental footprints of products and services so that they can make informed choices." Finally the strategy highlights the importance for this transition of a dynamic and up-to-date education and capacity building system, by pointing out the need to "invest in human capital in the next decade and beyond, equip current and future generations with the best education and training in the necessary skills (including on green and digital technologies) with training systems that quickly react to changing job requirements."

Energy efficiency is also a pillar[5] of the Energy Union Strategy launched in 2015. This Strategy sees energy efficiency as a resource in its own right and places it at the core of the EU energy policy. A pervasive policy role was then given to energy efficiency through the so-called Energy Efficiency First Principle (EEEP), which is explicitly mentioned one of the three main goals of the EU energy strategy within The Clean Energy for All Europeans Package (2016)[6], (or "Winter Package"), and requires that energy efficiency is streamlined in every energy policy action by the EU.

The empowerment of consumers is a keystone of this strategy, and relies substantially on the role of correct, transparent and relevant information: "consumers will be better informed and have clearer, more transparent energy bills and more understandable contracts. They will have the right to request a smart meter, thus being informed about their energy consumption and costs in real-time, with full control over their data". In the view of the Commission, they will eventually be able to rely upon the internet of things (thus a very rich and detailed stream of digitalized data) to fine-tune their energy use to their real needs and they will continue to get immediate and clear information on energy efficiency of buildings and appliances from the EU energy labelling system. The empowerment of EU citizens, and hence the enabling role of information to this purpose, is also among the key policy areas within the Clean Planet for All Strategy (EC, 2018).

2.2 Current EU information policies for energy efficiency in public buildings

The current EU regulatory framework energy efficiency in public buildings is covered by two Directives, both revised in 2018 following the approaches put forward in the Clean Energy for All package: The Energy Efficiency Directive (EED), first adopted in 2012, and the Energy Performance of Buildings Directive (EPBD), first adopted in 2010.

The main provisions in EU policies concerning energy efficiency in public buildings have been discussed in the previous Policy Paper, to which the interested reader is referred to. Here we limit our attention to the regulatory aspects for which information is directly significant.

[5] The other pillars of the strategy are increasing energy security, a fully integrated internal energy market, decarbonization of the economy, and supporting research, innovation and competitiveness.
[6] https://publications.europa.eu/en/publication-detail/-/publication/b4e46873-7528-11e9-9f05-01aa75ed71a1/language-en?WT.mc_id=Searchresult&WT.ria_c=null&WT.ria_f=3608&WT.ria_ev=search

A well-known prescription in this regard, is the one included in the 2010 text of the Energy Performance of Buildings Directive, according to which, that when a building (or a fraction of it) is sold or rented, energy performance certificates must be provided, and included in advertisements for the sale or rental of buildings. Also in the requirement of the same Directive, that EU countries to put in places inspection schemes for heating and air conditioning systems, or equivalent measures, and to draw up lists of national financial measures to improve the energy efficiency of buildings, information plays an important role.

Among the new measures included in the amended text adopted on 31 May 2018, information matters for the promotion smart technologies in coupled with a rating scheme for smart-readiness in buildings and for the obligation for Member States to report their national energy performance requirements and ensure their cross-national comparability, and for the suggestion to deploy transparent advisory tools, (in particular one-stop-shops for consumers and energy advisory services).

Thus, information is a key ingredient of the new EED. It is mentioned with reference to billing and metering, (Artt. 9-11) where it is prescribed that clear and timely billing information must be provided to consumers, at no extra cost, and that smart meters, and the information they provide, must be made available to consumers. The EED specifies the minimum information to be mentioned in the bills. This includes, interestingly:
"current actual prices and actual consumption of energy or total heat cost and heat cost allocator readings; (b) information about the fuel mix used and the related annual greenhouse gas emissions, including for final users supplied by district heating or district cooling, and a description of the different taxes, levies and tariffs applied. Member States may limit the scope of the requirement to provide information about greenhouse gas emissions to include only supplies from district heating systems with a total rated thermal input exceeding 20 MW; (c) comparisons of the final users current energy consumption with consumption for the same period in the previous year, in graphic form, climate corrected for heating and cooling; (d) contact information for final customers' organisations, energy agencies or similar bodies, including website addresses, from which information on available energy efficiency improvement measures, comparative end-user profiles and objective technical specifications for energy-using equipment may be obtained information about related complaints procedures, ombudsman services or alternative dispute resolution mechanisms, as applicable in the Member States; (f) comparisons with an average normalised or benchmarked final user in the same user category. In the case of electronic bills,

such comparisons may instead be made available online and signposted to within the bills."

Savings resulting from information campaigns are mentioned as valid alternate policy measures to attain the obligation schemes foreseen by the EED: "surveyed savings, where consumers' response to advice, information campaigns, labelling or certification schemes or smart metering is determined. This approach may be used only for savings resulting from changes in consumer behaviour. It shall not be used for savings resulting from the installation of physical measures".

The main contribution of EU information -related policies to energy efficiency in buildings stems from the Directives which deals with certifying and labelling the energy performance of buildings and of the appliances used indoor. The EPBD, also revised in 2018, prescribes that performance certificates must be provided each time buildings (or dwelling units within a building) are sold or rented, and shown in any advertisement related to such transactions. Moreover, an Energy Performance Certificate, "displayed in a prominent place clearly visible to the public" is prescribed for buildings with a total floor area over 250m^2 occupied by a public authority and frequently visited by the public, under Art.12(1)b and Article 13 of the revised EPBD.

Labelling of energy-consuming goods is ruled by Regulation (EU) 2017/1369 of the European Parliament and of the Council of 4 July 2017 which repeals Directive 2010/30/EU.
The regulation prescribes that clear energy consumption information is provided when energy consuming appliances are sold. In a building perspective, this is relevant for lamps and for heating and cooling appliances.

3 Known issues in the literature

Highlights

- Energy efficiency improvements are undertaken less frequently and to a lower extent than what could be expected on the basis of economic rationality. This "energy efficiency gap" can be explained on the basis of behavioural and informational issues.
- Asymmetric information, free-riding and misalignment of incentives can result in suboptimal situations. Other behavioural and cognitive biases can lead to a wrong perception of the costs and benefits of these investments and hence to a low uptake of energy efficiency upgrades.

- Although these explanations for the energy efficiency gap have been developed in the context of residential energy use, they are also relevant for commercial and public buildings.
- Policy measures designed to tackle these information issues can contribute to the reduction of the energy efficiency gap.

Energy efficiency provides an important and well-known opportunity to save money to energy users, and yet the empirical evidence of the last decades consistently pointed out to low uptake rates in energy efficiency renovations, particularly in buildings. Explaining this phenomenon, dubbed the "energy efficiency gap" (Jaffe and Stavins, 1994), and finding remedies to it, have been the motivation of a large amount of empirical research, mainly focusing on residential consumers. Several studies, (reviewed in Ramos et al. 2015) also report that traditional remedies, such as taxes subsidies and regulatory standards, have a limited effectiveness in reducing this gap. This has led to a number of studies on the roles of human behaviour and of information in explaining the energy efficiency gap, and as bases for non-conventional policy tools which may be more effective than traditional ones in tackling the issue, or, at least, which can complement them within a balanced policy mix.

A couple of well-established economic concepts related to information issues can help explaining a good deal of the energy efficiency gap. For one thing, this is typically an area where very different actors can access the relevant information in very different degrees. As a rule, people using any given building do not know precisely how energy-efficient it is. Finding this out requires professional skills that only people with the right professional background can have. This is a typical **asymmetric information** issue and it can lead people to base their decisions about energy efficiency renovations on partial and incomplete information: underinvestment can then result on a pure rational basis if benefits are underestimated because of asymmetric information. Some of the regulations currently in place in the EU, in particular those about energy labelling, are aiming at correcting this issue.

Another information-related issue, liable to contribute to the energy efficiency gap, has to do with the observability of the actions of the agents involved, and with by how much their incentives diverge. In the case of buildings, issues of this kind can arise for instance between landlords and tenants and between employees and energy managers. In the first case, if the rental price tenants pay is fixed, they will not perceive the (avoidable) cost of overheating their place in winter and overcooling it in summer. A similar situation can arise in an office building, unless specific incentives are provided to employees in order to keep

indoor temperatures within a reasonable range (or unless the temperature is set centrally by the energy manager). In the case of public buildings, public administrations can play both the role of the tenant and the one of the landlords, depending on the contractual arrangement of the buildings. It is not uncommon that public institutions rent their premises from large real estate companies, bringing the divergent incentives issue to a much larger scale than with residential consumers. On the other hand, central and local governmental agencies are often the landlords of a large population of social housing dwellers, for which energy efficiency issues are linked to energy poverty considerations, which in turn can further compound the divergence of incentives.

In economic terms these situations are **principal-agent** problems and are caused by one group of actors **free-riding** on the economic activities of another group. Moreover, between landlords and tenants, the divergence in incentives has a direct bearing on the choice of investing in energy efficiency upgrades (the so-called "**split incentives**" problem): tenants may lack the incentive to invest in energy efficiency upgrades because they may foresee to occupy their current dwelling for less than the pay-back time of the investment; if the tenants pay energy bills directly, the landlord may have an incentive to postpone upgrading the energy efficiency of the dwellings until there are urgent needs of reparations, because they do not enjoy the monetary benefits that saving energy would bring about. Both in the case of free-riding and in the case of split incentives the issue stems from a misalignment of incentives between those who benefit from energy services and those who are responsible for it. The main difference between this class of issues and those generate by asymmetric information is that in this case, tackling the issue by acting on behaviours through the provision of the correct incentives, is more effective than increasing the information available. For instance, even if indoor temperatures are monitored by means of remote sensing devices, there is little that landlords and energy manager can do unless appropriate incentive schemes (rewards or sanctions correcting users' incentives) are enforced. Enriching the information set remains relevant, though: monitoring would provide the necessary evidence to justify the enforcement of the incentive scheme.

Other information-related issues have to do with the interaction between general human behaviour and information, that is the relevance of information beyond the standard economic rationality. Among those mentioned in Ramos et al. (2015), information-related behavioural issues are for instance the dependence of decisions from the way the issue is presented (framing); the fact that we are not always able to base our decisions on all available information due to time or

constraints or excessive effort requirement (limited attention); the increasing difficulty in making a choice in presence of a higher number of options (the paradox of choice), the tendency to undervalue new solutions in comparison to what we already have and are familiar with (endowment or "status-quo" effect).

Other information-related behavioural issues stem from the difficulties of probabilistic reasoning and have to do with the fact people regard as more likely successions of events which are internally logical, although their probabilities are actually lower than those of less "logic" ones (representativeness/conjunction fallacy); the tendency of giving higher probabilities to options whose examples can be easily thought of (availability fallacy); and finally the bias induced by the initial value provided of a quantitative information (anchoring).

These information-related failures have been shown in the literature to be important factors among those liable to generate the energy efficiency gap (Ramos et al. 2015). The status-quo effect for instance can result in a sceptic attitude towards adopting innovative energy efficiency solutions; limited attention, anchoring and framing, as well as the fallacies related to probabilistic reasoning, can result in a poor understanding of the energy situation of a building and hence of the opportunity to undertake renovations; the paradox of choice may result in a sub-optimal selection of the energy efficiency upgrades to be implemented. Therefore, information-based policy measures have a good chance to provide a significant contribution to the reduction of the energy efficiency gap.

Information-based instruments to support energy efficiency improvements in buildings can be sorted into three main groups (Ramos et al. 2015): "i) Certificates or labels that show the energy efficiency of a product; ii) Feedback to customers, which can be channelled through smart meters that show real-time energy consumption and bills with comparative information about similar or representative households; and iii) Energy audits that inform about specific measures households may adopt to reduce consumption."

The literature on the effectiveness of these measures does find evidence of successful implementation, but it is not always univocal as to the magnitude of such effectiveness. It varies with the class of measures, the geography, and the kind of energy efficiency improvement targeted. As far as energy efficiency labelling for residential and commercial buildings in the EU and in the USA are concerned, the results in the literature are quite encouraging, and show that in general people value such improvements and are prepared to pay a significant premium on the purchase or rental price (from 2% up to 30%).

Feedback-based measures are also found to be effective, but effectiveness increases with the frequency with which information is provided. This is reflected also in the higher savings resulting from providing a clear input of quasi-real-time consumption through smart meters, compared to the savings (noticeable but smaller generally resulting from providing feedback periodically through supplementary information in the energy bills.

As to energy audits, there is mixed evidence in the literature about their effectiveness. According to Ramos and co-authors, this is mainly due to "the self-selection bias due to the voluntary nature of audits" and to "the heterogeneity of the samples".

The above results refer to buildings in general, but are usually derived from observing residential, and less frequently, commercial buildings' users. Studies of the relevance of information for public buildings are scarce if non-existent. However, some regularities can be found in the literature by broadening the scope to bundling together commercial and institutional buildings. A comprehensive review can be found in Ruparathna et al. (2016). Some of the results reported are not surprising, in view of the findings of the studies on residential consumers: for instance, the importance of building codes, energy labelling and smart meters is confirmed also in the case of commercial and institutional buildings. There are however information-related measures which are specific of buildings of this kind. Building codes, for instance, should include daylight sensors and occupancy sensors to allow real-time monitoring and allow adjusting energy consumption to the profile of the users and to energy pricing patterns. Energy benchmarking (that is, defining the typical energy features of buildings similar to the one under scrutiny) is useful because it "improves the energy efficiency and transparency of energy consumption, promotes competition among institutions, established (sic) baseline for energy labelling programs and helps to investigate reasons for poor energy performance". The heterogeneity of users within a commercial or institutional building, particularly if opened to the general public, complicates considerably the task of managing its energy use efficiently. A key lever in this regard is the involvement of all stakeholders. In particular "cooperative efforts are required to establish energy efficiency culture, identify opportunities for low-carbon operations and to execute proposed solutions by the management". Training building users is also important, as it helps them familiarize with the energy characteristics of a building and with the options open to individuals in order to contribute to its efficient use. Awareness-raising actions targeting employees would reinforce energy efficiency actions through organizational dynamics, and effective

communication between the energy managers and the users of the building helps eliminating misunderstanding that may hamper optimal energy use. In an organizational perspective, in order to have all building users onboard, it would be important to strike a balance between automated central control and monitoring of energy use, and leaving some freedom to users to adjust indoor conditions to their needs: "building occupants are more forgiving of thermal discomforts if they are provided with control to alter it". On the other hand, the "ability of zone control and occupancy measurements enables significant energy savings while creating minimal impact on the thermal comfort".

4 Policy lessons from modular projects

Highlights:

- The EB community projects have singled out information-related measures that are particularly relevant for MED public buildings, and likely to lead to significant improvement in their energy performances.
- Capacity building for local public administration staff is recognised as crucial by most projects. Training activities need to be tailored on the specific characteristics of their target group and of the aspects of energy efficiency for which skill development is required (e.g. legal and regulatory, financial, technical etc.)
- Knowledge is also effectively fostered by exchanges of ideas and experiences among peers (e.g. within the same public administration or among public officers belonging to similar agencies in a national or international context) or among different users of the same buildings.
- Standardisation of information, along with easy access to information through platforms or one-stop shops, can maximise clarity and transparency and minimise search costs.

The Technical Paper on MED Tools, Methodologies and Indicators introduced a consistent framework of the life cycle of public buildings, in order to organize the contribution of the MP in a logically coherent fashion. We recall briefly that approach here, because information-related policy recommendations can be relevant for a number of stages in the life cycle of a public building. Figure 1 below, from that technical paper, summarises the various steps.

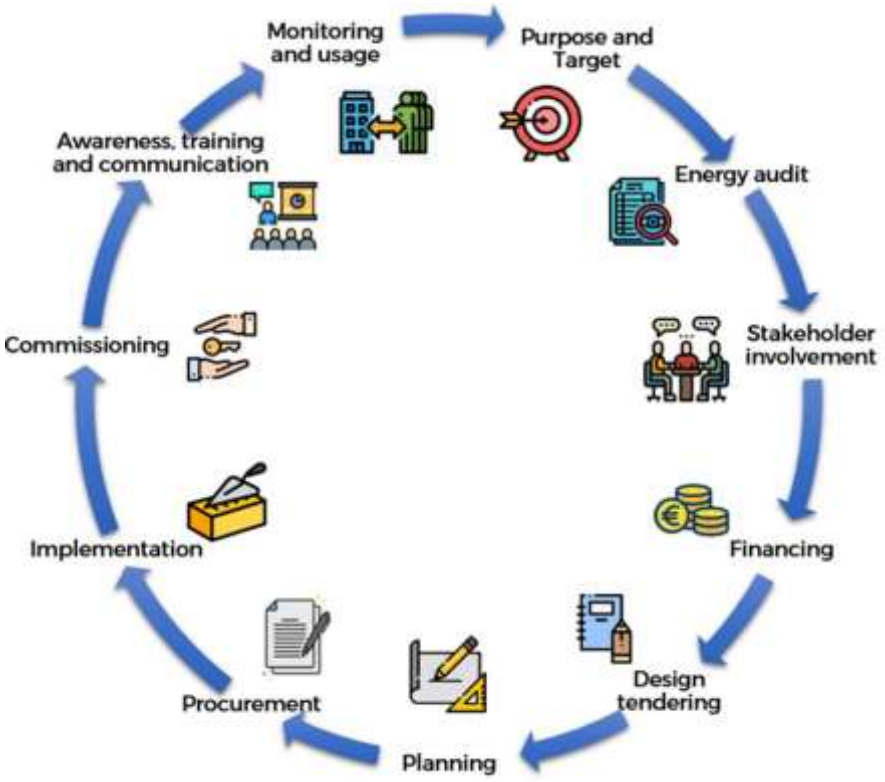

Figure 1 The lifecycle of energy efficiency investments in public buildings (Source: MEDNICE).

In terms of definition, the eleven stages of this lifecycle approach are quite self-explanatory; the interested reader is referred to the technical paper for details about this approach. Here we highlight that the stages for which information-based policies are likely to be particularly incisive are a subset of those in the figure, although in a broad sense correct and timely information is of course a precondition for all the stages. In particular the Energy Audit, Stakeholder Involvement, Awareness Training and Communication stages are by definition based on the creation and/or the exchange of knowledge about the energy efficiency potential and of the energy efficiency achievements of the building under scrutiny. In Policy Paper 1, we already highlighted the importance of correct information in order to secure the best financing options available. Moreover, as noted in the Technical Paper, Sustainable Energy Action Plans of municipalities under the Covenant of Majors, a fundamental planning tool for EU municipalities, need to be based on a survey of the existing building stock, along with an energy audit in order to allow a planning process based on the most complete information set.

The rest of this section builds on the policy-relevant results generated by the EB modular projects. To this purpose, a direct interaction with modular projects on the topics of the present policy paper was established, by means of virtual meetings with modular projects coordinators, in order to elicit further relevant information and opinions.

Modular Projects agree on the idea that **capacity building activities**, carefully tailored on the needs of local administrations, are crucial. Local administrations, due to lack of specific training of the workforce, and the concentration of several tasks among few people, tend to consider EE renovations as secondary projects. More ad hoc training coupled with some simple, user-friendly, and versatile diagnosis tools will empower local and regional technicians to gain an understanding of the scope of the saving potential, may help increase the relevance of this kind of investments in the eyes of local administration and hence increase their implementation.

MPs highlighted the need for tailored capacity building among local public administrations in rural areas, where interest in these matters is high, but the budget that can be devoted to improving the situation is very limited. This implies that they need a different capacity-building approach than in urban areas, since they cannot afford to hire technical staff expert on EE.

Tailored training is also particularly recommended in the case of EPCs. EPCs are perceived as very complex contracts, both from the technical and administrative point of view, and quite difficult to be triggered. There is a widespread need of more information about EPC procedures. Training is effective particularly when tailored on the local specific situation and to the needs of the group targeted. This does not exclude the opportunity of creating occasions from representatives of the public and private sectors to share experiences and points of view, as this can lead to a mutually beneficial exchange of information.

Peer learning is seen as a particularly useful approach for capacity building for EPCs, as it helps local and regional authorities to mutually benefit from the experiences of their peers as to investment programmes. Sharing stories about real case studies and discussing actual constraints, obstacles and solutions brings about significant added value.

Peer learning in capacity building could also benefit from out-of-the-box, innovative learning strategies. This could entail for example, designing and implementing living-labs focused on the entire "chain" of planning,

implementing, commissioning and monitoring building energy upgrading projects.

Other suggestions to boost capacity building entail, for example, promoting the organisation of brief training courses focused on specific issues organised at *national* level, as there is often a lack of opportunities to share experiences and to compare experiences with stakeholders of the same country; promote the interaction of public administrations at the *international level*, by means of peer-to-peer knowledge transfers, or by using virtual means of communication (webpages, online platforms, etc) or by organizing international training events[7]. Organising such activities in collaboration with the Covenant of Mayors, and with other Cooperation Programmes within the energy efficiency policy field, would considerably raise their profile and their international relevance.

Another interesting recommendation was to **foster the dialogue within the public administration involved.** One MP noted that it is quite urgent to increase and improve communication among the various branches of local PA involved, and sometimes within the same branch. In the context of schools, for instance students and teacher proved very receptive and energy-savvy as they came up with innovative solutions in their school energy plans. More difficult was to involve school administrations, which sometimes found the energy efficiency activities as an extra burden on the top of their workload. The MP on this regard suggests that the school's directors and headmasters should take the lead and support these initiatives with the weight of their authority even by making them compulsory. Similarly, "public authorities have been pushed to work differently from the routine getting involved in the project activities and adopting a different working method". This involves **looking at school buildings not only as infrastructures to be managed and maintained but also as community spaces** whereby the community itself can strongly help in the common goal of energy saving. Therefore, besides the technical devices and solutions, the municipalities are asked to consider also the behavioural solutions and best practices adopted in the school buildings.

Even simple communication campaigns about basic, common sense good practices would avoid paradoxical situations such as the ones mentioned by one MP as follows: "*There is still too much waste of energy. In our schools, children*

[7] A practical suggestion in this regard was to make sure that such events can be accessed by remote through virtual platforms, and that they are recorded and made available for streaming on such platforms for later perusal, in order to allow access to a larger audience and in particular to those who, due to budget and time constraints, are unable to attend in person despite their interest in these events.

have to wear the t-shirts also during the coldest months because it's really too hot. The same [holds] for public offices with open windows during winter."

Another point - also emerged in the field financing and discussed in the previous Policy Paper - is **the need for standardized and homogeneous information**. The lack of homogeneity complicates for instance the international use of information tools originally developed in a specific Member State. Extra effort towards integration and standardization of tools is also needed in order to increase knowledge in these matters at the local level. Local public building owners and managers are often unable to keep up with the legislative changes and the technical solutions. They often rely on external consultants, thus foregoing important opportunities to increase their own knowledge. To avoid the dispersion of information of varying quality and accuracy resulting from uncoordinated, autonomous, and sporadic information updating by local administration, it would be advisable to set up unique national contact points (**one-stop-shops**) to help them to obtain correct, relevant and up-to-date information quickly, and also to help improve their communication skills.

A number of recommendations had to do with **the accessibility of relevant data and information repositories**. It was noted that in the recent years, EU-projects' have generated a considerable amount of energy projects, results, tools, indicators, etc. These should be immediately available to the end-users, which design and implement real-scale energy renovation projects. Thus projects and initiatives providing a synthetic and easily accessible repository of this hoard of information, are particularly welcome. They should aim at making this knowledge accessible and understandable by end-users and at ensuring, where possible, the coverage and constant updating of new findings about codes, directives, regulations and technical solutions.

Another important barrier to overcome in order to improve these aspects is the lack of data regarding EE in rural areas. The lack of data hinders the development of effective communication and capacity building activities.

Finally, an issue related also to the continued provision of correct and useful information is intrinsic to the nature of projects such as those funded within the INTERREG programs. These projects come by design with an end-date, and the resulting discontinuity in interaction with stakeholders (local administrations and public buildings' users) can hinder the consolidation of the measures and good practices developed during the project's lifetime. It is thus crucial that funding programs capitalise carefully on the results, policy recommendations and on the

stakeholder' networks put together by their projects, and that future projects build on the heritage left by those which preceded them.

It is worth noting that in the course of their activities, Modular Projects came across some unexpected situations, which can also hint to useful policy lessons. Projects dealing with schools, for instance, met with a very enthusiastic response from students, teachers and headmasters. This was reflected in the creativity of the schools' communities, in terms of written contributions and innovative use of media about energy efficiency in school buildings. This suggests that a bottom-up push can sometimes help in raising the level of attention of local administrators and policymakers on energy efficiency issues and provide additional motivation to implement policy measures, including those capacity building activities for their staff which, as underlined by Modular projects' findings, are so urgently needed. Similarly, public authorities in rural areas showed an interest beyond expectations in these topics, and this interest evidenced the need of fine-tuning tools and information to the rural context, unveiling an area of policy intervention often overlooked by national energy policies.
There were also some disappointing "surprises" which are nevertheless useful in order to point out areas in which policy intervention is needed. For instance, a MP pointed out the long administrative delays occurring in the implementation of the small-scale investments even in presence of inexpensive solutions or of relatively simple procurement processes. Administrative barriers should then be simplified as much as possible, and again capacity building initiative tailored on the needs of local public administrations can help significantly the latter in familiarizing with ways to speed up these processes.
Finally language itself was found to be an important knowledge barrier to overcome. Not everybody is fluent in English, especially with technical terms. This means that all products, especially the user's guides of the produced tools, should be in translated in the relevant local languages.

5 Final recommendations and conclusions

Highlights:

- Based on the policy lessons gathered by the projects in the EB community and in the light of the literature on the role of information policies for energy efficiency, the following overall recommendations can be put forward:
    - raise local awareness to create an environment more receptive to capacity building initiatives and to energy efficiency actions
    - provide the information local public administrations need. Capacity building programs need to be carefully tailored on local needs and supplemented by accessible and transparent information services such as one-stop shops and information platforms.
    - foster standardisation of information and information exchanges within public administration and between the latter and all public building users.

Information-related policies can entail very different measures, which deploy their effects at very different levels, engage different groups and require different efforts and tools. They range from information and awareness campaign directed to the general public, to raising awareness within specific target groups and seeking their active involvement (e.g. awareness campaign in schools or among employees of an institution), to services providing information and expertise upon request, such as one-stop shops, energy audits and web-based information platforms, to capacity building initiatives targeting specific topics and/or specific recipients. In general these classes of actions work at different levels and can be performed quite independently one from each other. Projects in the EB community have highlighted the relevance of all these measures, with a slight preponderance of recommendations related to capacity building activities. However interesting dynamics seem to be at play between these different target groups and the related policy measures. There seems to be scope for a bottom-up push towards the adoption of policy measures: there is strong interest in energy efficiency among users of public buildings, such as the schools population and local administrations' employees, which can be leveraged to foster more effective capacity building initiatives targeted to those who are called to make energy efficiency investment decisions. In particular, targeting students in awareness campaigns has multiple benefits Not only it is likely to meet with a very positive reception, as experienced by some EB community projects, but also, students can turn naturally into energy efficiency ambassadors towards their families and their social circles, acting as a very powerful sounding board. Moreover in a long-run perspective, this helps engraining a sustainability mind-set

in the young generations, which hopefully will influence their future choices as consumers, citizens, stakeholders and, for some of them, even as policy-makers.

Thus the recommendation that naturally stems from these considerations is to **raise local awareness to create an environment more receptive to capacity building initiatives and, in general, to investments in energy efficiency for local public buildings.**

A logically related recommendation is then to **provide the information local public administrations need** in order to understand correctly the opportunities, processes and costs related to energy efficiency investments in public buildings, not only **through custom-tailored capacity building programs, co-designed with the involvement of local administrators in order to respond effectively to their needs,** but also **through accessible and transparent information services such as one-stop shops and information platforms.**

It is interesting to notice how policy recommendations put forward by EB Community projects do resonate with the findings in the literature about asymmetric information and misalignment of incentives.

Besides the typical asymmetric information issues affecting building users, owners and managers about the technical features of the building and about the technological options to improve energy efficiency, there are indeed asymmetric information issues which are specific to local public administrations, such as their sometimes limited familiarity with unusual procurement procedures, with the specific needs of rural administrations, and with the details of EPC contracts. Among the policy recommendations summarised in the previous section, those related to capacity building, as well as those about the need for standardised information, and those on the accessibility of relevant data, respond effectively to such asymmetric information issues; moreover, these policy recommendations implicitly engage the agents potentially endowed with more accurate information (building firms, energy technicians and consultants, national public administrators, national energy agencies, ESCOs, etc.) in a more open and transparent exchange of information with local administrations.

The other information biases described in Section 3 are less clearly connected to the findings of the EB Community projects, with the exception of the suggestion to increase the standardisation of information, which can help tackling the issues of framing, limited attention and paradox of choice by conveying the attention of decision-makers towards a set of widely shared and clear definitions of energy efficiency issues and solutions; in any case all those cognitive issues can be

substantially reduced by the deployment of correct and accurate training activities.

On the other hand, the need to foster a constructive dialogue among different offices within local administrations and among the latter and the various users of public buildings, speaks of the need of aligning incentives among key players in order to coordinate the efforts and maximise the results of energy efficiency projects in local public buildings.

Thus, looking at the EB Community recommendations in the light of the literature, yields as overall recommendation **to foster standardisation of information** and **information exchanges within public administration and between the latter and all public building users.**

Overall, the most powerful policy-relevant mechanism that the EB Community projects have unveiled, is precisely the virtuous circle between awareness-raising targeting communities of users of public buildings and the demand for more incisive policy actions, including carefully tailored capacity building activities: a powerful a push from the bottom by informed and sustainability-conscious local communities towards more effective and more widespread energy efficiency improvements in the public building stock.

The recommendations put forward in this Policy Paper and in the previous one, directly inform the Manifest on "Recommendations for renovating public buildings in the MED area to close the 6% energy efficiency gap". Both Policy Papers and the Manifest will be presented to EU policymakers and stakeholders at the final EB Community Conference in Brussels on October 2019.

6 References

Chetty, Raj, Adam Looney, and Kory Kroft (2009), "Salience and Taxation: Theory and Evidence," American Economic Review, 99(4), 1145–1177

D'Agostino D., Zangheri P., Cuniberti B., Paci, D., Bertoldi, P. (2016) "Synthesis Report on the National Plans for Nearly Zero Energy Buildings (NZEBs) - Progress of Member States towards NZEBs". JRC Science for Policy report, Joint Research Centre, Ispra, Italy. http://publications.jrc.ec.europa.eu/repository/bitstream/JRC97408/reqno_jrc97408_online%20nzeb%20report%281%29.pdf

European Commission (2016) "EU Reference Scenario 2016 - Energy, transport and GHG emissions Trends to 2050 - Main results" Brussels https://ec.europa.eu/energy/sites/ener/files/documents/20160712_Summary_Ref_scenario_MAIN_RESULTS%20%282%29-web.pdf

European Commission (2018a) "Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions and the European Investment Bank - A Clean Planet for all A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy". COM (2018) 773 final, Brussels. https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_en.pdf

European Commission (2018b) "Communication from the Commission to the European Parliament, the European Council, the Council, the European Central Bank, the European Economic and Social Committee and the Committee of the Regions - Action Plan: Financing Sustainable Growth", COM (2018) 97 final, Brussels. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0097

IEA 2018 The future of cooling https://webstore.iea.org/download/direct/1036?fileName=The_Future_of_Cooling.pdf

Jaffe, Adam B. and Robert N. Stavins (1994), "The Energy Efficiency Gap. What Does It Mean?" Energy Policy, 22(10), 804-810.

Gerarden, Todd D., Richard G. Newell, and Robert N. Stavins. (2017). "Assessing the Energy-Efficiency Gap." Journal of Economic Literature, 55 (4): 1486-1525.

Giraudet, Louis-Gaëtan, D. Finon. European experiences with white certificate obligations: A critical review of existing evaluations. 2014. hal-01016110. https://hal.archives-ouvertes.fr/hal-01016110/document

Hassett, K. and Metcalf, G. (1993) Energy Conservation Investment: Do Consumers Discount the Future Correctly? Energy Policy, Volume, 710-716

Moneta, Roberto, Nino Di Franco, Ilaria Bertini, and Alessandro Federici. 2015. 'Rapporto Annuale Efficienza Energetica-RAEE 2015'. http://openarchive.enea.it/handle/10840/7099.

Nocera, M. (2014). Le Detrazioni Fiscali Del 55% Per La Riqualificazione Energetica Del Patrimonio Edilizio Esistente – 012. ENEA, ROME. ISBN 978-88-8286-301-2 http://efficienzaenergetica.acs.enea.it/doc/Rapporto55%25_12.pdf

Rademaekers, K., Eichler, L., Perroy, L., van der Laan, J. (2017) "Assessing the European clean energy finance landscape, with implications for improved macro-energy modelling", European Commission, Bruxelles. https://ec.europa.eu/energy/sites/ener/files/documents/macro_eu_clean_energy_finance_final.pdf