# Matchmaking tools and resources with needs on implementing the Energy Efficiency Directive policies

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## Keywords

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## Abstract

Within the context of the European Union Energy Efficiency Directive (EED), Member States are implementing policies on national, regional and local levels to fulfil the EED requirements. While from a policy design process several issues are resolved through the ongoing dialogues, several barriers on the implementation phase hinder the adoption of the measures foreseen. This article demonstrates the stated needs from policymakers in various governance levels, based on the EED requirements, as a result of a needs assessment survey carried out in the framework of the EC H2020 PUBLENEF project. In brief, the main needs on a regional/local level are the insufficient budget, the lack of stakeholder's available time, the difficulty in mobilisation of local stakeholders, as well as the necessity for the current legislation needs to evolve to allow the multi-governance development of energy efficiency policies, and finally the need for simplification regarding administrative procedures and training of the elected representatives regarding energy efficiency issues. At the same level, evaluations demonstrate that there is lack of energy modelling on the regional/local levels for energy efficiency policy planning, there is absence of monitoring policy outcomes on the local level, the enforcement process for not reaching local targets is low, and finally, there are not many innovative financing mechanisms for energy efficiency eligible for the local level. To overcome these issues, several tools and best practices are developed in EU projects, which PUBLENEF collected. Based on the analysis most best practices addressed Energy Audits and Management Systems, Technology issues and financing technical support (with an absence on practices on target setting and quality of savings). Tools mainly address information and training, energy services, financing support, public procurement, while there are few or none on the role of public buildings, metering, billing, cost of access to metering and billing, penalties, energy transformation, distribution, qualification – accreditation and certification schemes. This paper describes the resources from evaluations on EED and suggests points of focus for the EED Articles that lack support.

## Introduction and methodology

Within the context of the European Union's Energy Efficiency Directive (EED), Member States implement various policies on national, regional, and local levels to fulfil the EED articles' requirements. Public bodies working on the development, implementation, and evaluation of these energy efficiency policies face various challenges or barriers that hinder the adoption of the measures foreseen. These challenges can be traced back to a range of 'needs' among policy makers. These needs may include issues such as a lack of knowledge, information, or experience with regard to legal and administrative specifics, communication and consultation with citizens, financial tools and taxation, or project management, or a lack of political will. This article demonstrates the voiced needs of policymakers in the various governance levels, based on the EED requirements, as a result of a needs assessment survey carried out in the framework of the EC Horizon 2020 PUBLE-

NEF project[1]. The EED articles considered in this study include articles 3 (energy efficiency targets), 4 (building renovation), 5 (exemplary role of public bodies' buildings), 6 (purchasing by public bodies), 8 (energy audits and energy management systems), 14 (promotion of efficiency in heating and cooling), 16 (availability of qualification, accreditation and certification schemes), 17 (information and training), 18 (energy services), 19 (other measures), 20 (national fund, financing and technical support), and 24 (review and monitoring of implementation).

Through a survey and a range of interviews with policy makers at Member State, regional, and local levels, a total of 55 needs assessments were conducted in 14 EU Member States (Austria, Bulgaria, Croatia, Czech Republic, Ireland, Italy, France, Greece, Netherlands, Poland, Romania, Spain, Sweden and United Kingdom). For each of these, an analysis was carried out following the structure of the various EED articles.

In addition to the needs, also a range of 'good practices' and 'tools' were identified. A good practice was defined as a policy implementation practice that can act as a good example for other policy makers, for example because of its innovative or interdisciplinary approach, or it offers a good return on investment, or it provides learning opportunities, or in general for its easiness in public acceptance and policy adoption. In addition to 54 such good practices in energy efficiency policy design and implementation, PUBLENEF has also collected an inventory of 146 'tools' as used by implementing bodies across the EU, which include software, guidelines, presentations, protocols, templates, and other materials for use in energy efficiency policy implementation.

Following on the results of these inventories, this article presents an overview of how the good practices and tools can be used to fill the needs identified. For this reason, the collected good practices and tools are 'matched' to the expressed needs. The matching approach adopted includes four steps:

- analysing the good practices collected, in order to better understand the fundamental drivers of the practices in energy efficiency policy design and implementation, through their classification on the basis of EED articles and locations. The selected good practices were examined by the partners in close coordination with managing authorities, and relevant experts and stakeholders. The selection process was based on criteria such as: level of efficiency obtained, type of technology, type of financial mechanisms, project delivery structure, cost-effectiveness, and level of reproducibility (i.e. dependence on country context). When trying to decipher the strengths of various practices, a number of questions were also posed, examining previous experiences, the particularities of internal resource allocation, what professionals were necessary for delivery, and the possibility for improvement. Questions which were focused on trying to find weaknesses, looked at unforeseen risks during implementation, and trying to highly how these practices could be improved. In the end, each good practice received an overall score, which can help the end users to assess how easy or difficult it would be for them to replicate the practice;
- classifying the needs identified, by analysing the indicators used for the need assessment and according to their EED article references;
- allocating all good practices to the identified national, regional, and local needs;
- developing a web-based tool that allows policy makers to search for inspiration on available tools and best practices for implementing their energy efficiency policies and strategies.

Since both good practices and needs are classified using the main related EED articles, a 'matching matrix' has been created with these articles as common identifiers. Based on the needs identified and the available good practices and tools, this article highlights points of focus for EED articles that lack sufficient good practices, tools, or other support.

## Insights from the Needs assessment on energy efficiency policy making at the multilevel governance

In order to conduct the needs assessment, a set of questionnaires was formulated to address the following issues: Status quo i.e. existing energy efficiency capacity aspect was explored in relation to challenges to energy efficiency policy implementation and opportunities; financial incentive requirements; regulations, voluntary agreements, and barriers to implementation; training and education shortfalls, and degree of public-private partnerships. The understanding of the capacity gaps and identification of possible solutions included the research on the type of support needed for the development of concrete and comprehensive energy efficiency policies. In pursuit of this aim, primarily gaps in current energy efficiency policy practices across the EU were identified, and then relied on international precedent for finding possible solutions.

In addition to the aims outlined above, since the EED covers various sectors, the questionnaires had to be malleable for transposition in each given administrative level. Questionnaires were also designed as brief as possible to capture the most essential information from policymakers. The administrative level aspect was included in such a way so two needs assessment questionnaires were created, one regarding national needs, and the second aimed at identifying regional/local needs. The national questionnaire template was divided into 12 sections: the first section essentially outlined how the questionnaire ought to be presented, and the remaining 11 related to the EED articles within the scope of PUBLENEF (as explained above). At the national level it seemed appropriate to refer to the EED articles for each section of the national questionnaire while the regional/local questionnaire, used more general sections focusing local policies and also local projects management issues. In order to acquire both qualitative and quantitative data, both Yes/No questions, and open-ended questions were used.

On the regional/local levels, the "strength parameters" are project/institution characteristics that are customized to address EED requirements, while the "weakness parameters" were defined as characteristics considered as a disadvantage in implementing EED requirements. The "opportunity parameters" are external elements that the project/institution could exploit to facilitate the implementation of the energy efficiency

1. http://www.publenef-project.eu

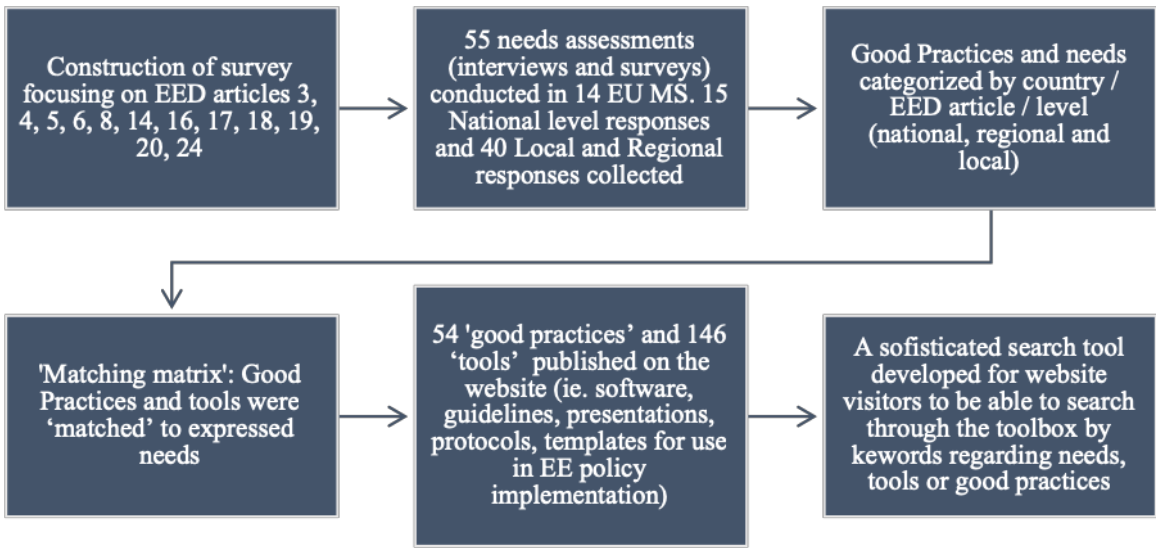


*Figure 1. Methodology process of creating an easy-to-use PUBLENEF toolbox.*

| Relevance of the parameter | | | | |
|---|---|---|---|---|
| Cat 1: X < 20 % | Cat 2: 20 % ≤ X ≤40 % | Cat 3: 40 % ≤ X ≤ 60 % | Cat 4: 60 % ≤ X ≤ 80 % | Cat 5: 80 % ≤ X |

*Figure 2. Relevancy of the parameter.*

directive, while "threat parameters" are those external elements that could possibly hinder the implementation of the energy efficiency directive. Strength and weakness parameters were categorized in five categories: 1) legal and administrative needs, 2) information and training, 3) communication and consultation with citizens, 4) financial tools and taxation, and 5) project management. Opportunity and threat parameters were categorized in four categories: 1) legal and administrative needs, 2) information and training, 3) financial tools and taxation, and 4) political will. For each of these parameters an indicator was created based on the responses received to the yes/no questions of the questionnaires and based on the percentages of yes (or no) answers to these questions, where a scale of relevance was built (Figure 2). These indicators allowed for a comparison of parameters between countries and also took into account questions which were left unanswered. The overall response rate to questions asked was 92 %, which demonstrates also an interest from policymakers to discuss the issues they face in implementing energy efficiency policies.

At the national level, the "strength parameters" are those national level characteristics and policy structures that enhance the fulfilment of the EED requirements, while the "weakness parameters" refer to misalignments between policies, lack of supporting structures, unavailability of financing means and also information barriers. Unlike in the regional/local needs assessment, at the national level both strength and weakness parameters were categorized in 10 categories: 1) goals, targets, specific measures and policies, 2) exemplary role of public bodies' buildings (Article 5), 3) purchasing by public bodies (Article 6), 4) energy audits and management systems (Article 8), 5) Technology (i.e. promotion of efficiency in heating and cooling as it relates to Article 14), 6) Availability of qualification, accreditation and certification schemes (Article 16), 7) information and training (Article 17), 8) energy services (Article 18), 9) Energy Efficiency National Fund, financing and technical support (Article 20). and 10) review and monitoring of implementation (Article 24). The relevance indicator of the parameter used are identical the regional/local needs assessment (Figure 2). The overall response rate for this section of the questionnaire was 75.8 %.

#### INSIGHT ON THE REGIONAL/LOCAL NEEDS ON ENERGY EFFICIENCY POLICY MAKING FROM THE SURVEY

Regional and local questionnaires received were related mainly to local and multiannual plans concerning various energy efficiency aspects. In most such implementation needs, the main goals were similar; to increase energy efficiency, reduce emissions, and encourage renewable energy deployment; while the key stakeholders were the local authorities, citizens, and SMEs. Most of the projects were linked to national environmental/energy legislation while a few projects referred to local legislation and responsibilities. One response referred to a project which is a voluntary process, and not linked to national legislation. Most projects where locally funded, while 8 projects relied on funds from the EU.

Most replies on the regional and local levels referred to the issue on information and training as expressed in Article 17 (Figure 3). Most interviewed organizations that consider having adequate in-house expertise about legal and administrative aspects (65.9 %). 32 % of negative answers were linked to generalist structures who need specific knowledge and therefore need to hire external experts. These actors underline the difficulty for them to identify legal aspects or new regulations. Regarding information and training, the interviewees agreed

on a sufficient in-house expertise on: legal and administrative aspects (78 %), training (73.2 %), energy technologies (73.2%), financial tools (65.9 %), and technical tools (58.5 %). However, a few interviewees underlined the use of external experts sometimes and the lack of manpower in organizations.

Additionally, most comments on the way to improve actual practices are linked to global information and training improvements. Regarding communication and consultation with citizens, the results reflect the fact that most policy implementation strategies were based on awareness and informative actions targeting citizens. Nevertheless, respondents highlighted a difficulty in finding the appropriate communication channels, and a lack of in-house expertise for communication. Still, the only 'weakness' in the communication/consultation process is the insufficient budget allocated to this cause. In many cases, the analysis indicated a lack of national, regional and local funds available for energy efficiency activities; thereby inhibiting the possibility of conducting information and participation campaigns which rely on expensive technologies. On the financial tools and taxation, a significant number of interviewees had experienced some difficulty in understanding the financial options (grants and subsidies) available to them, and they highlighted a need for trained local authority staff officials for this purpose. The responses received indicate that the budget available to local authorities for improving their energy efficiency have been reduced. When the weaknesses in the project management category as well as the qualitative responses on the reasons for the difficulty to mobilise all the stakeholders were analysed, it became evident there is a general lack of resources, coordination, information exchange at the local and regional level, and a difficulty in achieving political support and mobilisation within the local authorities. Also, the difficulty for some administrations to respond to European project calls is evident, as well as the variability in goals among the stakeholders which makes it difficult to mobilize them.

The opportunity analysis on legal and administrative aspects offered different comments concerning conflicting legislation. Regarding administrative procedures, 29 % of the interviewees state that there is a lack of information; the feedback relating to this mentions a lack of workshops for European funding (first calls), the fact that usually the law surrounding admin procedure is inconsistently explained, small organizations need to hire external consultants; a lack of coordination between local authorities, and overly complex administrative procedures. Regarding information and training, all parameters were considered as opportunities. Considering the information and training possibilities comments were that at times it is difficult to select the appropriate training program, sometimes highly-educated staff think they have sufficient knowledge and are not entered into additional courses. Also, a need for practical training on energy supply contracting in local authorities was noted. Concerning the financial tools and taxation opportunities, interviewees noted a lack of public subsidies, financial instability, and inconsistency in payments, the need to simplify payment procedures and a need for more private sector involvement. Respondents also highlighted a need for a mechanism which could provide information on how to avail of all forms of funding, as well as a need for subsidies to be made available for all forms of energy efficiency projects. The analysis clearly showed a need to make the financial mechanisms available and much less complex and to create a dedicated website for the purpose of providing information to potential applicants; the respondents also express the need for the bureaucratic processes of submission, acceptance and implementation to be more streamlined. Regarding political will, analysis highlighted a need for greater coordination between national and local targets, as there is regularly a disjunction between the two. With regards to the regional/local level, respondents highlighted a need for elected representatives to be admitted into training programs, in order to better engage them through the policy implementation process.

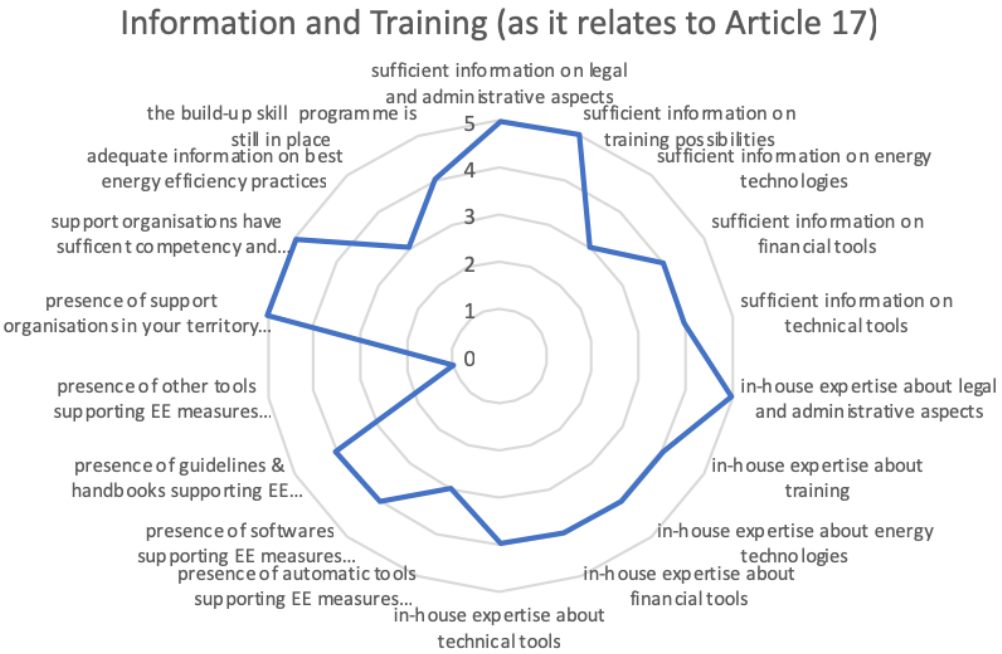


*Figure 3. Strengths and weaknesses related to Article 17 EED.*

### INSIGHT ON THE NATIONAL NEEDS IN ENERGY EFFICIENCY POLICY FROM THE SURVEY

Goals, targets, specific measures and policies' findings showed that most of the local/regional strategies feed into the national ones. Nearly all strategies target every sector (public sector, enterprises, households, etc.) and are energy efficiency multi-plans. Although 71.4 % of the respondents understand the significance of energy modelling at the national level for calculating ex-ante the policy outcomes, the main weakness at the local and regional level (64.3 %) was the total absence of energy modelling. As all of those interviewed, work in national administrative bodies, this result can also be seen as a national perspective of the local and regional administrations.

Regarding the exemplary role of public body buildings (Article 5), 92.8 % of respondents confirmed there is a program for monitoring energy efficiency levels primarily at national level. The absence of program for monitoring energy efficiency at local level is indicated by 42.9 % of respondents, which makes it the weakest indicator of those analysed, just above the absence of such programs at regional level (35.7 %). Nevertheless, a low response rate for both questions concerning local and regional levels should be taken into account.

The main strength factor regarding the purchases by public bodies (Article 6) was the fact that the public sector (and not only the central government) purchase energy efficient buildings, products and service at national level (85.7 %). The weaker factor was the fact that public procurement doesn't include life-cycle cost analysis (50 % of the responses).

According to the interviewees, the energy audits and management systems (Article 8) seem well implemented. The preparation of business cases and the implementation of energy management systems showed weaker parameters, but they were still quite significant with a high response rate for these questions.

The main strength factor for technology category (i.e. promotion of efficiency in heating and cooling as it relates to Article 14) was the completion of a comprehensive assessment of the potential for the application of high-efficiency cogeneration and efficient district heating and cooling at a national level (71.4 %).

Availability of qualification, accreditation and certification schemes (Article 16) was indicated as existing by 78.6 % of the interviewees and no significant weakness factors were recognized.

At the national level most of the parameters were strong regarding information and training (Article 17). Only one parameter was recognized as weakness: insufficient information on energy technologies (42.9 %). Regarding this weakness, the comments mentioned the lack of capacity, the scattered information and the lack of information regarding emerging technologies.

Regarding energy services (Article 18), more than half of the interviewees declared the availability of supporting structures in the public sector in taking up energy service offers, in particular for building refurbishment. Also, 50 % declared to have access to model contracts for energy performance contracting (78.6 %). The only parameter that reached more than 35 % as a weakness was the lack of information on best practices for market proven energy performance contracting, including, if available, cost-benefit analysis using a life-cycle approach. This parameter can be considered as varying significantly from one country to the other.

Analysis of the category energy efficiency national fund, financing and technical support (Article 20), showed strong parameters across all aspects (presence of an Energy Efficiency National Fund, accessed and utilised by the public sector, financing facilities established for energy efficiency improvement measures, existing financial institutions which act as Energy Efficiency National Fund). The weaker parameter was the lack of use of other innovative financing mechanisms (other than grants from EU financial institutions, National Funds, etc.).

Basic or advanced national monitoring and reporting systems are undertaken in most countries to demonstrate progress achieved towards national energy efficiency targets. Nevertheless, 50 % of the interviewees indicated that there are no implications to the regional and local authorities where targets are not being met, while, additionally, even if there are some consequences for the public sector for publishing of the results, there are still no enforceable penalties.

### LESSONS AND OUTCOMES

There is great diversity among responses and countries due to national and regional legislation and specificities. The variety of subjects, and the lack of precisions and details in many questionnaires, made the comparison complex.

On the regional/local levels the main strengths are related to the in-house expertise about communication, consultation and mobilisation of the relevant in-house services, while the weaknesses are the insufficient budget, the lack of stakeholder's available time and therefore the difficulties to mobilise them. The sufficient information regarding administrative aspects, training possibilities and energy technologies are considered as the best opportunities. The main threat is the existing legislation which needs to evolve to allow the development of energy efficiency policies, the need of simplification regarding administrative procedures and the need for training of the elected representatives regarding energy efficiency issues. As the implementation of EU directives has resulted in a constant process of updating respective policies and programmes, elected representatives need to be kept up to date on a continuous basis. The qualitative analysis has also outlined that the current regulations, both legal and financial, should be made more consistent and easier to understand. Regulations on the energy efficiency requirements of buildings as well as energy efficiency planning rules, need to be made more coherent, and energy actions and climate change planning need to be synchronized.

At the national level there are several strengths, such as purchasing by public bodies, energy audits and management systems, availability of qualification, accreditation and certification schemes, and energy efficiency national fund, financing and technical support. While at the national level interviewees did not point out any relevant weaknesses, absence of energy modelling at the local and regional level needs to be improved as this creates uncertainty on the local and regional policies that complement the targets of the national ones. Additionally, the absence of program for monitoring energy efficiency at local level in the context of exemplary role of public body buildings and review and monitoring of implementation i.e. public sector should be notified where targets are not being met. The

fact that at a national level mostly strengths were detected is probably due to the questions' syntax and to the fact that most of the interviewees work in the national institutions. As representatives of national policies, it can be difficult for them to underline lacks and weaknesses at the national level. The same kind of bias can be highlighted at the local/regional level as many of the interviewed structures are energy agencies or municipalities working with the PUBLENEF partners which are energy agencies. Therefore, it can be easier for them to underline national threats, such as insufficient budgets or needs of legislation evolution, than local weaknesses.

## Matchmaking needs assessment with best practices and tools

In order to reply to these needs with practical solutions, a set of 54 'good practices' in energy efficiency policy implementation have been singled out from another questionnaire that was answered by 15 national and 40 local and regional policymakers[2]. A good practice has been defined according to a set of quantitative parameters, resulting as exemplary for other policy makers, for example because of its innovative or interdisciplinary approach, good return on investment, learning opportunities, or more in general for its high energy savings potential. Indeed, several stakeholders submitted a number of GPs, providing their characteristics and selecting the addressed needs, both at national and regional/local level, which reply to specific Articles of the EED.

Besides, 146 'tools', as products from EU or national funded projects have been identified: software, guidelines, presentations, protocols, templates, and other materials to be adopted in order to overcome the needs through the replication of a good practice, which are all recorded in the PUBLENEF toolbox (www.publenef-toolbox.eu).

A ranking, as shown in Table 1, has been carried out for the top 20 tools gathered at national/regional and local level with the specific EED articles covered. Table 2 summarizes the information for the Top 20 tools identified:

The 146 gathered tools address a wide range of needs related to energy efficiency policy implementation process, such as energy consumption monitoring, new technology for heating and cooling, renovation of residential and public buildings, public lighting, consumer information and capacity buildings and financing programs. The aim of this work is to facilitate the speed up of the energy efficiency implantations policy by the adoption of the gathered tools in other countries and regions. This "tool collection exercise" is a first step to replicate the good practices in municipalities and regions where specific needs have arisen. In this case, the adoption of the available tools can facilitate their overcoming. As an example, the absence of a specific methodology and formalization for the EPC development in a specific country could be addressed by a methodology/guideline/protocol already developed by another EU member State, more EU member States jointly, an EU supranational organization or a European project consortium financed by a specific programme. Example of these gathered tools are the following: TRUST EPC South, EPC Plus, EPC – Guide, METHODOLOGY for the EPC project evaluation, and others. Another example could be the lack of a diagnostic tool for energy audits, thanks to this analysis several diagnostic tools for energy audit could be already available such as Simplified Energy Auditing Software 3.0 (SEAS) from Italy or the Handbook Energy Audit in SMEs from EU PINE project, and these tools/guidelines gathered could be more easily adopted in other European countries.

#### MATCHMAKING NEEDS ASSESSMENT WITH BEST PRACTICES AND TOOLS

The collected Good Practices and tools were 'matched' to the expressed needs through three steps:

- Good Practices analysis to better understand the fundamental drivers in energy efficiency policy design and implementation, through their classification by EED articles and territorial level;
- Needs classification, by EED article;
- Good practices – Needs matching at National (N), Regional (R), and/or Local (L) level.

To this aim, since both good practices and needs are classified by EED articles, a 'matching matrix' has been developed (see Table 3 for needs identified at national level and the related good practices matched to each of them). It is worth to remark that all the collected good practices were used for the need matching, regardless their territorial level. Please note that the same good practices could potentially cover different needs addressing more than one EED articles[3].

In the EED Article 3, lack of both operational goals and energy modelling for regional and local authorities are perceived as the main barriers to be faced also through the replication/adaptation of some of the collected good practices. Unfortunately, only for the former need a matching has been possible to date.

The main barrier in Article 5 is represented by the difficulty in the involvement of ESCOs, through Energy Performance Contracts (EPC) also; by contrast, a number of matched good practices are focussed on the renovation strategy.

The main needs from Article 6 to be overcome are the lack of the life-cycle cost analysis within the public procurement, long-term EPCs, assistance in the procurement: unfortunately, for none of them a good practice has been matched yet.

Furthermore, all needs under the Article 8 are almost equally important, and a number of good practices can be consulted, in particular for the financial approval of the energy efficiency action suggested by energy audits, and for the development of programmes for the implementation of energy management systems. Most of the matched good practices are implemented at local level.

2. PUBLENEF has agreed in its very beginning that a sample of 50 replies on needs and good practices would be representative of the current implementation status in the EU, given that most regional/local governments implement their actions through standardized regional action plans or Sustainable Energy Action Plans under the Covenant of Mayors.

3. For example, the Good Practice 05 (GP05) named "Action Globale Innovante pour la Région – Innovative Global Action for the Region" (AGIR) gathered by Fedarene covers 24 different needs, selected 82 times by the interviewed national experts, and relative to 6 different EED articles (art. 5, art. 8, art. 14, art. 17, art. 18 and art. 20), thus addressing different topics such as: the exemplary role of the Public sector; energy audits and management systems; adoption of energy efficient technologies, as heating/cooling systems; information and training (the most addressed); availability of energy services; energy efficiency national fund, financing and technical support.

**Table 1. Examples of good practices collected, by EED article(s), territorial level and country.**

| GP no. and title | Level | Country | Articles |
|---|---|---|---|
| GP2 NEWLIGHT: a potential solution for up-scaling investments in Energy Efficiency and Renewables | Regional | Croatia | 20 |
| GP5 AGIR: Action Globale Innovante pour la Région – Innovative Global Action for the Region) | Regional | France | 3, 5, 8, 14, 17, 18, 19, 20 |
| GP6 The Night Hawks project - Night Walks: off production hours site inspections i.e. energy checks | local | Sweden | 12,17 |
| GP11 REACH – Reduce Energy Use and Change Habits | national/regional/ local | Croatia | 17 |
| GP15 Energy saving in schools Bielsko-Biala | local | Poland | 12,17 |
| GP18 The Sustainable Construction Programme in Andalusia (PICSA) | regional/local | Spain | 4,17,20 |
| GP27 Project Regional Networks for the development of a Sustainable Market for Bioenergy in Europe (BioRegions) | regional | Bulgaria | 3, 14,17 |
| GP36 Installation of renewable energy systems in the public and residential buildings | regional | Poland | 14 |

*Source: PUBLEnEf.*

**Table 2. Ranking of tools on energy efficiency policy implementation.**

| Tool | Score | Level L | Level R | Level N | EED Articles |
|---|---|---|---|---|---|
| Retrofit Action Hub | 102.5 | | | X | 4, 12, 17, 18, 20, 24 |
| TRUST EPC South | 101.8 | | | X | 4, 17, 18, 20 |
| EPC Plus | 99.8 | x | x | x | 17, 18, 20 |
| Premium Light Pro | 98 | x | x | x | 4, 6, 8, 17, 20 |
| CITYnvest | 90.4 | x | x | | 4, 6, 17, 18, 20 |
| Street Lighting Toolkit | 89 | x | x | x | 8, 17, 20 |
| RenoWiki | 89 | | | x | 3, 4, 17, 20 |
| CERTuS | 84.5 | x | x | x | 4, 17, 20 |
| Shared Energy Council | 83 | | x | x | 3, 17 |
| EmBuild | 82.5 | | x | | 4, 17, 20 |
| Handbook addressed to public sector entities | 79.6 | x | x | x | 6, 8, 17, 18, 20 |
| Streetlight Refurbishment with EPC – Guide | 79.3 | x | x | x | 6, 8, 17, 18 |
| ZEBRA2020 | 75.5 | x | x | x | 3, 4, 5, 17, 24 |
| Building renovation | 72.5 | x | x | x | 4, 17 |
| METHODOLOGY for the EPC project evaluation | 71.8 | x | x | x | 4, 17, 18 |
| Facilitators Guideline for Energy Performance Contracting (EPC) | 71.8 | x | x | x | 4, 17, 18 |
| Model processes for combining Energy Performance Contracting (EPC) with other energy-related actions | 71.8 | x | x | x | 4, 17, 18 |
| Triple-Win-Solutions for the Split-Incentive-Dilemma | 71.8 | x | x | x | 18,17,4 |
| EPC business model | 71.5 | x | x | x | 5, 17, 18 |
| RETscreen | 71.5 | x | x | x | 4, 8, 14, 17 |

**Table 3. Needs identified at national and regional levels by EED articles, and matched GP(s).**

| EC EE directive – n. art. | n. GPs | n. national needs | | | n. regional/local needs | | |
|---|---|---|---|---|---|---|---|
| | | stated | matched | % | stated | matched | % |
| Art. 3: Goals, targets, specific measures and policies | 12 | 6 | 2 | **33** | – | – | – |
| Art. 4: Building renovation | 6 | * | – | – | – | – | – |
| Art. 5: Exemplar Role of Public Body Buildings | 8 | 5 | 5 | 100 | – | – | – |
| Art. 6: Purchasing by Public Bodies | 3 | 16 | 2 | **12.5** | – | – | – |
| Art. 8: Energy Audits and Management Systems | 14 | 14 | 14 | 100 | – | – | – |
| Art. 12: Consumer information and empowering programme | 6 | * | – | – | 40 | 4 | **10** |
| Art. 14: Technology (i.e. Promotion of efficiency in heating and cooling | 12 | 12 | 9 | 75 | – | – | – |
| Art. 16: Availability of qualification, accreditation and certification schemes | 0 | 2 | 0 | 0 | – | – | – |
| Art. 17: Information and Training | 9 | 44 | 36 | 82 | 156 | 110 | 71 |
| Art. 18: Energy Services | 4 | 25 | 25 | 100 | – | – | – |
| Art. 19: Other measures to promote energy efficiency | 1 | 0 | – | – | – | – | – |
| Art. 20: Energy Efficiency National Fund, Financing and Technical Support | 11 | 13 | 13 | 100 | 28 | 28 | 100 |
| Art. 24: Review & Monitoring of Implementation | 3 | 13 | 6 | **46** | – | – | – |
| Art. 28: Transposition | 2 | 0 | – | – | – | – | – |

*Source: PUBLEnEf.*

Proposed needs for the EED Article 14 are all equally important, and gathered good practices are mainly addressed to the assessment of the potential at local and regional level of efficient heating and cooling systems, in particular those implementing high-efficiency cogeneration.

The highest number of needs and matched good practices are about information and training (EED Article 17). Some key issues faced by regional and local governments are the lack of capacity, resources, and skills for replicating their own action plans or strategies in the municipalities. The replicability of good practices in terms of dissemination and the promotion could accelerate the creation of a culture driven by energy efficiency values where the behaviours of the main stakeholders (local, regional and national authorities, Energy Mangers and ESCOs, local and national agency, citizens, and others) are naturally committed with energy savings choices. The 2030 revised goals of the EED could be reached if the energy efficiency become key values of the European national governments.

Related to Energy Services (Article 18) the common need is that the market uptake of EPC contracts should facilitate the process of the building renovation in the public sector through available funds, but not exploited yet. On the financing part (Article 20 EED), the main barrier is the adoption of innovative financing mechanisms, where good practices do exist.

Finally, the main obstacle for the achieving of energy saving targets in the public sector (EED article 24) is that there are no implications to the regional and local authorities when targets are not being met. To date, no GPs have been matched to this important issue.

The Matchmaking has been implemented for regional/local needs too, grouped into three main general strands relative to communication and consultation with citizens (EED art. 12), information and training (EED art. 17), financing tools (EED art. 20). As shown in Table 3, a total of 18 needs were identified, selected 211 times by the interviewed regional and local experts, and matched with 47 GPs, relative to different territorial level. More specifically, good practices cover 11 different needs, for a total of 133 preferences gathered through the submitted questionnaires.

From PUBLEnEf matchmaking analysis some key issues faced by regional and local public bodies in implementing their energy efficiency measures may be singled out, such as the insufficient budget available and resources to develop the actions, lack of expertise and capacities and skills for adopting action plans or strategies in the municipalities. Best practices provided by the PUBLEnEf project to overcome these hurdles are a starting point to optimize the decision making in terms of lack of time, resources and skills for project planning, facilitating also to some extent the necessary investments. These good practices are selected also on the ground of their replicability to other regions and cities. This means in essence that their upscaling through the Covenant of Mayors activities (and also customization based on each city/region characteristics) can assist regions and cities to mobilize the required stakeholders and even provide the required means for attracting investments to finance their strategies. Such good practices are often also replicated in the framework of other projects and initiatives, such as for instance the peer to peer learning program on en-

Source: PUBLEnEf needs assessment

| Energy Efficiency Directive Article | | No. tools |
|---|---|---|
| Art. 3 | Goals, targets, specific measures and policies | 19 |
| Art. 5 | Exemplary Role of Public Buildings | 10 |
| Art. 6 | Purchasing by Public Bodies | 39 |
| Art. 8 | Energy Audits and Management Systems | 51 |
| Art. 12 | Consumer information and empowering program<br>Communication and consultation with citizens | 11<br>1 |
| Art. 14 | Technology i.e. Promotion of efficiency in heating and cooling | 10 |
| Art. 17 | Information and Training<br>Communication and consultation with citizens<br>Project Management | 87<br>4<br>33 |
| Art. 18 | Energy Services | 89 |
| Art. 20 | Energy Efficiency National Fund, Financing and Technical Support<br>Financial tools and taxation | 36<br>27 |
| Art. 24 | Review & Monitoring of Implementation | 35 |

*Figure 4. Tools available addressing EED Articles.*

ergy efficiency financing solutions developed in the EC H2020 PROSPECT project[4], where authorities learn from their peers on how to implement realistic solutions in financing their energy action plans.

There is a broad range of tools and good practices available for supporting the policy making processes on different layers, that is by EED article, especially for: information and training (Art. 17), for example through software or online platforms addressed to regions and municipalities; financing and technical support (Art. 20); energy services (Art. 18) and audits (Art. 8); and for renovation strategies (Art. 4) also, even if no needs have been identified for this topic (both at national and regional/local level). By contrast, there are almost no tools on the exemplary role of public buildings, metering, billing, cost of access to metering and billing, penalties, energy transformation, distribution, qualification, accreditation and certification schemes; such issues require further support to assist regions and cities. The tools available supporting EED Articles are presented in Figure 4.

Given that also at regional/local level the main needs faced by public bodies are directly related to EED requirements also, an alignment between national and local regulations and implementation is necessary, in order to develop a sound framework to roll-out energy efficiency measures, with a focus on successful energy efficiency policy and programmes at local level, mobilising support and participation of citizens, and stakeholder engagement and coordination.

4. PROSPECT (Peer powered cities and regions) http://www.h2020prospect.eu.

## Conclusions

Public authorities develop and implement energy efficiency policies, while they often face challenges and barriers that hinder the adoption of the necessary measures. In the framework of the EC H2020 PUBLENEF project, a survey and a range of interviews with policy-makers in 14 EU Member States were conducted to identify shortfalls in existing energy efficiency policies and to determine the needs on policy implementation related to specific articles of the EED. Two sets of questionnaires, at national and regional/local levels, were used focusing on gathering insights on various challenges to EE policy implementation and resulted in 55 individual responses to the needs assessment. A needs assessment analysis of the questionnaires followed the structure of the different EED articles.

At the regional/local levels, the main needs identified were insufficient budget, the lack of stakeholder's available time and the difficulties to mobilise them. Also, as the main threats identified were the need for the existing legislation to evolve in order to allow the development of energy efficiency policies, the need for simplification of administrative procedures and the need for training of the elected representatives in the context of energy efficiency issues. The qualitative analysis offered important input and showed the need for more consistent and comprehensible legal and financial regulations. Additionally, a need for regulations on the energy efficiency requirements of buildings and energy efficiency planning rules to be made more coherent was recognized, as well as for energy actions and climate change planning to be more in line with one another.

The analysis of responses from the national levels did not point any crucial weaknesses but did show the need for improvement of the energy modelling at the local and regional levels, as well as the improvement of the monitoring energy efficiency at

the local level in the context of exemplar role of public body buildings. Furthermore, as the public sector should be notified where targets are not being met, consequently the improvement of the monitoring of implementation at regional/local levels is necessary. The findings from both questionnaires showed several biases, at the national levels this was mostly due to the question syntax and to the fact that most of the interviewees work in the national institutions. It seems that for representatives of national policies, it can be somewhat difficult to underline lacks and weaknesses at the national level. On the other hand, similar kind of bias was found at the local/regional level, where for energy agencies or municipalities it was sometimes easier to identify national threats, such as insufficient budgets or needs for legislation evolution, than specific local weaknesses.

In response to the needs identified, a matching tools and resources with needs on implementing the EED policies was conducted. Matchmaking matrix included 54 good practices and 146 tools and aimed to identify means of assisting policymakers in tackling their specific issues. The highest number of matched good practices addressed the needs of regional and local governments in implementing their energy-efficiency policies such as lack of capacity, resources, and skills for replicating plans/strategies. No good practice was found to match the need for the public sector to be informed when targets are not being met, although this was identified as the main obstacle for the achieving of energy saving targets in the public sector. Tools and good practices support the policy making processes on different layers and addressed several EED articles, most often aspect of information and training (Art. 17), financing and technical support (Art. 20); energy services (Art. 18) and audits (Art. 8); and also aspect of renovation strategies (Art. 4) even if this need has not been identified in this context. Matchmaking analysis identified the general lack of tools on the role of public buildings, metering, billing, cost of access to metering and billing, penalties, energy transformation, distribution, qualification, accreditation and certification schemes. These issues require further support to assist regions and cities in the implementation of sustainable energy efficiency policies.

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