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Effectiveness of Blending Alternative Procurement Models and EU Funding Mechanisms Based on Energy Efficiency Case Study Simulation

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Abstract: Over the past twenty years, many countries have been looking for alternative procurement models in providing public sector energy efficiency (EE) projects because of high public sector debt and budget deficit. These projects have traditionally been procured and financed by the public sector. While the majority of EU funding resources will be realized in more traditional, purely grant-funded procurement models, a new Investment Plan for Europe for the programming period 2014–2020 has focused on supporting higher private sector involvement in infrastructure investments for achieving the EU Strategy 20/20/20 goals. Seeing that the fundamental purpose of investing in infrastructure is investing in providing public services, the involvement of the private sector is only possible through some alternative procurement models. In these initiatives both the public and the private sector retain their own identities and responsibilities, while their co-operation is based on clearly defined divisions of tasks and risks. The main objective of this paper is to assess the effectiveness of blending alternative procurement models with available EU funding mechanisms in EE sector by applying case study simulation. The findings will show the effectiveness of alternative options and the use of blending solutions in EE investments.

Keywords: public infrastructure; public procurement; funding; energy performance contracts; energy efficiency; private sector participation; public-private partnership; ESCO

1. Introduction

In recent years, more and more research has started exploring the area of energy efficiency (EE) and models that have been developed within such projects. Due to the fact that EE projects have become a crucial policy tool for fostering public sector investments and a driver of the construction sector in many countries [1], as well as the rising public sector debt and budget deficit, many decision makers in the public sector have started to introduce new delivery models for the provision of public services [2]. According to the European Investment Bank (EIB) [3], energy performance contracts (EPC) and public-private partnership (PPP) are some of the most common options for the implementation of the public sector EE projects and are called alternative procurement models.

According to the European Commission (EC), the energy sector is one of the main elements of the Europe 2020 flagship initiative for a resource-efficient Europe [4]. For this reason, the EC proposed an update to the Energy Efficiency Directive [5] in 2016, which is mainly focused on three main pillars: "putting energy efficiency (EE) first, achieving global leadership in renewable energies and providing a fair deal for consumers" with the main purpose of cutting CO_2 emission by at least 40% by 2030. Today, about 75% of buildings are energy inefficient and, depending on the member state, only 0.4–1.2% of the stock is renewed each year [6]. While the majority of EU funding resources will be realized in more traditional, purely grant-funded procurement models, the new Investment Plan for Europe for the programming period 2014–2020 has focused on supporting higher private sector involvement in infrastructure investments, energy performance projects, research and innovation initiatives, etc., in order to achieve the EU Strategy 20/20/20 goals. Considering that the fundamental purpose of investing in infrastructure is investing in providing public services, the involvement of the private sector is only possible through applying some alternative procurement models such as EPCs or PPPs.

According to Sorrell [7] these contracts typically include obligations during the whole life cycle period. Polzin et al. [8] state that the private sector can identify public needs better and deliver public services through EPCs at a lower cost than current prices. According to Hannon et al. [9] and Marino et al. [10] the key element of success in these contracts is the involvement of the private sector not only during construction period, but during the whole life cycle of the contract. Bertoldi and Boza-Kiss [11] have made an analysis of barriers to the development of the EE markets in Europe. They have analyzed the EE market in EU member states and Southeast and East European countries. In their conclusion they state that EE markets vary widely across Europe, i.e., only a few countries such as Malta, Cyprus and Estonia lack any EE activity whatsoever, while the South-East Europe markets are at a high level of development, which can present a certain challenge if public sector decision makers want to achieve goals identified in the new Investment Plan for Europe. Recently, the European Court of Auditors published a report [12] where they stated that EU funds have not been sufficiently absorbed for providing alternative procurement models and that the legal and institutional framework in many EU member states is not yet adequate for EU supported PPP projects.

In Croatia, several researchers have investigated investments in the EE sector and their impact on the economic growth and development. In 2007 Bukarica, Morvaj and Tomšić [13] investigated potentials for cost-effective EE project improvements. They found that "policy measures should shift from strictly end-users oriented approach towards whole market approach." Pavković, Zanki and Čačić [14] have carried out an analysis of results obtained through selected energy audits and preliminary energy studies of public buildings in Croatia. In their conclusion, they have prescribed methodologies when implementing activities that are being undertaken in the preparation of basic documents that precede the realization of EE projects (such as EE studies, EE energy audits, etc.). Bukarica and Robić [15] have conducted a comprehensive research of the energy efficiency gap in Croatia on four groups of stakeholders: public institutions, businesses, civil society organizations and the media. The authors have concluded that relevant stakeholders of the overall EE development in Croatia attribute the EE gap in Croatia to the lack of a serious and strong political commitment to adopting and implementing EE policies.

As there is still a significant lack of scientific and professional research in this field, this paper represents an attempt to identify the process of allocation of EU funds with alternative procurement models for the purpose of implementing EE projects. This process is called blending.

The main aim of this paper is to assess the effectiveness of blending, i.e., using alternative procurement models with available EU resources within the new Investment Plan for Europe. The analysis is based on a Croatian case study in the energy efficiency sector. As the maximum effectiveness of each transaction can be achieved through the synergy of the public and private sector capacities, the overall objectives of this paper are: (i) to examine the possibility of applying alternative procurement models for the implementation of EE projects based on a Croatian case study in the operational phase, (ii) to analyze different funding mechanisms for the implementation of EE projects, (iii) to demonstrate a possible concept and effectiveness of EE project blending using a Croatian case study.

According to the set objectives, the main motive for choosing Croatia as a case study is the availability of historical data and the fact that Croatia is one of the EU pioneers in developing detailed methodology for blending EU funds with alternative procurement models.

This paper has the following structure: The research starts with an introduction and a review of past research of the private sector involvement in energy efficiency (EE) sector. The second chapter offers an overview of procurement models and funding mechanisms, while the third chapter is a detailed elaboration of a Croatian case study and the concept of blending with results. The fourth chapter offers a discussion and the last chapter is a conclusion.

2. Procurement Models and Funding Mechanisms: An Overview

Investments in public sector EE projects, such as renovation/deep renovation of public buildings, street lighting projects, etc., are an important backbone of GDP growth. According to the European Court of Auditors [16] increasing effectiveness in providing such projects means using less energy input for at least the same level of economic activity or service. A typical EE project in the provision of public service can include the deep renovation of public buildings, replacing energy-inefficient constructions and equipment such as street lighting, district heating systems or other parts that cause increased energy consumption [17]. Many local units in the EU are facing difficulties in preparing, procuring and implementing EE projects [18]. According to Bratt et al. [19] these investments can mitigate financial constraints in the long term and help public sector units to meet their targets in line with the EU Strategy 20/20/20. An important tool for achieving these targets is a model known as energy performance contracting (EPC) and/or public-private partnerships (PPP) [20]. In these models, public authorities implement EE projects without buying new equipment or providing construction upgrades. Instead, the authorities buy public services or energy savings [21]. Procuring public EE projects can be done in several ways. One of the most common implementation models, instead of the traditional procurement, is to apply one of the alternative procurement models such as the energy service company (ESCO), services contracts or public-private partnerships. As the new Investment Plan for Europe for the programming period 2014–2020 focuses on supporting higher private sector involvement in infrastructure investments than traditional procurement, the aim of this paper is more focused on alternative procurement models, where the private sector bears the operational risks of the projects. That means that the private sector is responsible for the design process, construction process, operation and maintenance of infrastructure [22].

2.1. *Traditional and Alternative Delivery Models in EE Projects*

The traditional procurement model or the standard procurement model is still widely used in providing public infrastructure across the globe. In many countries this is the only model applied. The main characteristic of the traditional model is the fact that the public sector is fully responsible for the provision of public services and efficiency. All the project phases, from the beginning of project preparation, through to the project construction, maintenance and operational period, are a responsibility of the public sector. All the project risks are borne by the public sector. During the project implementation the public sector is not only responsible for financing and procurement of the asset, but also for achieving technological optimization and effectiveness throughout the whole life cycle period. By applying the traditional model, the private sector has a very small influence, usually during the construction period only, therefore it is questionable if the public sector has the knowledge and skills to optimally manage and operate project risks in the long term.

Besides the traditional model, several alternative procurement models are widely used. One of them is the energy service company model or ESCO model. ESCO involves the private sector in the implementation of EE projects on the basis of EPC. During the implementation of EE projects, a private company guarantees to the authorities that the project implementation will result in a measurable estimated improvement of energy efficiency and/or in savings in energy consumption [23]. According to Nolden et al. [18], the main advantage of the ESCO model is that the authorities do not have to take out a loan or invest any money into the implementation of EE projects. Figure 1 shows a typical ESCO transaction structure.

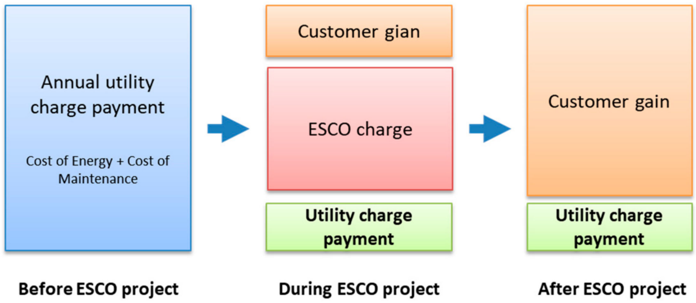

Figure 1. Energy service company (ESCO) transaction structure. Source: Authors.

In a typical transaction structure, ESCOs normally guarantee projected savings [2], while their remuneration is linked to project performance, i.e., directly linked to the amount of energy saved in physical or monetary terms [24]. However, the cost of projected energy savings is not the sole cost of the project and it depends on various external factors, i.e., in EE building renovation projects, on the behavior of end users. Usually, in order to maximize profits ESCOs focus on lower cost measures and do not take a comprehensive approach which provides deeper savings [25], e.g., in street lighting projects, ESCOs only improve (change) the street lighting "bulb" without any improvements in power cables, pillars and other infrastructure. This lost opportunity, in the case of materialization of the project's risks, can cost much more in the long term than the energy savings at the beginning of the project. According to Nolden et al. [18], one of the main disadvantages of the ESCOs is their exclusive focus on energy saving instead of improving the entire infrastructure of the project.

Although the main focus of the ESCO model is on savings, another alternative model is usually applied. It is the public-private partnership model or the PPP model. According to Grimsey and Lewis [22] the main focus of public-private partnership (PPP) is on providing public services. In general, the PPP is a form of cooperation between the private and the public sector in the provision of public infrastructure [26]. The PPP model may involve financing, design, construction, operation and/or maintenance of infrastructure, which is traditionally procured and provided by the public sector such as economic infrastructure, social infrastructure, etc. [27]. Due to the fact that many public EE projects have some characteristics of PPP (provision of public services, transfer of construction risk, availability risk etc.), they can be realized through the PPP model. In a typical PPP structure, the private sector bears risks related to construction and/or reconstruction and at least one of the following risks: availability risk or demand risk [28]. The main advantages of using PPPs in EE projects derive from the comprehensive preparation and implementation of the public infrastructure EE projects. The main purpose of implementing the EE PPP projects is reflected in the provision of public services, not only in realizing energy savings (as it is the case with the ESCO model). During implementation, PPP contracts can connect different elements of infrastructure projects, i.e., link the design and construction with one or all of the finance, operation and maintenance elements [29]. The PPPs also have a better scope for transferring risks compared to the traditional or ESCO procurement methods. For example, public sector payments are not fixed and are not based on expected savings, but they may be withheld until assets are in operation thereby "encouraging" contractors to complete EE projects on time and within budget [30]. Therefore, public authorities only focus on setting output specifications and realizing the expected value-for-money [31].

Unlike the traditional model, the use of alternative procurement models has to be justified by different analytical techniques. One of the most common techniques is called "Value-for-Money"(VfM) analysis. VfM is an analytical tool for comparison of different delivery options [32]. It includes all costs of possible EE projects in the whole life cycle. All the values in VfM analysis are in the form of "unique unitary charge" [33]. Figure 2 shows a typical example of the final result of VfM analysis with three possible procurement options (traditional procurement, ESCO model, PPP model).

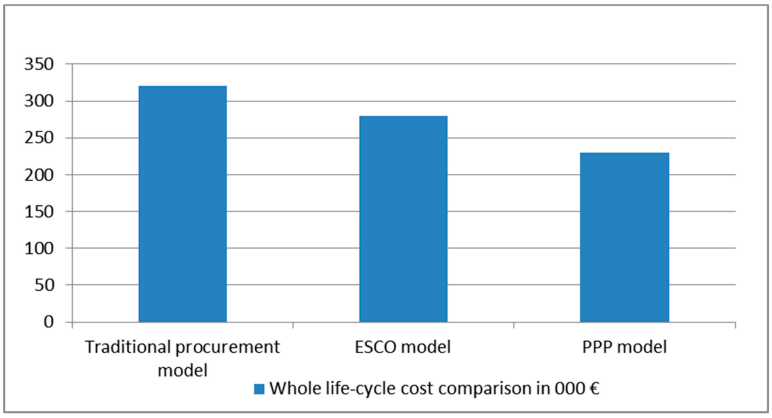

Figure 2. Example of Value-for-Money analysis. Source: Value-for-Money analysis in PPP projects (Manual no. 6, AIK).

Figure 2 shows the net-present-value (NPV) of unique unitary charges of three different procurement options and indicates that the most favorable option is the PPP model. That means that if the public sector wants to implement a certain EE project, the maximum value-for-money in the whole life cycle will be achieved by the PPP model, taking into account all costs in a 30 year period of the project life.

2.2. Traditional and Alternative Funding Mechanisms in EE Projects

Procuring EE projects requires significant funding resources. While the public sector is usually more focused on traditional, budget or purely grant-funded models, there are several other (alternative) funding mechanisms available. All of them can be divided into two main groups: (i) on-balance sheet funding mechanisms and (ii) off-balance sheet funding mechanisms.

The first group, (i) on-balance sheet mechanism, is a situation where a central or local authority lends financing resources from third parties and present a traditional funding mechanism. It is called "on-balance" because it causes public deficit and debt increase. It comes in the form of classic (A) debt funding, where financial institutions (usually banks) provide financial instruments to public authorities for purchasing new EE equipment or meet construction costs of EE projects. Another type of on-balance mechanism is (B) equity financing, where a project sponsor usually provides an instrument in the form of subordinated debt in exchange for a stake in an EE project or it can be in the form of subsidies or grants from various third parties, such as national funds, EU funds etc. The third type of funding is a combination of equity funding and debt funding called (C) mezzanine financing. It is usually provided when there is a funding gap between equity and debt instruments. It allows holders to convert mezzanine debt into equity or debt.

The second group, (ii) off-balance mechanism, is used in funding EE projects when some private sector participation exists and presents an alternative funding mechanism. It is called "non-recourse finance", because the only collateral for repayment is future cash flow from the investment. It can be in form of project finance or leasing. Project finance transactions can take the same form as on-balance sheet mechanisms (equity finance, mezzanine finance and debt finance) but with different collateral, while leasing instruments are usually used for financing equipment rather than investments in fixed assets.

The relationship between traditional and alternative funding mechanisms should be observed through their financial impact on the whole life cycle costs. Such values are analyzed in the Value-for-Money analysis and their goal is to show how much the applications of different mechanisms will contribute to achieving savings in the whole life cycle period. By the application of exclusively traditional or exclusively alternative mechanisms, the possible savings from the synergistic effects of blending cannot be achieved. According to the report of the European Court of Auditors [12], the European Commission during 2000–2014 supported 17 PPPs through different traditional funding mechanisms, usually in the form of equity and debt instruments, which contributed significantly to the sustainability of such projects. The potential advantages of using different mechanisms as well as projections of possible savings are shown on the basis of the case study, which is presented in the next chapter.

3. Case Study Simulation

In 2017 the Croatian Government adopted a program for implementation of energy efficiency projects for the period 2016–2020. The program is determined by two implementation models—traditional procurement (procuring works), while the other is alternative procurement (procuring services). According to a report from the Croatian Ministry of Construction and Physical Planning [34], more than 140 million euros have been made available to Croatia in the period 2014–2020 for the implementation of EE projects in the public sector. The majority of the funds will be used through a traditional, purely-granted model, while only some of the funds will apply to some of the alternative procurement models (such as PPP or ESCO). As the one of the goals of this paper is to examine the possibility of applying alternative procurement models and to demonstrate a possible concept of blending, our analysis is conducted in two phases. In the first phase the historical data of a case study is presented while in the second the effectiveness of blending process is discussed.

3.1. Basic Case—EE Project in Education Sector

The basic case study deals with a deep renovation and increasing the energy efficiency of school buildings in Northwest Croatia, currently running as a PPP project [35]. The main reason for selecting this case study was historical data availability. In this phase we conducted the analysis in two steps. In the first step, statistical data about revenues, costs and other issues from the specific project were collected from the Croatian PPP unit [36]. VfM analysis [37] of the project is presented as a "unique unitary charge" per square meter per month [38]. The price of the public services includes whole life cycle costs (WLC) of the contract in the 30 year period and it is shown in Figure 3.

According to Figure 3, Value-for-Money analysis (Appendix A: Table A1) shows that the public authority assessed the unitary charges of the project at 7.02 €/m^2 [39] per month and the maximum price of the public service if the project were realized through traditional procurement. The second column in the graph (6.23 €/m^2) [40] shows the value after tendering procedure and a bid offered by the private sector, i.e., the contracted price for providing public service.

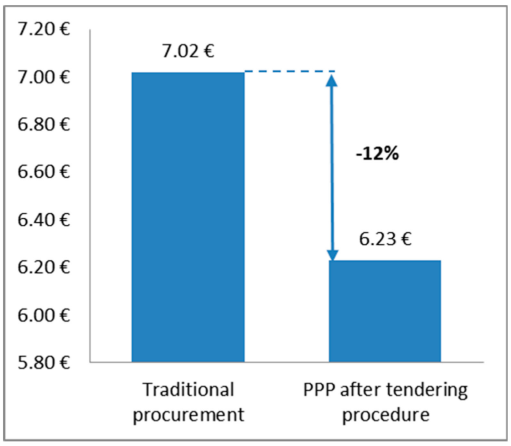

Figure 3. Value-for-Money analysis after tendering procedure presented as a unitary charge per square meter per month. Source: Authors' calculation (based on data available in Appendix A: Table A1).

Unlike the traditional procurement where the payments or unitary charges are largely fixed and without a possibility of changing, unitary charges in alternative procurement models are not fixed and depend on the availability of services. That means that the level of public sector payments in the form of unitary charges will be directly correlated with the provision of the public service; any incomplete provision of the service or unavailability of assets will result in payment deduction. In the concrete case study in Figure 3, it means that the value of 6.23 €/m^2 [40] per square meter presents the maximum contracted unitary charge and it will be paid from public to private partner only if the public service is 100% available. The payment is directly correlated with the level of service provision. If the level of service is lower, the unitary charges will also be lower. The basic payment structure operates on the condition: "100% availability = 100% payment or 0% availability = 0% payment".

In the second step of the analysis we collected the relevant historical data of the case study from 2013–2017. The data was obtained in the form of unitary charges per month per square meter from the regulatory body responsible for PPPs in Croatia. According to relevant historical data the following figure shows the ratio of contracted and paid unitary charges for the period 2013–2017.

Referring to data in Figure 4, the difference between contracted and paid unitary charges in 2015, 2016 and 2017 is most significant and on average amounts to a high 18%, whereas in the preceding years (2013, 2014) it stood at around 2–3%, (Appendix A: Table A2), which is presented in Figure 5as the level of availability of EE infrastructure.

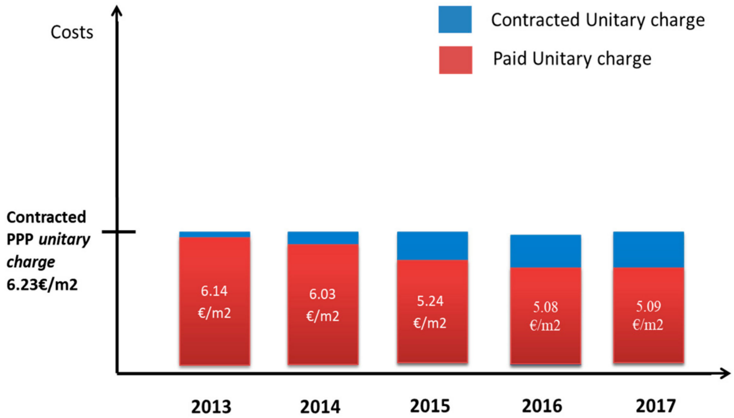

Figure 4. Historical ratio of contracted and paid unitary charges. Source: Authors' calculation (based on data available in Appendix A: Table A2).

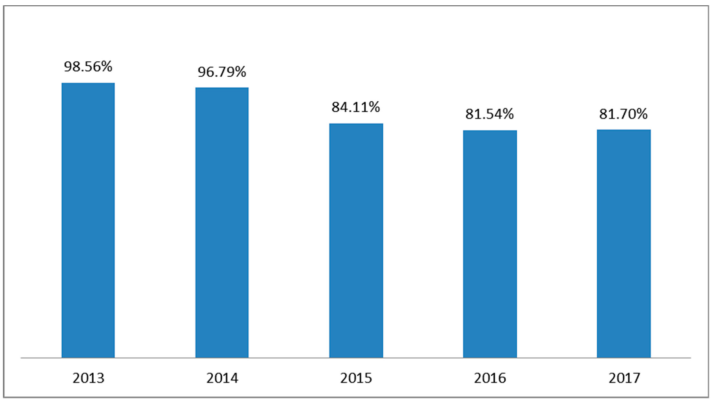

Figure 5. The level of availability of EE infrastructure. Source: Authors' calculation (based on data from Figure 4).

The values in Figure 5 present a sensitivity analysis sui generis of contracted and paid unitary charges, which means that the public sector using a payment structure of alternative procurement models, based on the "pay only the services that had been delivered" principle, saved significant amount of taxpayers' money during the mentioned period.

3.2. Concept of Blending in EE Projects

According to the EIB [41], around 450 billion euros have been made available for the current programming period 2014–2020. While most of the resources will be delivered through more traditional purely grant-funded structures, applying alternative procurement models and private sector financing with using various EU funds and financial instruments is called "blending" [41]. The main concept of blending, as a new and innovative method, includes a simultaneous use of grants, such as non-repayable resources and financial instruments, as repayable resources, in the same contract.

There are three possible solutions for using grants and financial instruments in procuring energy efficiency infrastructure [41]. The first is the more traditionally recommended form of procurement where the "EU grant is payed as a contribution to the capital costs in a construction-only contract." This model involves private sector participation only during the construction phase and it represents the simplest structure from a grant perspective. Risk transfer is very limited, and there is no private financing for construction. The second model of procuring involves using some alternative models and grants. It includes the "EU grant as a contribution to the capital costs based on a single contract covering construction and operation expenditures". During implementation of this model the private sector is usually responsible for the design phase, construction phase and operational phase, while financing provision is not within their domain. Payments from the public sector during operational phase usually include operating and maintenance costs only while the costs of capital are covered by the grant and are not included in the contract. The last model includes the "parallel funding and financing of capital expenditure based on two separate contracts". This type of procuring has two components, the first is funded by the private sector (usually Design-Built-Finance-Operate contract) whereas the second is funded by national and EU funds for infrastructure components.

Garido et al. [42] point out that blending financial structures can provide additional discipline in the deployment of EU funds and introduce a benefit of private sector financial discipline in EE projects, such as efficient risk management, punctual project and budget delivery, provide efficient public service, etc. Pereira [43] argues that these structures can significantly contribute to the sustainability of projects. Unlike the traditional model, where the main focus is on capital costs and funding, the aim of the blending process is to achieve not only financial effectiveness for the entire duration of the contract, but also transfer operational risk to the private sector or another contract party which is most capable of managing it. The selection process starts with developing relevant documentation which is the main goal in the first step of assessing the structure of whole life costs, i.e., the price of the public service in cases when the public sector realizes projects independently, regardless of any other procurement model (traditional model, ESCO model, PPP model).

As the objective of this paper is to present the concept of blending, the following paragraphs will offer a simulation of using different sources of funding (grants and financial instruments) within different alternative procurement models in a Croatian case study.

3.3. Effectiveness of Blending

Based on the data presented in a case study in the first phase, using different sources of subsidies (such as grants) and financing sources will be presented in second phase of our analysis where we will test the effectiveness of blending. The following second phase is done in three steps. In the first step the (i) test of using grants will be employed, while the (ii) test of using financial instruments will be employed in the second step. The third step (iii) presents the simulation of the possible cost of public service during 2013–2017, according to Figure 4, if in the same period the blending process was available for the public sector.

The first step of assessing the effectiveness of blending starts with using grants. Becker et al. [44] maintains that using grants has a direct influence on reduction of the investments costs which have to be paid by the party. One of the most important parts of whole life cycle costs is Capital expenditure.

Its reduction is directly correlated with the level of unitary charge payment. The amount of the grant is calculated by the application of an equation prescribed by the European Commission [45]:

$$FG = EC * CR * \frac{\sum_i I - \sum_i NR}{\sum_i I} \tag{1}$$

where: the *FG* is financial grant as multiplication of eligible costs (*EC*), co-funding rate (*CR*) and funding gap. Therefore, in our case [35], if we take into consideration that the hypothetical minimum grant for EE project is around 30% of eligible capital costs [46], it will directly cause a reduction of the whole life cycle costs (WLC) in the form of a unitary charge payment. As the correlation between CAPEX and WLC is around 1:3 in nominal values, in the first step of analysis, the grant effect on our case study will result in an additional reduction of unitary charge of 14%, as shown in Figure 6.

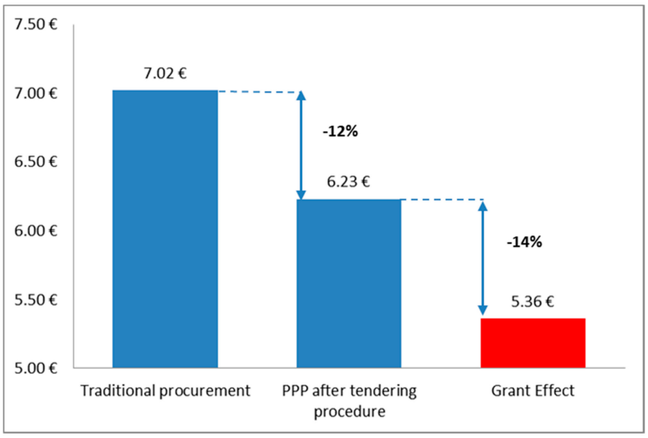

Figure 6. Value-for-Money analysis with grant effect. Source: Authors' calculation.

It follows that the first step of blending will increase value-for-money by an additional 14%, and the new contracted unitary charge will amount to 5.36 €/m^2 (Figure 5). Instead of using grants as a source of funding, Aglieta et al. [47] suggest that the new Investment Plan for Europe also recognizes the use of financial instruments. According to the EIB [41], both sources (grants and instruments) can be blended, which would cause additional savings. In the second step, by using our example of a real case study simulation, the effect of a paid grant with the possible use of current financial instrument sources available to the EU member states [48], within the current operational program Competitiveness and Cohesion 2014–2020, resulted in a reduction of contracted unitary charges in the mentioned energy efficiency project by at least an additional 3 percentage points [49], approximately 17% (5.20 €/m^2) from the initially contracted unitary charge [50], as displayed in Figure 7.

Although using alternative procurement models is still in uncommon in many EU member states, using these models may result in achieving a huge value-for-money in public sector infrastructure projects. While the process of blending presents a new opportunity for the public sector, unfortunately there is still a lack of knowledge and willingness to implement these "hybrid" structures. The case study simulation based on a real project shows the possibility of realizing significant savings from the contracted unitary charge at the beginning of the PPP contract by at least 17% if we apply blending options after the tendering procedure, or if we take into consideration traditional procurement, then 29% (17% + 12%) of savings could be achieved during the whole life cycle period. The contracted unitary charge in our case study project before blending is 6.23 €/m^2, and it will be paid only if the public service is 100% available. After blending, the new contracted unitary charge is at 5.20 €/m^2 (Figure 6).

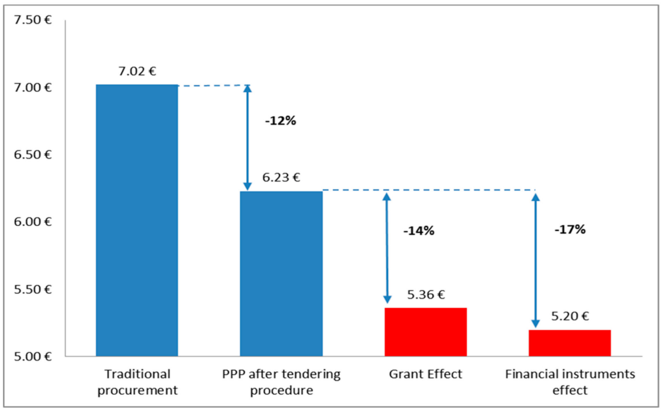

Figure 7. Value-for-Money analysis with grant and financial instrument effect. Source: Authors' calculation.

The last part of our analysis includes price simulation of the same level of project availability during 2013–2017, if in the same period the blending process existed in the public sector. If we consider Figures 4 and 5, the historical ratio of contracted (6.23 €/m^2) and actually paid unitary charges, we can simulate the cost of the public service during 2013–2017, assuming there was the possibility of blending EU grants and financial instruments in the same period. The simulation is shown in Figure 8.

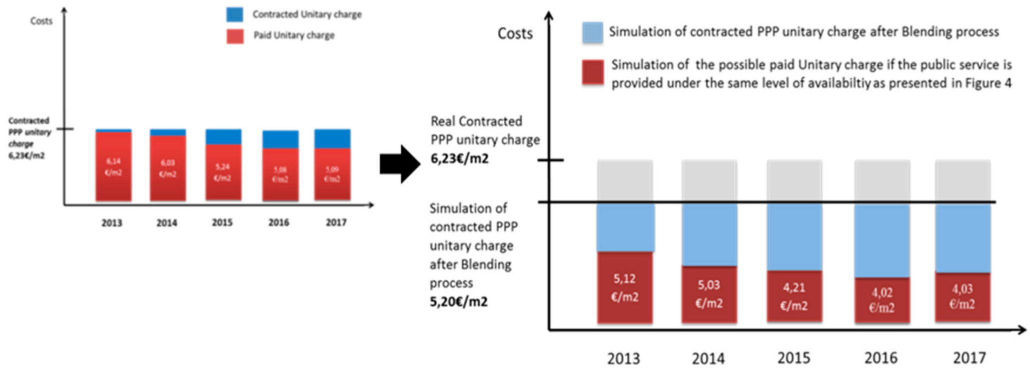

Figure 8. Simulation of paid unitary charge with the effect of blending (based on data from Figure 4). Source: Authors' calculation.

Figures 4 and 5 give the possible correlation between the (i) contracted unitary charge and the (ii) unitary charge that is really paid during the 2013–2017 period. Figure 8 shows the new contracted unitary charge of 5.20 €/m^2 after the blending process is finished and the possible unitary charge payments, if the public service is provided under the same level of availability as presented in Figure 5 for the period 2013–2017. The blending effect clearly indicates that the price of public services presented in the form of unique unitary charge could have been available for the average price of 4.48 €/m^2 (according to Figure 8) and result in significant public sector savings.

4. Discussion

Nowadays there is a significant lack of research focusing on the efficiency of blending alternative procurement models with different financing mechanisms. In the available papers by Sorell [7], Polzin et al. [8] Hanon et al. [9], the authors focused solely on the private sector participation through PPP or ESCO models without using any real or case study data. Some authors focused on some parts of blending effectiveness only. For example, Juričić and Kušljić [51] focused only on combining PPP and EU grants, while Ferrer and Behrens [52] focused only on combining traditional procurement and financial instruments. In our paper we have taken a step forward and we have assessed the effectiveness of using alternative procurement models with available EU resources, i.e., blending using a case study simulation.

Although many EU member states have a long tradition of publicly led and financed infrastructure through traditional procurement, rising public sector deficit and debt has become a significant obstacle to purely-granted EE investments. The European Commission has fostered more private sector participation through the new Investment Plan for Europe. According to Bertoldi and Boza-Kiss [11], it is crucial to develop new or improve existing policies. The efficiency of blending shows higher value-for-money for the public sector, even if the lowest possible level of grants and financial instruments is applied. It is possible to assess the impact of certain WLC project variables using sensitivity analysis. Thus, a small impact on capital cost change can cause significant changes in the structure of WLC. Seeing that using grants and financial instruments significantly reduces the total costs of projects, their combined application contributes to the aimed project efficiency.

This research has effectively demonstrated synergistic effects of (i) efficiency of private sector participation in alternative procurement model and (ii) simulation of possible blending effectiveness with both EU grants and financial instruments, based on a real case study.

5. Conclusions

The aim of this paper was to test the efficiency of the application of possible alternative procurement models with available EU funding mechanisms, based on a Croatian case study. According to the analysis, three possible procurement options have been identified. Besides the traditional procurement, PPP and ESCO models have been found. The key difference between different procurement options is transferring operational project risks to the private sector. While ESCOs carry a limited risk transfer and are more focused on projected savings, PPPs are based on providing overall public services within fully private responsibility, whether or not the savings are realized. The analysed financial mechanisms are observed with regard to fiscal treatment of projects, therefore on-balance and off-balance mechanisms are defined. Although the European Court of Auditors has [12] pointed out that the use of different funding mechanisms (traditional and alternative) contributes to the sustainability of projects, there has still not been a sufficient number of such EU-level projects to draw concrete conclusions and recommendations based on "lessons learnt" principles.

The effectiveness of blending solutions using EU grants and financial instruments that are currently available through the new Investment Plan for Europe has been tested, based on a Croatian case study and data of contracted and paid unitary charge in an operational period. The analysis has shown that it is possible to increase the level of effectiveness in the whole life cycle costs by more than 25% compared to traditional procurement. Additional private sector discipline and payment mechanisms based on the "100% availability means 100% payment and vice versa 0% availability means 0% payment" rule has demonstrated significant public sector savings through paying only for those services that have actually been delivered. Any incomplete provision of service or partial availability of EE infrastructure automatically causes public sector payment deduction.

In traditional procurement, EE projects are usually financed from classic budget finance and available public sector grants, while possible combinations of grants and other mechanisms are possible only if there is enough institutional and administrative public sector capacity that understands all advantages and drawbacks of such operations. The situation in Croatia has changed significantly during the last few years, mostly because of improvements of the legal framework [53], which defines the process of preparation, proposal and approval of EE projects. It is, however questionable whether Croatia, due to the lack of political support and the focus on traditional procurement, has the institutional readiness for the implementation of these projects in comparison with other EU member states.

This paper has outlined an attempt to identify the process of allocation of EU funds with alternative procurement models and an effectiveness estimate of the blending process. The findings of this paper can aid decision makers in selecting the optimal EE project implementation model which would offer the highest value-for-money to the public sector. However, seeing that this paper and the findings are based on a case study of an EE building renovation project, it is highly recommended to conduct additional research and efficiency estimates in other EE sectors such as street lighting, district heating, etc.

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Appendix A

Table A1. Value for Money analysis—data summary. Source: AIK.

VfM Analysis for EE School Project No. 0004/2011	Traditional Procurement	PPP Bid (Offered by Private Sector)
Discount rate	5.50%	5.50%
CAPEX	2,149,697.00 €	2,149,697.00 €
NPV of *Whole-life-cycle costs* (30 years)	4,971,851.01 €	4,412,340.71 €
Monthly *Unitary Charge*(Availability Payment)	22,527.18 €	19,992.18 €
Duration (number of years)	30	30
Total m^2 of asset	3,209.00 m^2	3,209.00 m^2
Monthly *Unitary Charge* (Availability payment) per m^2	7.02 €	6.23 €
Proposed PPP model:	Availability based PPP model	
Value for Money (% difference form *traditional procurement*)	12%	

Table A2. Project No. 0004/2011—data summary for 2013–2017. Source: AIK.

YEARS	2013	2014	2015	2016	2017
Unitary Charge Data					
Number of m^2 of project asset	3.209 m^2	3.209 m^2	3.209 m^2	3.209 m^2	3.209 m^2
Indexation	No	No	No	No	No
Contracted monthly *Unitary Charge*	19,992.18 €	19,992.18 €	19,992.18 €	19,992.18 €	19,992.18 €
Contracted monthly *Unitary Charge per m^2*	6.23 €	6.23 €	6.23 €	6.23 €	6.23 €
Contracted yearly *Unitary Charge*	239,906.16 €	239,906.16 €	239,906.16 €	239,906.16 €	239,906.16 €
Contracted Yearly *Unitary Charge per m^2*	74.76 €	74.76 €	74.76 €	74.76 €	74.76 €
Payment Mechanism (Yearly Data)					
Contracted level of Availability of Asset	100.00%	100.00%	100.00%	100.00%	100.00%
Payment Deduction (Risks Occurrence)					
Risks related with construction	0.000320%	0.000000%	0.000320%	2.679760%	0.000000%
Risks related with operation	1.004200%	0.021200%	3.807000%	4.760900%	4.291600%
Risks related with maintenance	0.021300%	2.003100%	7.603020%	10.430120%	14.004060%
Risks related with compensating events	0.008450%	1.080560%	2.793000%	0.000000%	0.000000%
Risks related with relief events	0.400200%	0.099800%	1.685200%	0.580052%	0.000000%
TOTAL payment deduction (Yearly sum) as % of Availabiltiy level	1.434470%	3.204660%	15.888540%	18.450832%	18.295660%
Payment Adjustment					
Level of Availabiltiy of assets after Risks payment deduction (yearly data)	98.5655%	96.7953%	84.1115%	81.5492%	81.7043%
Paid Values					
Paid *Unitary Charge* (yearly) after adjustment (level of availabilty of asset)	236,464.78 €	232,217.98 €	201,788.57 €	195,641.48 €	196,013.74 €
Paid *Unitary Charge* yearly per m^2 based on availability of asset	73.69 €	72.36 €	62.88 €	60.97 €	61.08 €
Paid *Unitary Charge* monthly per m^2 based on availability of asset	6.14 €	6.03 €	5.24 €	5.08 €	5.09 €
Special Purpose Vehicle (SPV)					
Name:	Meteor Partnerstvo d.o.o.				
Headquarter	Varaždin, Croatia				

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