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**Monitoring and Evaluation Research of
Energy Efficiency Policy Deployment
Parallel Monitoring, Evaluation, and Communication Research;
Impact and Awareness Evaluation
– Collaborative Approach –**

Review paper

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Serbian Energy Efficiency Project, corresponding to a millennium goal of sustainable development is, methodologically wise, completely innovative. Parallel with defined Project's objectives, it brings in an innovatively developed M&E approach, named "Parallel Monitoring, Evaluation and Communication".

*In this paper we will focus on following aspects that approach involves: Participatory M&E of goal achievements; Research of the **resonant** effect of Project's impacts, thus Impact Evaluation; Evaluation of the overall energy efficiency policy Instrumental and Conceptual; Communication of M&E research results, outcomes and policy impacts.*

Methodology interactively encompasses various criteria and aspects, from technical and economic, to social and environmental.

Evaluation also encircles: Instrumental impacts – implementation of energy efficiency measures, achieved savings, reduced environmental impacts; Conceptual impacts – energy efficiency awareness raising, knowledge improvement and spreading, increase in beneficiaries satisfaction and comfort, changes in behavioural patterns, changes in public discourse.

This innovative approach forms a divine fusion of several, completely different sciences: Technical sciences, comprising architecture, civil engineering, mechanical engineering; Economy, finance and financial analyze; Human sciences like sociology, psychology and relatively new branch Communicology. None of the mentioned expertises is a solely used, thus their "collaboration" © produces a synergetic result in final evaluation!

By designing a methodology approach, we faced the most challenging task of how to compare inputs. That is how to find "common denominator" – etalon, that would serve as derivative unit for comparison.

Key words: *monitoring, evaluation, research, energy efficiency*

FOREWORD

On sustainability and energy efficiency in general

There is a growing – obviously unstoppable – realization that sustainability in general, respectively energy savings, could not be controlled by small groups of people,

companies, and neither states. This becomes the planetary concern which brings up the urgent need for efficient framework, *i. e.* “open” approach, since there is no other way to heal, neither individual nor global, welfare and environment – we need.

Energy efficiency policy brings into focus the need to reexamine the attitude toward natural resources and tomorrow of coming generations.

Practically, both on mezzo and macro level, unless they make changes, it is generally accepted that governments will not be able to afford to meet costs and social commitments tomorrow.

Energy consumption, dirty fuels, unaffordable energy bills, pollution, will reach a tipping point where the burden of financial commitments exceeds revenues.

Significant rate will continue its rise intensively, leaving no-choice, except to face this challenge and introduce energy efficiency measures.

The challenges of energy efficiency measures will be ongoing. Short-term or half measures cannot suffice.

Needs for changes in this sector calls for innovative measures, with a long term view – over lasting the time frame of individual projects – and dedicated to **creating an impact, not the outcome.**

EXECUTIVE SUMMARY

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In this paper we will focus on following aspects that approach involves:

- participatory M&E of goal achievements,
- research of the **resonant** effect of Project’s impacts, thus impact evaluation,
- evaluation of the overall energy efficiency policy Instrumental and Conceptual, and
- communication of M&E research results, outcomes, and policy impacts.

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- *Instrumental* impacts – implementation of energy efficiency measures, achieved savings, reduced environmental impacts, and
- *Conceptual* impacts – energy efficiency awareness raising, knowledge improvement and spreading, increase in beneficiaries satisfaction and comfort, changes in behavioural patterns, changes in public discourse.

This innovative approach forms a divine fusion of several, completely different sciences. Technical sciences, comprising architecture, civil engineering, and mechanical engineering; economy, finance, and financial analyze; and human sciences like sociology, psychology, and relatively new branch, Communicology.

¹ Serbian Energy Efficiency Project – World Bank credit (IDA) Credit YF3870) – Sustainability Project

None of the above mentioned expertises is a solely used, thus their “collaboration”[©] produces a synergetic result in final evaluation!

By designing a methodology approach, we faced the most challenging task of how to compare inputs. That is how to find “common denominator” – etalon, that would serve as derivative unit for comparison. Or, how to face “one to one”:

Physical parameters (<i>e. g.</i> temperature or heat consumption)	<i>vs</i>	Psychological parameters (<i>e. g.</i> perception, satisfaction, disapproval)	<i>vs</i>	Public opinion Public discourse Public Outreach
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This has been a challenge even to an experienced researcher to set up a basic standpoint.

PROJECT BACKGROUND

- Serbia Energy Efficiency Project, co-funded by IDA² Credit and local participation – total amount 25 millions US Dollars.
- Project’s objectives:
 - energy efficiency improvements in the retrofitted social public buildings (schools, hospitals, institutions for people with special needs) by implementation of energy saving measures on building envelope, heating system and interior lighting, thus make heating more affordable,
 - increase in end-user satisfaction with the improved indoor comfort,
 - to reduce the local and global environmental impact of the use of dirty fuels for heating of buildings in Serbia, and
 - end-users awareness raising on energy efficiency, on the need for rational use of energy and related cost and savings that could be achieved.
- Two components:
 - component A – Heat supply rehabilitation of Clinical Center of Serbia³, and
 - component B – Energy Efficiency rehabilitation of social public buildings – schools, hospitals and institutions for people with special needs;
- Implementation on two phases. We will focus on the 1st phase, which consists of two implementation years:
 - 1st implementation year – 10 buildings, and
 - 2nd implementation year – 18 buildings,Thus monitoring census counts 28 buildings.

But acquiring wider scope, in terms of setting up the M&E research system of energy efficiency and sustainability policy deployment, we realize that we will be influenced by many aspects: project-cycle itself, the main stakeholders and their inter-relations, the relation of the project to government issues, government to energy efficiency

² International Development Association

³ Not in the focus of this paper, since only focus groups method was applied according to Project's terms of reference

and sustainable development policy, European Union Regulatory Policy, directives and actions, global initiative and so on.

METHODOLOGICAL INPUT

The complexity of overall M&E research arises from two, co-varied issues.

The first is project of implementation of energy efficiency measures within group, *i. e.* social public buildings.

Second is the impact M&E research of related project on energy efficiency policy, since it is the largest energy efficiency project in the area.

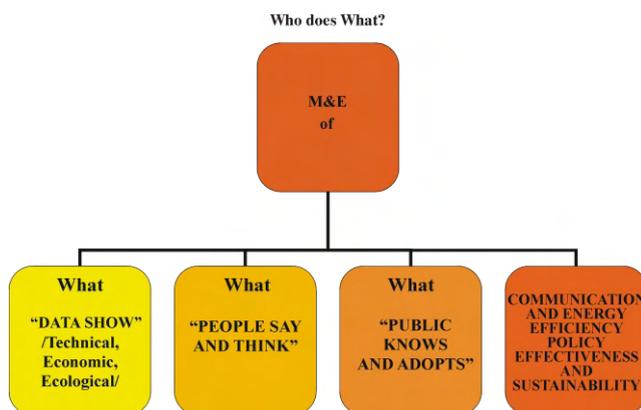
We have two strata:

1st – *Impact Evaluation* – Project outcome model. Program being independent variable and outcomes/impact being dependent variable.

2nd – *Influential Evaluation* – Policy outcome model. Now, project’s impact becomes the input into energy efficiency policy in future, thus policy itself becomes a dependent variable, too.

Project – impact – influence – policy outcome/impact.

In favour to explain applied M&E research methodology, let us briefly graphically illustrate:



STEPS IN MONITORING AND EVALUATION RESEARCH

Planning

Determining the Model of M&E research

What is so innovative and why we have to carry out Parallel M&E Research?

Technical measures should meet technical, financial needs, and environmental need;

Social science and social responsibility, meets satisfaction and socio-psychological needs of end users and community at large;

Communication acquires feedback on the progress and gives incentives to stakeholders.

Cohesion of different measures, integrating needs and technology, enhances:

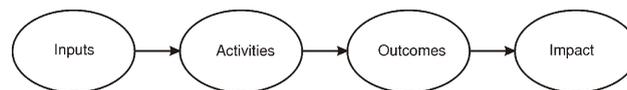
- savings at one side, and
- satisfaction, awareness and comfort, regulative on the other.

This is how collaborative approach pursues innovation.

Collaborative approach, applied technically (technical monitoring), reasonably and scientifically (social monitoring), interactively (communication and publicizing), makes not only benefits, but a difference with extended, multiple impact.

Finally, the chosen model of Monitoring & Evaluation research is:

“*Project Outcome Model*” – portrayed in terms of inputs, activities, outputs, outcomes, and impacts.



Log frame or else?

Due to related multiple goals to be achieved, we face multitask activities; hence we achieve multilevel outcomes and impacts. In certain practice this has always being a challenge for the researcher how to set up a proper Log frame matrix.

Having in mind these obstacles and for the sake of more clarity and feasible visibility for stakeholders and management, we have chosen the *Outcome Sequence Chart*, rather than “*cascading log frame*”.

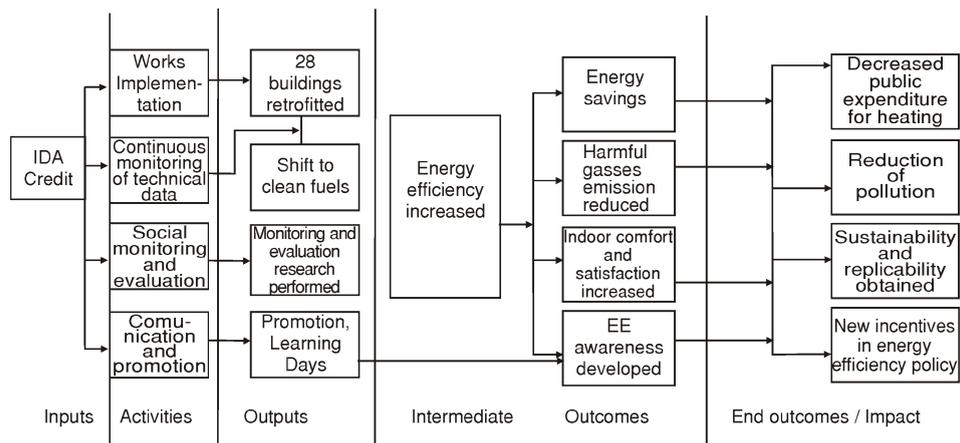


Figure 1. Outcome sequence chart⁴

⁴ Author: Gordana Stojanović

*Key performance indicators*⁵

Progress towards the development objectives would be monitored through a set of indicators agreed with the Borrower. The energy efficiency component will emphasize monitoring and evaluation, linking energy efficiency measures with improved functionality and health environments in buildings. Monitoring indicators include:

Key outcome indicators:

- quantified energy savings of the retrofitted public buildings, and cost of heat per square meter,
- improvement in air quality through reduction in emission of local air pollutants (sulfur dioxide, nitrogen oxide, and particulates) and greenhouse gases (carbon dioxide) produced by the boilers using dirty fuels, and
- increased end-user satisfaction measured through improvement in indoor air quality, indoor temperature, and perception surveys of improvement in comfort of students and patients.

Key output indicators such as:

- improved heat generation efficiency and reduction in heat losses in the rehabilitated heating network,
- number of buildings retrofitted with energy efficiency equipment,
- social monitoring and evaluation research carried out, and
- outreach programs performed.

TECHNICAL MONITORING & EVALUATION

Hereby we will address to technical monitoring briefly, since it a starting point of giving inputs into social impact and policy impact evaluations.

This is a result based monitoring, with fully and precisely developed methodology.

The purpose of this addressing is only to briefly show that correlation is most visible in the time-line of activities and sample selection.

Thus, we will not enter into in-depth review of applied technical and economical analyze and deployed monitoring methods.

1st step – Ex ante evaluation, technical, environmental, and economic

Of what: “BASE CASE” performance prior to implementation of recommended energy efficiency measures.

(Energy efficiency measures have been identified in separate extensive Evaluation Reports – Energy Audits, subsequently accepted by relevant Ministries).

*2nd step – Continuous technical monitoring*⁶

- baseline and outcome,
- before / after

⁵ Reference: PAD – Project appraisal document – PO 75343

⁶ Includes also financial monitoring and harmful gasses emission – primarily

When: Monitoring and measuring of the existing energy parameters – before the implementation. After the implementation of the measures same buildings are monitored during following heating season.

How: Defined by monitoring plan and protocol, designed by Design and supervision consultant.

Data to be collected:

- continuously monitored data within the monitoring period of four weeks on the hourly basis (*i. e.* thermal energy consumption, temperatures, humidity *etc.*).
- data obtained from single point measurement (*i. e.* illumination level, O₂, air flow *etc.*) before and after implementation of proposed energy efficiency measures.

3rd step – Ex post evaluation

- baseline *vs.* outcome and
- before / after

Why:

- verification of achieved energy savings,
- establishment of heating energy consumption benchmarks for featured buildings,
- developing a Benefit sharing scheme in favour to acquire the part of funds and pass them to end users.

Indicators:

- consumption of energy for heating in MWh,
- costs, related to energy consumption, and
- CO₂ and harmful gasses emission.

4th step – Benchmarking

In favour of developing Benefit sharing scheme – meaning that achieved calculated savings and related reduced cost will be passed back to end beneficiaries for further needs or re-investment (at the far end the self-government or beneficiary could become a kind of “Self-ESCO enterprise”).

SOCIAL MONITORING & EVALUATION

Characteristics of the research

Research focused on *subjective perception of the* Energy Efficiency Project’s *outputs* in schools and medical centers in selected locations in Serbia.

Innovative socio-psychological research project (without direct role models in literature on energy efficiency) encompasses special reactions of target audience to energy efficiency measures in respective objects (schools and hospitals), where people live, work, study, receive medical treatment, *etc.*

Target groups

The Project, and consequently research, focuses on several target groups. They considerably differ in structure and size, since the energy efficiency issue is an overall issue involving all social groups and institutions.

It is equally natural to assume that considerable differences exist in the level of information and knowledge, as well as in the level of energy efficiency awareness. Therefore, qualitative research was of a great assistance for in-depth analysis, while *quantitative research* tools were more appropriate for overall assessment (*e. g.* with each target group) and for general insight.

The survey target groups have been defined in accordance with the project implementation field, namely the schools and the medical centers. In the focus of interview were students and school professionals – from school principals to teachers and head teachers to those in charge of energy issues and building maintenance, patients and a number of doctors and nurses, along with interviews with municipal officials involved in the project.

Research tools

Two specific research approaches have been applied at the same time, but with different target groups.

Qualitative approach

Individual interview of a similar structure as in Focus groups on energy efficiency.

Quantitative approach

Self administered survey during class (the so-called steered interview).

Questions

The first step in the program evaluation planning process is determining questions. We insisted them to be clear, focused, and relevant. So, we used:

Normative questions: which compares “what is” to “what should be”, and

Outcome/Impact questions: determining “what difference the program makes.”

- *A logical theory:* the connection between the program and outcomes should make sense. It is logical to expect from beneficiaries to spread the knowledge and attitude towards energy efficiency.
- *Co-variation:* both the program and the outcome should have the ability to change. This means that if we compared the attitude and awareness of beneficiaries and other groups that did not received the same program (variation in program participation) we would see whether there were changes in behavioural pattern (variation in conceptual issues).
- *Elimination of rival explanations:* we needed to enable the proof that it is the Project and related communicating activities, rather than other factors that explain the changes we have measured.

Design

Project's appraisal indicators are very demanding, thus requiring sophisticated M&E methodology:

- dominant “technical tendency” requires equivalent “subjective tendency”,
- in both cases both measurements and evaluation are required, and
- effects have to be scoped on both fields, and also in at least two time lines: at the beginning *Before* and the end *After* of the research⁷.

For this purpose double (comparative) research is being prepared:

- *Initial* (Baseline), and
- *Evaluation* (After).

We have used *experimental research design*.

Indicators

The key indicator is an increased end-user satisfaction measured through:

- improvement in indoor air quality, indoor temperature and lighting, and
- improvement in comfort of students and patients and employees.

During research, following measuring have been carried out:

- subjective perception of indoor comfort by the end user,
- informative level on energy efficiency issue,
- attitude towards energy efficiency, and
- openness and readiness for cooperation and change.

The hard line of the research was the definition of the measuring of the subjective perception. Technical aspects of the Project were known (Design & supervision consultant's technical measures package proposals), while subjective, psychological, *i. e.* perceptive aspects do not have their equivalent in it (for example, experiencing sensations like “warm”, “cold”, “better”, “same”, “blows”, “does not blow”, *etc.*). Team of experts has developed series of such measures.

DATA COLLECTION – DEVELOPING DATA COLLECTION STRATEGY

Research sample

Sampling method used:

Non-random sampling in the first strata and than random sub-sample of respondents

Modality:

Judgmental

Type:

Panel sample and sample of equivalence.

⁷ Before and After designs are also called pre- and post-tests

In this kind of sample, selections were made based on pre-determined criteria. According to team consultations sampling method used not just one but *several sub-samples*:

- students in schools,
- teaching staff and non-teaching staff,
- patients in health centers,
- medical and non-medical staff, and
- local self-government representatives.

Sub-sampling among these groups has been random.

Sampling criteria:

- geographic (North, South, developed region, deprived region, urban, rural, *etc.*).
- characteristic of buildings (*e. g.* area, heated area, age, fuel type, *etc.*), and
- energy efficiency measures applied.

Research tools

Three special instruments for these types of research (in compliance with different target groups of project participants) have been prepared for schools and health centers:

- questionnaire for the pupils,
- questionnaire for the interview with medical center patients about energy consumption and energy saving, and
- conversation reminder for the talk about energy efficiency.

These tools are dedicated for survey of:

- students,
- patients, and
- professionals in schools and hospitals.

Conceptual survey framework

Surveys envisaged within this project relay upon experiences based on focus groups; however they are also extended to:

- interviews with end-users (students in schools and patients in hospitals), and
- interviews with professional and technical staff in schools and hospitals, as well as municipal officials involved in the Project.

IMPLEMENTATION, MODEL OF DATA PROCESSING AND ANALYSIS

Data processing and analysis

Introduction on research interpretation:

- qualitative researches are interpreted *categorically and descriptively*,

- quantitative researches are interpreted *with previous statistical processing (tables in the attachment are statistical measures H-Square Test and C-Coefficient)*⁸,
- comparison of *Before* and *After* research are consistent for both research types, and
- the “constant” – research conditions *Before* and *After* under which surveys have been carried out.

AN OVERVIEW OF GATHERING, MANAGING AND COMMUNICATING RESULTS

The journey data would take

Data travel. In this journey data are gradually collected, collated, and analyzed as they move from site monitoring field, to be centrally available for management reports and broad dissemination.

Journey involves:

From **Data** to **Information** to **Knowledge** to **Dissemination**

Data are the raw material and has no meaning yet.

Information involves meaning by synthesizing and analyzing data.

Knowledge emerges when the information is related back to concrete situation in order to establish explanations, lessons, and awareness.

Various tools will be used to communicate findings.

There are **two** ways of communication:

- Internal inside Project, and
- External towards external publics.

Reporting results inside Project – internal

*Technical monitoring report*⁹

The aim of the Technical Monitoring Report is to analyze and verify the successful implementation of the works. This means monitoring the buildings “as is”, *i. e.* “before” the refurbishment works, and comparing this to its performance “after” the refurbishment has been completed.

*Social monitoring report*¹⁰

The aim of the Social monitoring report is to analyze and verify the successful achievement of set objectives. It is supposed to identify if changes occurred in which direction. In this case this is the improvement of end-users’ satisfaction and indoor comfort,

⁸ Contingency (correlation) coefficient

⁹ JV BDSP Partnership L.t.d., London and Entel – Energoprojekt, Belgrade

¹⁰ PR Communications Hill&Knowlton, Ljubljana, Prvoslav Plavšić, TTL – Evaluation Report Before–After 2007.

rising of awareness on energy efficiency issues, the impacts of policy instrumentalisation, *etc.* This means monitoring the samples “as is”, *i. e.* “before” the works implementation, and comparing this to its performance “after” certain period of time.

The main consideration within subject reports was to obtain: internal validity.

Internal validity is an ability of a project to eliminate all the other explanations that reflect the impact.

COMMUNICATION AND REPORT ON ENERGY EFFICIENCY POLICY IMPACT

Communicating results towards external public, influencing stakeholders and impacting energy efficiency policy in general

Start of the Communication activities: 2005

Reporting party: World Bank, Government of Serbia, and Project Coordination Unit.

Overall communication activities have been carried out in compliance to Communication plan¹¹, generated upon scientific postulates of relatively new Communicology science.

Method used: SOSTAC analyze

- S – Situation (situation analyze and assessment),
- O – Objectives,
- S – Strategy,
- T – Tactic,
- A – Action, and
- C – Control (monitoring and evaluation).

THE STARTING POINT – BACKGROUND

General starting point:

- pre-implementation situation analyze and SWAT analyze,
- social monitoring and evaluation research, and
- pre-test study on energy saving and energy efficiency issues.

Communication task:

- project and energy efficiency promotion, dissemination, publicizing of Project’s activities and energy efficiency issues.

Objective:

- to adopt a positive attitude towards energy efficiency issues due to the resonant impact of the Project’s benefits, and
- impact on the future deployment of energy efficiency and sustainability policy.

¹¹ Author: Gordana Stojanović, M&E and Communication Expert

Communication objectives

General objective

- improve energy efficiency in public social facilities – schools and hospitals.

Specific objectives

- quantified decrease in energy costs and heating more affordable,
- proven economic feasibility of the investments,
- improved work and leaving conditions, and
- quantified reduction of local and global environmental pollution.

Social objectives

Creating a positive image and reputation of a Project through:

- increased end-user satisfaction and perception of improvements in indoor comfort of schools and hospitals, and
- perception surveys and raised awareness of general energy efficiency benefits.

Communication objectives

- information, dissemination and publicizing of Project's goals and outcomes within defined target audiences.

Impact objectives

- *Institutional* – to actively involve into instrumentalisation of energy efficiency within legislative framework, and
- *Conceptual* – to make an effort to influence public discourse and behavioural change.

Conclusions from Post-Test study

On Projects

Beneficiaries seem to be extremely open to receive further information and further education on energy efficiency and personal participation in similar projects, and propose strong media and other tools of publicizing. After all, this has been planned by the scenario of "Learning Days". (*e. g.* workshops, presentations, energy saving brochures, teaching packs, energy monitors in schools, *etc.*).

If we would summarize all suggestions, we could conclude the following: the young feel that all consumers should join energy efficiency campaign, including them. In the first place, schools should teach more about energy, then lessons and advisory classes should be organized for parents in order to educate the older people, who should then pass it over to the children, provided that they themselves follow advice. From the media is in that case much more expected.

The Evaluation report for the Condition After, for 2005, is added that the answers are much more favourable, undoubtedly under the impact of the interventions within buildings. Now, these become statements and state descriptions, not only the attitudes.

General conclusion is that there is an evident resonant impact of Project's and promotion activities. This is related to increased interest of potential beneficiaries and municipalities who directly address to PIU in favour to acquire information on possible project's replicas in their environment.

Also, there is an evident present of willingness to apply benefit sharing schemes as a first step to validate the outcomes of implemented energy rehabilitation works.

On Policy

Portraying outcomes of energy efficiency policy deployment, one must stress that sustainability ratings have improved over time, ever since the initial incentive of adopting Energy law 2004. Following has been a Strategy of energy development up to 2015 and the latest is the Program for Strategy implementation adopted in 2007.

The role of the Project's communications expert is to, as a technical support to Serbian Energy Agency, to pass necessary incentives for policy influencing and *vice versa*. To deploy adopted incentives and lessons learned whenever possible.

This interactive role, with a "push" and "pull" incentive models, has brought some insights into general tendency in energy efficiency deployment.

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Апстракт

Гордана СТОЈАНОВИЋ

Агенција за енергетску ефикасност Републике Србије, Београд, Србија

Мониторинг и евалуационо истраживање промене политике енергетске ефикасности Паралелни мониторинг, евалуација и комуникације; Евалуација утицаја пројекта – Колаборативни приступ –

Пројекат енергетске ефикасности у Србији, у свом одговору на миленијумски циљ одрживог развоја, методолошки је потпуно иновативан. Паралелно са дефинисаним циљевима, Пројекат доноси иновативно развијени приступ мониторинга и евалуације, назван „Паралелни мониторинг, евалуација и комуникације”.

Обрађени су следећи аспекти новоразвијеног приступа: партиципаторни мониторинг и евалуација остваривања циљева; истраживање резонантног утицаја Пројекта, евалуацију свеукупне политике енергетске ефикасности, инструментална и концептуална; комуницирање резултата мониторинга и евалуације, резултата и дугорочних утицаја. Методологија интерактивно обухвата различите критеријуме и аспекте, од техничких и економских, до социолошких и еколошких.

Евалуација такође обухвата: резултате инструментализације – примене мера енергетске ефикасности, постигнуте уштеде, смањење загађења животне средине; концептуалне резултате у вези са подизањем свести о енергетској ефикасности, повећањем и ширењем знања, повећањем задовољства корисника, променама у обрасцу понашања и променама у јавном дискурсу. Иновативни приступ представља сјајно уједињење неколико, потпуно различитих наука: техничких – архитектуре, грађевинарства и машинства; економије, финансија и финансијске анализе; хуманистичких наука као што су социологија, психологија и релативно нова грана, комуникологија. Ниједна од поменутих експертиза се не користи издвојено, већ њихова „колаборација” даје синергички резултат у финалној евалуацији!

Приликом пројектовања методолошког приступа, суочили смо се са веома изазовним задатком, како да упоредимо инпуте. Како да пронађемо „заједнички именилац” – еталон, који би служио као сведена јединица за поређење.

Кључне речи: мониторинг, евалуација, истраживање, енергетска ефикасност

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