

## Annex 10.1

# INSTRUCTIONS

## On how to conduct survey and evaluation (monitoring)<sup>1</sup> of the implementation of municipal energy programmes (MEPs)

### Introduction

The survey and evaluation (monitoring) of the implementation of any Municipal Energy Programme represent the final step of the municipal energy planning process. The significance of that step is of exclusive importance for the identification and evaluation of the actual results from the implementation of the programme and for ensuring the results sustainability. Through the survey and evaluation of the results from the implementation of the Municipal Energy Programme the following tasks are realized:

*To avoid the formal approach to Municipal Energy Planning (MEP)*

There are still municipalities, which make certain efforts in developing Municipal Energy Programmes to meet specific regulatory requirements without being fully aware of the need of accurate and consistent implementation of these programmes. That attitude influences both the process of working out of these programmes and the process of their implementation. Sometimes, despite of the existence of municipal energy programmes the local authorities' actions continue to be random and chaotic, the energy efficiency projects and measures are being selected on the basis of subjective decisions and without correspondence with the approved municipal programmes. In practical terms this approach makes the programmes pointless and therefore it should decisively be rejected. Introduction of mandatory survey and evaluation of the results of the on-going implementation of the programme is a significant precondition for compliance with the approved programme and its consistent implementation.

*To improve the results from the implementation of MEP*

The observations reveal that programmes (not only related to municipalities and energy efficiency), whose implementation has been monitored, achieve up to approximately 30% higher results as

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<sup>1</sup> The notion "monitoring" is usually used to denominate a complex of three basic actions – survey, analysis and evaluation. Since the evaluation is always performed on the basis of certain analyses, the word "analysis is sometimes omitted (it is assumed to be implicit) and monitoring is presented as "survey and evaluation". In this guide we use the term "survey and evaluation" and for short also the summary notion "monitoring", which is gaining ground as a term in many national languages.

compared to similar programmes whose results have not been subject of survey and evaluation.

*To ensure reliable updating of MEP*

MEPs are usually compiled for medium-term periods of 4-5 years, which corresponds to the mandate of the elected local authorities. Frequently, certain changes in the conditions for implementation of some of the planned energy efficiency projects might occur during those periods. For instance, the real capacity of a given municipality to implement the projects or to apply certain measures, as well as the available financial means may not always correspond to those laid down in MEP. Because of these or some other circumstances it may become necessary for some of the projects to be implemented earlier than scheduled or to be postponed for later periods. All these factors impose the need of annual update of the programmes which is done by the annual Action Plans. Any such update, on the other hand, should be based on accurate data about the current state of the municipality. Such data is provided by the information system and also by the survey and evaluation (monitoring) report of the changes that have occurred as a result of the programme implementation during the past periods.

*To provide data for accounting the contribution of the municipalities*

In connection with the implementation of the national programmes for climate change mitigation municipalities periodically submit information about their energy consumption, about implemented projects and measures for energy efficiency improvement and introduction of energy generation from RES, reduced CO<sub>2</sub> emissions, realized investments, etc. The monitoring of MEP implementation reports are the sole reliable sources of such information.

The subject of this Guide comprises the organization, implementation and reporting of the activities related to the survey and evaluation (monitoring) of Municipal Energy Programmes. Every action is reviewed separately from the rest in order to clarify its substance and significance. In fact, some of these actions run consecutively, others take place simultaneously.

There are no accurate recipes as to how to perform monitoring of the MEP implementation. There are, however, good practices and lessons learned which may serve as examples for preliminary consideration and organization of the activities. Described in this Guide are also possible methods for implementation of a set of activities related to the survey and evaluation.

### **Preliminary arrangements**

This first action precedes the rest and creates prerequisites for timely launching of monitoring and its regular application during the entire planning period. The preliminary arrangements will give answers to the following major questions:

- *Why is monitoring performed?* This is the point, at which the objectives of the monitoring are set up and who and how will use the results from it.

- *What is the subject of monitoring?* To answer this question the following items should be defined: which elements of the implementation of MEP will be the subject of survey and evaluation; what data will be collected – detailed data about the implementation of specific indicators or summary data of the major priorities and objectives of MEP; what sources of information will be used.
- *Who will perform the monitoring?* The idea is to determine the composition of the team of experts, including municipal experts and /or hired external experts.
- *What will be the frequency of reporting?* Decision is made as to the periods for which the data from the monitoring will be summarized and analyzed and recommendations will be made.
- *What funds will be required?* These funds should be envisaged and allocated in the budgets of the municipal energy programmes themselves.

The answers to these questions help to define the monitoring objectives and scope, the necessary resources (human, material and related to timing) and the frequency of reporting.

The activities related to monitoring of the implementation of any Municipal Energy Programme, as well as the human and funding requirements, shall be planned in the Programme itself and in its budget. For that reason this Guide shall be treated as an integral part of the Guide on Municipal Energy Planning and more specifically as an aid to the performance of the activities under the last Step 10 of the MEP process.

### **Scope, indicators and output data**

This action serves to define the scope of monitoring, the indicators for evaluation of the implementation of the programme and the set of output data, that will be generated in result of the surveys.

#### **Definition of the scope of monitoring**

First of all it is necessary to define which elements (objectives, projects, measures or activities) of the Municipal Energy Programme shall be the subject of survey and evaluation. These may be the main objectives of the programme – reduction of energy consumption; limitation of fuel and energy costs and minimizing of GHG emissions or improvement of the quality of services. Subject of the survey may also be the investments made and their cost-effectiveness (rate of return), as well as the number of the population that has been affected by the programme. Certain more ambitious programmes may contain broader plans for survey and evaluation, under which every individual project or activity of the programme can be a subject of survey, analysis and evaluation. The description of the scope of monitoring is part of the programme itself. On the grounds of the approved scope of the monitoring the necessary human and technical resources (experts and equipment) shall be determined as well, while the required financial resources shall be envisaged in the budget of the programme.

### **Identification of the indicators to be evaluated**

The identification of the indicators for evaluation of the results from the implementation of the programme is of decisive importance for the final success and for the practical benefits from the monitoring. The major requirement with respect to the indicators is that they should be clear and measurable - an important precondition for their objective reporting. Some possible indicators are as follows:

- Volume of investments made (for instance in millions of the respective currency).
- Energy saved (in absolute figures - kWh) or reduced energy consumption (expressed as a ratio in percentage).
- Specific energy consumption (for instance in kWh/m<sup>2</sup> floor area of the building or in kWh/inhabitant).
- Comfort level (for instance indoor temperature or luminance level of rooms or streets).
- Quantity of reduced emissions (for instance in absolute figures - t CO<sub>2</sub> or as a percentage as compared to previous emission levels).
- Rehabilitated floor area of buildings (in absolute figures - m<sup>2</sup> or compared to the number of population - m<sup>2</sup>/inhabitant).
- Rate of return on investments made (for instance as the value of the Internal Rate of Return - IRR or as a Payback Period - PB).
- Production cost per unit of energy saved or reduced emissions (for instance €/kWh energy saved or €/t CO<sub>2</sub> emissions reduced).

In a number of cases the accounting of an individual indicator cannot ensure complete picture of the results from the implementation of the programme if it is not compared with other indicators. For instance, if the absolute energy consumption is reduced, this fact should be compared with the achieved comfort of habitation (lighting and space heating). In this way it is possible to establish whether the reduced consumption is the result of the improved energy efficiency only or is also the consequence of decreased comfort of habitation.

In selecting indicators for evaluation of the programme it would be appropriate to take also into account the specific data, which the municipal administration commonly collects for the elaboration of different types of reports and statements for the central authorities, most frequently for the Ministry of Finance, the Ministry of Energy or the Ministry of the Environment. In the event of good compatibility of the indicators with the needs of such data the time it takes to prepare such reports may be decreased significantly. At the same time the reliability and accuracy of the information is ensured and the submission of different data to different institutions is avoided.

### **Determination of the necessary input data**

During the performance of surveys on the implementation of the programme specific data is collected, which is recorded in protocols. On the basis of summary and analysis of the data the degree of implementation of the respective indicators is determined. When the

data refers to energy consumption or determination of the comfort level, the most accurate information is obtained by metering using the appropriate devices. Data of this kind is for instance energy savings (% or kWh) in the individual sites or in the municipality as a whole, floor area (m<sup>2</sup>), indoor temperature in the individual sites (t<sup>0</sup>), degree of luminance (Lux) of the rooms and open spaces, etc.

When the data refers to financial expenditures, the information is usually obtained from accounting documents and bank statements, which are kept by the financial departments of the municipal administration. This information may be presented both as absolute values and as a relative value of the investments per inhabitant or per m<sup>2</sup>.

It is necessary to identify the most reliable sources for collection of the data required for performance of the analyses and evaluations. Such are, for instance, the data obtained by measurements, which should be performed periodically or continuously by skilled experts. To this end metering devices are installed, whose readings should be given and analyzed periodically. On the other hand, certain information might be obtained from the respective energy managers of big sites or their top officials (school headmasters, directors of hospitals, child care establishments, etc.) or from the respective financial and technical departments of the municipality or the big sites. It is desirable that any information obtained indirectly (not by measurements) is carefully checked or corroborated by a second source.

### **Methods for performing monitoring**

Different methods for performance of monitoring are used in practice. The selection of any of them or a combination of several ones depends on the type and size of the municipality, of the nature of the main projects and activities envisaged in the programme, of the manner of financing and reporting, of the experience and capacities of the involved team, etc.

*Monitoring is most successful when the bases for its survey and reporting are laid down as early as in the process of compilation of the programme.*

The selection of the method for performance of monitoring on the implementation of a municipal energy programme depends to a large extent on the political will of the municipal administration to control certain aspects of the programme.

### **Theory-based evaluation**

This type of evaluation is usually applied for comprehensive and detailed survey of a large number of indicators. It is appropriate for very big municipalities with comprehensive and complex programmes, whose implementation would require multi-aspect survey and complex data analyses. To perform monitoring of this type is usually expensive and beyond the capacity of a single municipality. It requires involvement of big research centres and the use of complex and expensive methods of analysis and evaluation.

**Impact / performance evaluation**

Under this type of evaluation the monitoring is focused on the impact of the programme implementation and the sites performance after the realization of the improvements. Some of the indicators to be used for evaluation in this case are the degree of impact of the programme on the behaviour of the entire population or on the behaviour of the residents/users of the respective sites (residential buildings, hospitals, schools). The subject of survey may also be the performance of the sites after the implementation of the projects – buildings, lighting systems, transportation networks etc., for which respective measurements are conducted. It is also possible to monitor the impact of the programme on the quality of the services provided by the municipality – public lighting, transport, district heating, etc.

**Cost-benefit (cost-effectiveness) analysis**

When the socio-economic impacts of the programme are promoted as priority of the monitoring effort, the evaluation is usually based on comparative analysis of the costs and benefits and/or analysis of the cost-effectiveness. In such cases the evaluation is performed using economic indicators, such as Investments Rate of Return and the Payback Period, compared to the different benefits from them. Specific attention may be paid to the impact of the programme on the amount of public expenditures, which may be the subject of different kinds of studies (public expenditure tracking surveys).

**Evaluations through sociological surveys**

The information about the effects of the programme may be collected also through public debates, opinion polls and surveys or any other techniques of sociological studies. Ensuring the broad participation of the local community in the evaluation of the effects from the implementation of the municipal energy programme, especially those that are not technically measurable and are evaluated through subjective criteria, is certain guarantee for achieving credibility of the evaluations and ensuring public support for continuation of the implementation. To this end the results from the implementation of the programme may be periodically announced and subjected to public debate, mobilizing in this way the public support for the further implementation of the programme.

**Evaluation on the basis of a logical framework**

Recently planning, based on “logical framework”, acquires growing popularity thanks above all to its simplicity and clear internal logic. Under this modality of compilation of the programme the major indicators for evaluation of the effects from its implementation are identified simultaneously with the selection of priorities, which makes monitoring much easier and effective. Using this approach the advantages of the above listed methods may be successfully combined.

## **Recording of monitoring data**

In the course of generation and recording of data from the surveys several simple rules should be observed in order to prevent errors and inaccuracy of the obtained information and later on of the conclusions made.

### **Frequency of data generation and reporting**

#### *Data generation*

The accurate determination of the regularity (frequency) of data generation (collection) is an important condition for the success of the monitoring. This frequency should be set up on the basis of the programme objectives and careful analysis of the selected indicators. For instance, measurements may be performed on an hourly basis, at specified hours of the day, on a daily, weekly or monthly basis, etc. Depending on the requirements of the analysis solutions should be selected, that will not lead to generation of excessive amounts of useless information, but would rather ensure sufficient data to allow the accomplishment of comparative analyses.

#### *Data reporting*

The frequency of reporting the results is another important prerequisite for the credibility of the conclusions. Irrespective of the frequency of data collection, the reporting may be performed on a monthly, quarterly or annual basis. Not all the data however can be collected and reported at identical time periods. That is why it is necessary to coordinate carefully the periods of collection, analysis and reporting of the information. It is desirable that the information and conclusions reported to the municipal decision-makers should cover sufficiently long periods of time in order to prevent making erroneous conclusions on the basis of temporary deviations. Quarterly reporting is usually a suitable time frame for periodic information of municipal decision-makers, while in-depth annual analytical reports with recommendations are a mandatory basis for drafting the Action Plans for the next year.

### **Data about the various impacts of programme implementation**

As a result of the implementation of any municipal energy programme (or of individual projects and activities) different direct or indirect effects may be achieved, as well as effects which are manifested both within the period of validity of the programme and beyond its limits.

#### *Direct effects*

The technical energy efficiency measures in buildings result in energy savings, which might be assumed as direct effect from their implementation. Direct effects are also almost all that are in result of the implementation of investment projects for energy efficiency improvement. These effects are commonly represented as the difference between the baseline energy consumption (established prior to the start of the project) and the reduced consumption for the respective year as a result of the projects implementation. These

values are most often determined by measurements or by the data from the accounting documents.

#### *Indirect effects*

Through training of officials from the municipal administrations conditions for better energy management in municipal sites can be created. As a result significant energy savings can be achieved, which however are not directly measurable. The effect of the majority of these "soft" measures or activities (training courses, information campaigns, incentives for promotion of energy conservation, etc.) are indirect, although they might be considerable in value and importance and have a long-term impact. There are different methods for calculation of such indirect effects, which might involve taking account of some side factors that have influenced them.

#### *Effects in the framework of the programme (medium-term effects)*

Both direct and indirect effects from the implementation of the programme and some of its individual elements (projects and activities) attain certain values during the period of validity (implementation) of the programme. These effects are reported at the end of the planning period in the final report on the monitoring.

#### *Post-implementation effects (long-term effects)*

In the majority of cases the effects from the projects and activities laid down in a municipal energy programme continue to be felt even after the period of validity of the programme itself. The technical measures applied in a building (direct effects), for instance, may have a life cycle of 10-15 years, while the term of the programme has been only 5 years. The improved capacity of the municipal administration (indirect effects) may also have a longer influence on the local authority's activities than the timeframe of the programme itself, etc.

For a number of objective and subjective reasons the direct and indirect effects may decrease with the time. This situation is taken into account by the introduction of adjustment coefficients (the "causality" factor), which are set up through expert assessment and reflect the estimated decrease of the effects (savings, impacts) in regard to their initial maximum volume.

The effects, which get beyond the timeframe of the programme, should not only be reported at the end of the planning periods, but should be surveyed after it. In this way conditions can be created for their sustainable up-keeping for the longest possible time. In the course of the survey all effects of the projects and activities – direct and indirect, medium-term and long-term (after the period of the programmes validity) – should be taken into consideration. Each of these effects should be recorded and tracked under separate items in the database.

## Recording of energy savings

### *Direct savings*

By means of the model table "Direct energy savings" the energy savings and reduced CO<sub>2</sub> emissions, achieved as a result of the implementation of energy efficiency projects and measures in buildings which are incorporated in the municipal energy programme, may be recorded and reported.

*Table: Direct energy savings in the framework of the programme validity*

Year	Total floor area affected by the EE measures	Energy savings kWh/m <sup>2</sup>	Adjustment factor (coefficient)	Total energy savings kWh	Total reduction of CO <sub>2</sub> emissions
1	2	3	4	5	6
2010			1		
2011			1		
2012			1		
2013			1		
Total					

In column 2 is recorded the total floor area of the buildings, which has been affected by the programme. In column 3 are recorded the energy savings related to one square meter floor area, and in column 5 – the total energy savings for the total floor area affected by the measures. In column 6 is recorded the total volume of reduced CO<sub>2</sub> emissions.

When a shorter (for instance one year) period of the programme implementation is surveyed, it is possible that the energy savings will be equal to those calculated initially. If, however, the survey covers a longer period (several consecutive years), it may be assumed that in the course of the years certain changes in the conditions might have taken place, which would eventually decrease the effect of the measures and limit the savings. In such cases an adjustment coefficient may be introduced ("causality" factor).

*Table 2. Direct savings after the project implementation*

Year	Total floor area affected by the EE measures	Energy savings kWh/m <sup>2</sup>	Adjustment factor (coefficient)	Total energy savings kWh	Total reduction of CO <sub>2</sub> emissions
1	2	3	4	5	6
2014			1		
2015			1		
2016			0.8		
2017			0.8		
2018			0.8		
2019			0.6		
2020			0.6		
TOTAL					

Recording of the effects of the programme implementation (in particular the energy savings) may continue in the same way after

the expiration of its planned period. Reasonable setting up of the adjustment coefficient is of particular importance for this recording.

#### *I n d i r e c t   s a v i n g s*

Indirect energy savings are determined not by measurements with specific devices and hence their accounting is connected with a considerable degree of subjectivity. Such savings are usually achieved by the implementation of "soft" projects or measures. Monitoring of the indirect effects (savings) may be performed in two ways:

##### *(a) T o p - d o w n   m e t h o d*

This type of monitoring is based on preliminary determined total energy saving potential in the municipality. In the programme it is defined what portion of it can be mastered through "soft" projects or measures. It can be assumed, for instance, that by raising the awareness and training of households the residents' energy-related behaviour could be changed. On the basis of expert assessment we may assume that this behavioral change would contribute to the utilization of 10% of the energy efficiency potential in the buildings occupied by them. To pick up the rest of the potential we may envisage technical energy conservation measures.

##### *(b) B o t t o m - u p   m e t h o d*

In the case of bottom-up monitoring it is necessary first of all to calculate the estimated savings per selected unit (m<sup>2</sup>, inhabitant, household, site, etc.) and multiply it by a coefficient of replication. In order to determine the savings, which a medium-size household may achieve, we may again apply the assumption that as a result of the changed energy-related behaviour it may save 10% of the total energy saving potential of the building. The identified in this manner energy saved per household we may multiply by the number of households influenced by the project (using the coefficient of replication) and obtain the total energy savings resulting from that project.

In order to achieve the highest possible degree of credibility of the expectations from the programme, two approaches of survey and evaluation may be applied simultaneously – top-down calculations and bottom-up assessments – finding in this way the reasonable cross-cutting effect. In this way on the base of the concrete example mentioned above the number of households that should be included in the project may be found.

#### **Organization of the information**

Contemporary development of computer hardware and software is a perfect precondition for building and maintaining an information system for municipal energy planning and management. It is recommended that every municipality should create its own computerized information system. Such system should contain information about the status of the sites in the municipality at every moment as well as historical data about their status in previous years. Every new information that is entered in the system as a result of the monitoring on the implementation of the current

Municipal Energy Programme would enrich the system and improve its reliability.

The credibility of the information is a major prerequisite for the reliability of the conclusions from the analyses. Since the information is normally collected from different sources, sometimes the input data is in different, often incompatible dimensions (kg/tons, kWh/kW, etc.), which influences the final results. In order to avoid errors of this kind it is necessary to design simple conversion tables with clear instructions as to how to fill in the required data, while the responsible officials should be duly trained or instructed beforehand as to how to use them.

### **Evaluation and reporting of the results**

The evaluation of the results from the programme implementation is based on the data, which show the degree to which the preliminary defined success indicators have been met. The existence of clear and easy-to-measure indicators is a precondition for avoiding the subjectivism of any evaluation. For instance, when the indicator “*energy savings per 1 m<sup>2</sup> floor area*” is tracked, the data is obtained by summing up the energy saved as a result of the implementation of the individual energy efficiency projects in different buildings on the area of the municipality. This data is filled in periodically and is accumulates so that at every specific stage of the implementation of the programme it is possible to trace out the degree, to which a given indicator has been achieved. That may give the municipal leaders grounds to take the appropriate actions to support and accelerate the implementation of certain projects or to redirect resources from one direction to another if that would be in the interest of the overall implementation of the programme.

When monitoring data is analyzed it is possible to compile summary reviews of the results by sectors (buildings, services, transport) or to establish summary indicators, which have not been previously selected as success indicators (specific energy consumption, cost per 1 t saved emissions, investments per inhabitant, etc.). Using graphs and comparisons the conclusions from the monitoring may be visualized and turned into an effective management tool.

The analyses, conclusions and recommendations compiled on the basis of the results from the monitoring are summarized as reports for the municipal management. The periodicity and contents of these reports shall be agreed beforehand among the stakeholders. In order to serve the municipal leadership, it is recommendable that these reports should contain the following information:

- Description of the baseline status, in relation to which the comparative analyses in the report are made.
- Summary data about the implementation of the programme by each of the predetermined success indicators.
- Evaluation of the data by individual indicators and recommendations concerning the next stages of implementation (in the final reports these recommendations address the next planning period).

Sample



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- Description of the conditions, under which the monitoring has been performed during the period under review, any encountered difficulties/barriers and the opportunities for their overcoming.