

# Reforming the EPB certification and the property tax incentive to encourage additional investments in energy efficiency

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## Abstract

The EU member states have implemented energy performance of buildings (EPB) minimum requirements for new constructions, while in Flanders an additional property tax incentive is offered if higher standards of energy performance are achieved. The current paper aims to investigate whether the property tax incentive played a role in encouraging additional investments in energy efficiency in new constructions. It also aims to understand the mechanisms of the EPB certification process, including the decision-making between the client, the architect, and the EPC certifier, and the interplay between the implementation of the EPB regulations and the property tax incentive. For this purpose, in-depth, semi-structured interviews with EPC certifiers operating in Flanders were undertaken. Findings show that the property tax incentive plays an important role in additional investments, principally when the levels required by the property tax are close to the minimum standards as in recent years. The most commonly used methods to achieve lower E-levels<sup>1</sup> than the minimum requirements are PV systems, followed by efficient ventilation systems, heat pumps and airtightness test to a lesser extent.

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1. According to the calculation system implemented by the Flemish Energy Agency, the E-level (E-peil in Dutch) depends on the following parameters for dwellings: thermal insulation, airtightness, compactness, orientation, insolation, ventilation losses and systems (for heating, hot water, ventilation, cooling and renewable energy). A better performing building has a lower E-level.

Investments in systems are motivated by a common practice of making the EPB certification after the building permit was released; therefore, changes in the design are problematic. At this stage sufficiency or efficiency design strategies are difficult to be implemented and thus additional investments in systems are preferred. Only EPC certifiers who are the architects of the project have a more holistic approach and make EPB simulations at an earlier design stage. Requiring the EPB certificate before the building permit would encourage the engagement of the energy expert from an earlier design stage and a closer collaboration between the architect and the EPC certifier. Breaking the silos between the energy experts and the architects, as well as a holistic design are in line with the New European Bauhaus principles.

## Introduction

In line with Paris Agreement objectives, the EU set the priority to reach climate neutrality by 2050, which implies zero net emissions of CO<sub>2</sub> in 2050 and more ambitious targets for 2030 [1]. So far, substantial progress has been achieved in the building sector with the introduction of the minimum requirements for new construction and renovation with Energy Performance of Buildings (EPB) Directives [3–5]. Nevertheless, according to the European Commission, the current policies in place are not sufficient [2], and we have to rethink the policies for achieving the goal of “building and renovating in an energy and resource-efficient way” [1].

Some countries, regions and municipalities have implemented property tax incentives with the purpose to encourage energy efficiency and renewable energy systems in the residential

sector. Andalusia offers a reduction in the property tax rate for solar thermal systems for existing buildings [9], while Flanders and the municipality of Cluj-Napoca in Romania offer a property tax incentive for an overall energy performance that is more ambitious than the minimum requirements. However, the evidence of the efficacy of the property tax incentive to encourage additional investments in energy efficiency is scarce, and the current paper aims to fill this gap. For implementing this policy at a larger scale, it is first necessary to evaluate its impact and its interplay with other existing policies, for example, the minimum requirements for new construction and renovation in the EU MS introduced by the EPB Directives [35]. For this purpose, we have undertaken semi-structured interviews with EPC certifiers operating in Flanders. The study regards only residential new constructions, specifically single-family dwellings. The purpose of the semi-structured interviews was to understand in depth the decision-making process regarding additional investments in energy efficiency and whether the property tax incentive is one of the factors influencing it. To achieve the primary research objective, it was necessary to understand the process and the pitfalls of the implementation of the EPB certification. The study investigates the motivations for choosing specific energy-efficiency measures once the clients decide to aim for a lower E-level required by the property tax incentive.

## Property tax as a policy to promote energy efficiency in the residential sector

### PROPERTY TAX INCENTIVE IN FLANDERS

Following the EPB Directive [3] and its recasts [4] [5], the EU member states adopted the energy performance of buildings requirements (minimum requirements) for new constructions and major renovations. These minimum requirements were progressively getting stricter, achieving nZEB (nearly zero energy building) standard by 2021. In Flanders, the minimum requirements were implemented from 2006, see Table 1. The E-level (E-peil in Dutch) is calculated for new constructions and major renovations, and the calculation method differs from the one for existing buildings. The E-level is a measure of the global energy performance of a building and it is the result of a calculation and comparison with a reference building. It depends on the following parameters for dwellings: thermal insulation, airtightness, compactness, orientation, insolation, ventilation losses and systems (for heating, hot water, ventilation, cooling and renewable energy). A better-performing building has a lower E-level. The nZEB definition was introduced and promoted beginning from 2014, and it is set at the E-level of E30. This level has become the minimum requirement for new constructions since 2021.

At the same time, building regulations were accompanied by various financial incentives, one of them being the property tax subsidy, introduced in Flanders in 2009. Even though it is also offered for renovations, the current study regards only new constructions. In the first three years, 20 % and 40 % reduction in the property tax was provided for achieving lower E-levels than the minimum requirements. In the following years and until now, the property tax reductions increased to 50 % and 100 %, and the reduction is applied for a period of 5 years. The

E-levels required for the property tax incentive changed over the years, following the evolution of the minimum requirements, see Table 1.

Preliminary quantitative analysis of the data regarding new constructions in Flanders provides evidence of a bunching effect, see Figure 1. In the cases where the E-level was close to the one required for the property tax reduction, homeowners could have decided to make an additional investment to achieve it. The interviews aimed to clarify whether the property tax incentive or alternative policies such as income tax subsidy or bonuses played a role in the bunching effect. Another goal of the study is to determine the reasons why some energy-efficiency measures were chosen more often by the homeowners who decided to achieve lower E-levels required by the property tax incentive. Preliminary quantitative analysis shows that lower E-levels are correlated with energy-efficiency measures in the following order: PV systems, airtightness test, U-value, heat pumps, compactness<sup>2</sup> and ventilation system. These preliminary results of the quantitative analysis supported the elaboration of the research questions and the thematic labels for the elaboration and analysis of the interviews.

## Methodology

### RESEARCH QUESTIONS

The current study presents findings of in-depth semi-structured interviews with EPC certifiers operating in Flanders. Given the evidence of a bunching effect (see Figure 1), the study aimed to investigate the role of the property tax incentive in the decisions of homeowners to invest additionally in energy efficiency.

The main research question of the study was the following:

- What is the role of the property tax reduction in influencing decisions regarding achieving higher levels of energy performance for the new constructions in Flanders compared to the minimum requirements?

For a better understanding of the context, secondary research questions were:

- Are clients, architects and EPC certifiers familiar with the property tax incentive offered?
- What is the impact of the property tax incentive compared to other policies (minimum requirements, income tax incentives and cash incentives from network operators)?
- If the property tax reduction has an impact, which measures are chosen to improve energy performance?

In order to assess the impact of the property tax incentive on decisions to invest more in energy efficiency, other aspects of decisions making have to be taken into account, such as:

- At which stage of the design are EPC certifiers contacted?
- Who takes decisions regarding the energy-efficiency measures, the client, the architect, or the EPC certifier?

2. Compactness is calculated as a ratio between the outer surface which can dissipate heat and the volume.

**Table 1.** The evolution of the minimum required E-levels of the EPB regulations, property tax reductions and nZEB over the years in Flanders.

	EPB minimum requirements	Property tax reduction requirements		nZEB definition
		E-level	50%	
2006 - 2008	E100	-	-	-
2009	E100	E60 20%	E40 40%	-
2010 - 2011	E80	E60 20%	E40 40%	-
2012	E70	E60 20%	E40 40%	-
2013	E70	E50	E30	-
2014 - 2015	E60	E40	E30	E30
2016 - 2017	E50	E30	E20	E30
2018 - 2019	E40	E30	E20	E30
2020	E35	E30	E20	E30
2021	E30	E30	E20	E30

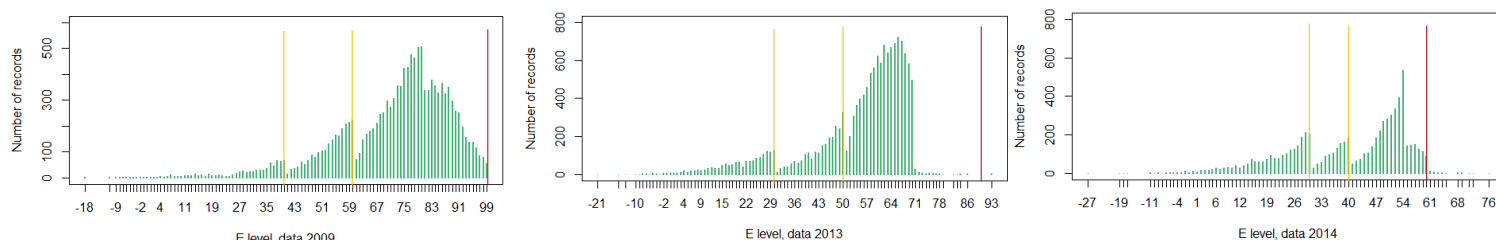


Figure 1. Bunching effect for E-levels required for the property tax incentive – E40 and E60 in 2009, E50 and E30 in 2013 and E30 and E40 in 2014. Data from building permits of single-family dwellings in Flanders.

#### DATA COLLECTION

The interviews with EPC certifiers took place face-to-face during January 2020. Invitations for the interviews were sent by e-mail to the list of approximately 1,700 EPC certifiers operating in Flanders published by the Flemish Energy Agency in November 2019. Seven certifiers volunteered for the interview and they vary in terms of location, size of the city and size of the company. A limitation of the study is the self-selection bias. To overcome it, the EPC certifiers were not notified in advance that the main topic of the research is the property tax incentive. The interviewees were only told that the investigation concerns the decision-making of homeowners and the EPB certification scheme. The purpose was twofold, to investigate if the EPC certifiers are familiar with the property tax incentive and secondly, to verify if they mention it spontaneously before the relative questions.

#### DATA ANALYSIS

The interviews were recorded on audio, and their verbatim transcription was analysed with the use of NVIVO software. The methodology of analysis was thematic coding. Thematic codes emerged out of the primary and secondary research questions presented in the previous section. Table 2 provides an overview of thematic labels and their relation to the research questions.

#### Main findings

##### PROFILE OF THE EPC CERTIFIERS

All the interviewed EPC certifiers have a long experience in the field of at least 8–10 years, and two profiles of EPC certifiers were identified: six out of seven interviewees are specialised in EPB certifications and make the calculations for projects of other architects. Only one certifier is a practicing architect who is part of an architectural firm that does certifications only for their own projects. The differences between these two categories of EPC certifiers appear to be relevant to the design and decision-making process regarding energy efficiency. Firstly, the external EPC certifiers are contacted by architects or homeowners only at a late stage of design when the building permit has been issued, whereas architects who make their own certifications are able to make EPB calculations at different stages of the design, starting with an early phase.

Secondly, these two types of EPC certifiers also differ in the number of certifications per year. External EPC certifiers provide hundreds of certifications per year. The architectural firm that makes the calculations only for their projects made around 120 projects over the last ten years. Some external EPC certifiers collaborate mostly with architects and future homeowners, while others have developers as their main clients. The

Table 2. Overview of the primary and secondary thematic codes and research questions.

Research questions	Main thematic codes	Secondary thematic codes
Knowledge. Are clients familiar with the property tax incentive offered?	Familiarity with the property tax incentive	Familiarity architects
		Familiarity EPC certifier
		Familiarity clients
What is the impact of the property tax incentive on improving the energy efficiency of the newly-constructed dwelling compared to other policies?	Lower E-level	Lower E-level and property tax incentive
		Lower E-level and profile clients
		Lower E-level and motivations
		Lower E-level and other policies
If it has an impact, which measures are chosen to improve energy performance?	Energy-efficiency measures	Airtightness test
		Heat pumps
		Insulation
		PV panels
		Solar water heaters
		Ventilation
		Windows
Whether property tax incentive or other policies are effective to encourage nZEB	nZEB	nZEB profile clients
		nZEB motivation
		nZEB other policies
Decision making/ other aspects of EPB implementation	Implementation EPB	Calculation method/ Software
		Stage design
Defining the profile of the EPB certifier	Profile EPC certifier	Type of clients
		Number of certifications

differences in decision making and motivations between the two types of clients will be detailed in subsection 4.4.2 Lower E-level and profile of the clients/ Motivations.

#### IMPLEMENTATION OF EPB/ DECISION MAKING

##### Stage design

External EPC certifiers agreed that they usually make the EPB certification after the building permit was issued. They are contacted most of the time by the clients, and they are asked to make the calculations for a project with a defined geometry and a roughly defined level of insulation.

Most of the time they come to me, and they say, this is our plan, the geometry is fixed and they have in mind a certain level of insulation and the thicknesses are already marked on the plans, and they give an idea of installations they are willing to place. EPC certifier 1

Certifiers agree that ideally, they should be contacted at an earlier stage of design, but if the project is modified during the issue of the building permit, the EPB calculations have to be repeated with extra cost for the clients. At an earlier stage of EPB implementation, the certifiers were sometimes contacted even at a later stage, when the construction has already started. It has changed over the years, now they are contacted earlier and with sufficient time to make the changes to the project because architects are more aware of the importance of the EPB regulations. However, once the building permit was issued, the architects insist on making no changes to their initial design and geometry; thus, only changes at the level of systems are

possible. Another option is modifications in the type of glazing, rather than in the size or orientation of the windows.

...The architects say ‘That’s my building, I have to have S31 with that building’... We can say you have to have screens, you have to have glass with better insulation, but not smaller windows, that’s the building, so that’s the building, it has to be that. EPC certifier 2

When the calculations are done after the design was decided, the EPC certifier proposes scenarios with varying levels of ambition in terms of energy efficiency, although, these scenarios are limited to the specification of systems rather than considering various passive measures and thermal insulation

The above seems to not be the case for EPC certifiers who are also architects, and they make the calculations for their own projects, as in the case of one of the interviewees. They perform EPB calculations from an early stage of design to make a “complete story”. Because the level of ambition in terms of energy performance is decided during the early design stage, various passive measures and thermal insulation are considered rather than limiting the energy efficiency measures to the specifications of systems. However, this design studio has a focus on sustainability, which could be another reason for this approach. The advantage of doing EPB calculations themselves allows them to do several calculations.

That’s a bit the idea of the office that’s not the EPB, the EPB is not a separate thing from the architecture... We start designing and in the feasibility studies we mostly start doing the EPB because we feel if you have to change it in the end, or during the process, mostly it’s more difficult. EPC certifier 7

### Calculation method/ Software

According to the Flemish Energy Agency, the E-level depends on the following parameters for residential buildings: thermal insulation, airtightness, compactness, orientation, insulation, ventilation losses and systems (for heating, hot water, ventilation, cooling and renewable energy) [12].

As the EPC certifiers are mostly contacted after the building permit is issued, thereafter, changes in design that could improve building compactness and orientation are not possible. In addition, at this stage, further improvements in the insulation do not contribute to lower E-level. The interviewees have often mentioned that the output in terms of E-level does not significantly improve with specific changes in the input, such as thicker levels of insulation. They also mention that the insulation levels are already relatively high due to stricter legal requirements for S-value<sup>3</sup> and U-values. In the previous years, points on the E-level could be gained with better insulation than the ones required by the maximum allowed U-values. On the other hand, changes in the systems result in significant changes in terms of E-level. In the subsection “Energy-efficiency measures” we will detail on the measures that are usually advised and chosen if there is a need to lower the E-level to achieve the minimum requirements or the levels required for the property tax incentive.

### FAMILIARITY WITH THE PROPERTY TAX INCENTIVE

Six out of seven interviewees mentioned the property tax incentive spontaneously, before the respective questions. It was mentioned as one of the main factors influencing the decision to aim for an E-level that is lower than the minimum legal requirement. The property tax subsidy is usually used when the certifiers communicate the results of the calculations to the clients, as an argument to choose the scenario for a lower E-level. The EPC certifiers also agreed that overall, the general public is familiar with the property tax reduction and that the share has increased compared with the early years of the implementation of the subsidy.

Once again, the architect that does the EPB certifications only for the projects of his firm was an exception. The architect was not familiar with the details of the subsidy as this information is provided to the clients by his colleague. According to the architect, it is difficult for him to follow the subsidies as the requirements are always changing. Nevertheless, since this firm focuses on sustainability, they already aim for a lower E-level in their projects than the one required by minimum requirements.

### LOWER E-LEVEL

#### Lower E-level and the property tax incentive

Initially, when the external EPC certifiers are presented with the project of the architect, they are required to achieve the minimum E-level stipulated by the EPB regulations. Some EPC certifiers consider that this level is not easily achieved for detached houses. Nevertheless, when EPC certifiers present the outcomes

of the calculations to the future homeowners, they present several scenarios with different levels of ambition in terms of energy performance. At this stage, the architects are usually not involved, and the EPC certifiers are the ones to recommend different alternative measures to achieve a lower E-level in comparison with the initial project. When EPC certifiers present alternative scenarios for achieving lower E-levels, they encourage their clients to invest more by using the argument of the property tax subsidy. It is important to note that all the external EPC-certifiers, six out of seven interviewees mentioned the property tax reduction in this context in a spontaneous way.

I always say: you think you have to pay 1,000–1,500 Euros a year for your property tax, so, for 5 years you don't have to pay it so, 1,500 per 5, you can invest that now, if you have the money, of course. So it is good for you, but, only when they are just at that point, or if they have money enough.  
EPC certifier 2

The property tax subsidy becomes an important argument, especially in the cases when the initial project is already close to the E-level required to receive the subsidy, and the extra investment needed is not too high.

I think if you reach E28, for example, and they know that E20 is a requirement for receiving the property tax then it's easy for them to say “Make me a calculation how much does it take to win the extra 8 points” and then I make an example.  
EPC certifier 1

Especially, it is the case with more recent projects because the gap between the minimum requirements and the level to receive the property tax reduction is not as wide as it was during the years of the EPB implementation, see Table 1. For example, in 2020, the minimum requirement is E35, and the levels required for property tax reduction of 50 % and 100 % are E30 and E20, respectively. In comparison, the gap during the early years of the implementations was wider, e.g., in 2013 the minimum requirement was E70 and the levels required for receiving the property tax reduction of 50 % and 100 % were E50 and E30, respectively. Because of a narrow gap in recent years, opting for the E-level necessary to receive the property tax reduction has become more frequent.

For the interviewee, who is also the architect of his certifications, E30 was the minimum standard for their projects in the last two years, and he encourages clients to opt for even more ambitious targets, such as E10. However, it is important to notice that this studio is specialised in sustainability; therefore, the profile of clients could be more environmentally conscious.

#### Lower E-level and profile of the clients/ Motivations

Currently, the property tax incentive is the only financial incentive available for homeowners who opt for a lower E-level than the minimum requirements. There appears to be a high motivation to make additional investment initially because the exemption of the property tax over five years provides significant monetary savings. The key issue is that according to the interviewees, mostly clients from the higher income group decide to invest more to benefit from the property tax reduction. However, it cannot be determined whether this category would have chosen the same lower E-levels in the absence of the prop-

3. According to the calculation method provided by the Flemish Energy Agency, the S-value (S-peil in Dutch) reflects the energy performance of the building shell. It accounts for insulation and insulation in winter and overheating in summer, as well as the shape of the building and the airtightness. A building shell with a better energy performance has a lower S-level.

erty tax incentive, although interviewees mentioned several other motivations. These include better quality of the house and being futureproof. Improving the quality of the house is an important motivation for developers or private owners who build properties as an investment and intend to sell them.

That's the part that I find unfair, it's always the richest people who can do the most investments, who get the most benefits. EPC certifier 4

For other homeowners, the investment for achieving the minimum required E-level appears to be already high, and they often refuse to make any additional investments due to financial restraints. Certifiers have mentioned that in recent years the cost of construction for the same type of dwelling has risen. One of the EPC certifiers expressed concerns that the property tax incentive is capitalised in the cost of the construction.

One of the certifiers mentioned that some clients are concerned that a lower E-level would imply a higher property tax after the five years of exemption. He specified that neither he nor the clients are familiar with the methodology of calculating the base of the property tax, the impact of the E-level being a supposition. Nevertheless, these clients do not opt for the E-level required to achieve the property tax subsidy and opt for the minimum requirements.

At the same time, some interviewees mentioned that they had noticed a trend of more awareness regarding energy efficiency in the last years. People that are partly self-builders are more interested in the EPB calculations and are more in contact personally with the EPC certifier. Some homeowners are informed from fairs regarding certain technologies and insist on opting for them. At the same time, if they are against a particular system, for example, mechanically-balanced ventilation, they are willing even to pay the fine as long as they can avoid installing it. Some assume that ventilation could affect the indoor comfort and convenience of natural ventilation. Likewise, some clients are against specific insulation materials for environmental or health reasons. More details regarding technologies will be presented in the following subsection Energy-efficiency measures.

#### Lower E-level and other policies

One of the research questions of the study was whether other policies played a role in the bunching effect illustrated in Figure 1 besides the property tax incentive. One of the hypotheses was the '*anticipation effect*' of the minimum requirements of the following years. For example, the minimum requirement of E40 in 2018 coincides with the level required for a 50 % property tax reduction in 2015, see Table 1.

The answers of the interviewed EPC certifiers showed that there are two categories of clients. The first category has a limited budget and asks the EPC certifier to achieve only the minimum required level for that year. The second category is wealthier and chooses for higher energy efficiency than required mainly to be able to benefit from the property tax reduction. However, the interviewees mentioned other motivations for the higher income homeowners that opt for their house to be futureproof, i.e. "*a comfortable, high-quality house and also which can last for a long time*" and "*that is built for the future*". It is mainly the case if the new construction is seen as an investment and not the first residence.

In the previous years, other financial incentives were available for achieving higher levels of energy performance, for example, income tax subsidies and incentives offered by the grid operators. The former was not mentioned by the interviewees perhaps because it was available only until 2013. The latter was mentioned as not being available anymore. Only one certifier mentioned a financial incentive that is still available, which is to receive a bank loan on favourable terms.

#### ENERGY-EFFICIENCY MEASURES

All the interviewed EPC certifiers present to their clients a final report with alternative scenarios based on simulations with the EPB software. One scenario, based on the initial design, aims to achieve the minimum required level, while the others are more ambitious. Therefore, if homeowners need to improve the initial design to achieve the legal minimum requirements or if they opt for the E-levels required for the property tax reduction, they follow the advice of the EPC certifier. Usually, at this stage, the architect is not involved anymore.

I always calculate how, what do to reach standard, doing nothing special, how is the house as it is, with the standard technique like gas heating, the ventilation D. And then from that point, I start simulating what happens when you take PV panels, if you put thermal panels and so on and then, so they then have a quite good view of what they can reach... but OK, it will cost." EPC certifier 3

As previously mentioned, the EPC certifiers are mostly contacted after the building permit was issued. For this reason, modifications to the design of the dwelling are not possible anymore; thus, the EPC certifiers can only propose changes to the building shell and the systems. The minimum required levels for S-level regarding the building shell are already quite strict, hence improving the insulation does not contribute significantly to lowering the E-level. As a result, EPC certifiers usually recommend improvements in terms of systems. According to the interviewees, some measures are advised and chosen more often, such as PV panels, ventilation system and heat pumps. The airtightness test is also an effective way to achieve a lower E-level.

The architectural firm that certifies its own projects is an exception to the above approach. They are able to make EPB simulations at an earlier design stage, and they try to convince the clients to invest in the building shell and passive measures before investing in systems. Being a firm specialised in sustainability, their clients usually aim for lower E-levels than required from the beginning of the design process.

When EPC certifiers present different alternatives for systems or insulation, often clients have preferences, or they are categorically against specific systems or types of insulation. If they have a negative attitude towards a certain measure, such as heat pump or ventilation, the EPC certifiers find it challenging to convince them even if those systems score well in the calculation software and are fit for the project.

Mostly, I think 8 out of 10 times they already know what they want. So, if they want a heat pump, they already know they want a heat pump, before we are there, if they don't want the heat pump, they know they don't want the heat pump, it's a bit, I think they search themselves on the internet, architects say some things and they go on with that. EPC certifier 2

### PV PANELS

Amongst the interviewed EPC certifiers there was consensus that increasing the capacity of the PV system is the most commonly used method to lower the E-level, either to reach the minimum requirements or the level required for the property tax incentive. It is also the most frequently mentioned energy-efficiency measure by all the interviewees (18 times). EPC certifiers and clients choose it for various reasons. Firstly, in the calculation method, the PV systems lower the E-level significantly. Secondly, it is easy to simulate various scenarios by adding extra area (m<sup>2</sup>) of PV panels, especially when the difference between the targeted E-level and the existing is minimum. Besides, it is easy to compute the additional investment needed and compare it with the property tax reduction. Some EPC certifiers compared the cost of a property tax for an average house with the cost of the PV system, yet it is unclear whether all the aspects of the payback calculations for a concrete project are considered in detail.

That's what I try to explain, 5 years no tax that means around, for a moderate house around 5000 Euros, how much is the cost for like 20 PV panels? 7000 Euros, so you have already a big amount, but OK, in 5 years. EPC certifier 3

Some certifiers mentioned that PV systems are less expensive compared to other systems, such as more efficient ventilation systems or heat pumps.

Interviewer: Are there any measures that come up more often?

EPC certifier 3: Most of the time the PV panels is the most because it's the least expensive and it brings the most points in E-level, so that's best thing to do, but besides that heat pump, also and solar panels... thermal.

At the same time, EPC certifiers emphasized that clients are concerned with the changing legal framework and existing taxes and financial incentives. Clients would prefer a predictable framework where they can estimate future benefits and expenses. For example, EPC certifiers are careful in recommending to increase excessively the capacity of the PV system because it would bear additional expenses for using the grid.

So we stay within certain boundaries, we're not going to say they need 10kW when it's only 5, because it will cost them 500 Euros extra per year and they don't need the electricity. So you have to search a balance between all the techniques. But that's always simulating. EPC certifier 4

### Ventilation system

Although less than PV panels, a better performing ventilation system is also recommended often by EPC certifiers, some considering it as the easiest option to lower the E-level:

I would say ventilation number one because the range in ventilation systems is very wide. With a simple ventilation system you don't get many points of reduction but you can easily win 10 to 20 points with the ventilation. EPC certifier 1

Recently the calculation method has changed to incorporate more refined options, for example, demand-controlled ventilation systems. Although such efficient systems can lower the

E-level significantly, they are expensive than conventional systems. Moreover, if with the PV systems, small incremental changes are possible, opting for a more efficient ventilation system means a significant additional investment.

Homeowners have polarised opinions regarding ventilation systems. Especially in the early years of the EPB implementation, some clients would insist against installing a balanced ventilation system. These clients would ask the EPC certifier to calculate the penalty cost for not achieving the required E-level, considering the avoided cost of the ventilation system. The clients used the argument of convenience in the use of natural ventilation.

Because EPC certifiers rely mostly on systems to improve energy performance, often balanced ventilation with heat recovery is required for achieving the required low E-levels and indoor air quality. Even some architects see the ventilation system as a requirement for achieving the E-level required by the EPB certificate, rather than as a means to achieve a healthy indoor environment. Often there is a contradiction between the professional advice of the architects and the EPC certifiers and some interviewees feel that the clients tend to trust the architects more.

At the beginning of the EPB there was a lot of mould, some architects were against the ventilation, but more insulation you have, you place, the more airtight the building is, more important is the ventilation. Now more architects understand the concept, but all the architects say the ventilation is not necessary, only for the EPB... Indeed there is a lot of misinformation and the clients, they believe the architect above us. And some discussion we have, we say, it has to be, it is a law you have to follow. Also, for the health of the building, for your own health, it is necessary to do it. EPC certifier 6

### Heat pumps

In addition to PV panels and ventilation systems, EPC certifiers mentioned heat pumps as an effective measure to achieve lower scores of E-level. For example, it is possible by opting for ground to water heat pump instead of air to water heat pump. According to interviewees, they recommend heat pumps more often since 2018, which can be related to a change in the calculation method that allows differentiating better between different heat pumps or different ventilation systems. EPC certifiers find it difficult to change some preconceptions of their clients in favour or against heat pumps and construction fairs often play a role in the choice of homeowners.

### Airtightness test

The airtightness test is optional, although, in its absence, a penalising default value for air leakage of 12 m<sup>3</sup>/h.m<sup>2</sup> is assigned in the EPC calculations, whereas on average the actual airtightness value is only 3,6 m<sup>3</sup>/h.m<sup>2</sup> [13]. Most of the certifiers advise it firmly to their clients to achieve a lower E-level of approximately 10–15 points. It is a very cost-effective measure, as an airtightness test is not expensive (ca. €200) and it is often mentioned as part of a minimum 'package' for those homeowners who want to achieve the legal requirement with a minimum investment. For other clients, who consider opting for lower

E-levels, the property tax subsidy is an important incentive to undertake the airtightness test.

#### Solar water heaters/ Insulation / Windows

In comparison with other systems, solar water heaters were mentioned very seldom. It appears to be less recommended and chosen by the homeowners who opt to lower the E-level of the dwelling.

Building shell theoretically contributes to the calculation of the E-level [12]. However, since the minimum required S-level and U-values are so strict, in the last years, adding more insulation does not change the E-level significantly. It was not the case in the first years of the EPB implementation.

The thing is that the insulation and the windows just to get the S-peil (S-level) on S31, and then they have to invest to have a good E-peil, but the insulation is already so good, so extra insulation, it will not change the E-peil (E-level). EPC certifier 2

The architects with a focus on sustainability have a different approach. The EPC certifier, who is also the architect of the project tries to convince his clients to invest first in the building shell and only afterwards in systems:

But we start with, we start by insulating, then by building airtight, that's the first two options for us, the first two logical steps, and then we go to the techniques, because those cost lots of money and they get broken in time. EPC certifier 7

Other certifiers also criticised that the insulation does not weigh more in the calculation method, as insulation would last more than the systems and it is less likely to be replaced soon.

Windows are often a source of conflict between architects, EPC certifiers and clients. Architects insist on their initial design in terms of size and orientation of the windows, moreover that the building license was already issued. Therefore, to achieve the required S-level the alternative to reducing the size of the windows is to opt for more expensive energy-efficient windows. In some cases, architects advise their clients to opt for paying the penalty rather than making changes to the design or investing more in better-performing windows.

With a design that is not so compact. I have to say the only thing you can do is triple glass. That is a lot more expensive, if you have a lot of glass, they won't change their concept. Sometimes architects say to their clients "You have to pay penalty if the S-peil (S-level) is too high". Some architects say it is cheaper to pay the penalty as to change the concept of the building, or to invest in more insulation, or more triple glass. EPC certifier 6

#### NZEB

Starting from 2021, the nZEB level of E30 became the minimum requirement for new constructions. In the year when the interviews took place, it was E35, yet in the early years of the EPB implementation, the gap between nZEB and the minimum requirements was wider, see Table 1. The EPC certifiers were asked which type of clients were opting for the nZEB standards in the previous years and currently, who targets more than nZEB. There is consensus among interviewees that these are usually clients with higher income, who sometimes invest in a second property to invest or even resell. These are seldom

private homeowners but rather developers or constructors investing in apartment buildings. Their main aim for investing in higher levels of energy performance is the quality of the building and to have a futureproof property that can be advertised for resale.

I think the main purpose for choosing for the BEN (nZEB in Dutch) building was, if we build now, we reach E50 for example, how much will our building be worth in say, 10 years? So I think it would be smarter to make a BEN building now then ... EPC certifier 1

Most of the private homeowners building the first residence as a single-family house are usually interested in achieving the minimum required E-level. Only recently, when this level is close to the one required by the property tax incentive, they are motivated to invest more to achieve it. Also, EPC certifiers state that few architects are interested in promoting the nZEB, except for the ones who have sustainability as a promotional label.

According to the EPC certifiers, when the gap between the mandatory E-level and one required by the property tax incentive was wider, the best policy for promoting nZEB was tightening the minimum requirements. They are skeptic that other policies can promote buildings with higher levels than nZEB. According to them, few clients build passive houses now because they require significant additional investments.

#### Discussion and policy recommendations

The main purpose of the study was to determine whether the property tax incentive, offered to achieve higher levels of energy performance for new constructions, was effective in encouraging additional investments in energy efficiency in the residential sector. Based on the interviews with EPC certifiers operating in Flanders, we can conclude that the property tax incentive appears to be an effective method to encourage homeowners to invest more in energy efficiency than mandated by minimum requirements. In 2013, the Flemish Energy Agency communicated the nZEB standard of E30 as a target for minimum requirements for new constructions to be achieved in 2021. In the same year, the property tax reduction of 100 % was made available for achieving the nZEB level compared with the minimum requirement of E70 at that time. Over the years, the minimum requirements became stricter, and the goal of the accompanying property tax incentive was to encourage homeowners to invest more than required by the EPB regulations. According to the interviewees, the property tax incentive achieved this goal and was an important factor in decision-making. Moreover, the incentive appears to be more effective in recent years to encourage homeowners to invest, because the gap between the levels required for the property tax reduction and the minimum requirements is lower.

After 2021, the legal requirement for new constructions is the nZEB level; thus, the property tax incentives can be used to continue to encourage lower E-levels for renovations. Nevertheless, the EPC certifiers mentioned that due to various constraints, achieving low E-levels for renovations is not always feasible, and the extra investment needed could be higher compared to new constructions. The efficacy of the property tax incentive to encourage deeper levels of energy renovations should be further investigated.



EPC certifiers agreed that in previous years, with lower minimum requirements, mostly higher-income clients were opting for nZEB. Today it is the case for dwellings with lower levels, since the nZEB is the minimum requirement for new constructions. This type of client usually invests in a second dwelling; it is an investment rather than the first residence. Their motivations are mainly for the property to be of high quality and futureproof, in the view of a possible resale. This leads to the risk for a Matthew effect that higher income groups benefit more from financial incentives [14, 15]. According to the EPC certifiers, the best policy to promote nZEB was the minimum requirements. Therefore, the property tax incentive may not be adequate to encourage significant investments in energy efficiency, but it is advantageous to accompany the tightening of the minimum requirements and to encourage small incremental improvements of E-level. Therefore, in the future, it could still be useful for encouraging more ambitious renovations if the levels required for the property tax reduction would be close to the minimum requirements. A limitation of the study is that the cost-effectiveness of the policy is not evaluated in comparison with the investments activated or alternative policies.

All the EPC certifiers present their calculations to the clients in the form of various scenarios: one to reach the minimum requirements and other, more ambitious scenarios in terms of energy efficiency. Usually, the energy-efficiency measures are recommended by the EPC certifier directly to the client, without involving the architect. The most frequently used method is to increase the capacity of the PV system. According to the EPC certifiers, it is cost-effective, and it allows them to simulate and adjust the capacity as much as needed to achieve the targeted E-level. Another cost-effective measure is the airtightness test. The test is voluntary, yet the default value given is very penalising while doing it can lower the E-value even with 10–15 points. Other frequently used measures are efficient ventilation systems and heat pumps. It can also contribute considerably to lowering the E-value, yet the investment cost is relatively high.

Nevertheless, limiting advice only to systems means losing many opportunities. One of the EPC certifiers interviewed is an architect of a design firm focused on sustainability. If the rest of the interviewees certify projects of other architects, this practice certifies only their own projects. It allows them to simulate from an early design stage and to repeat the calculations various times. Their principle is a holistic approach, to start with the design, then they try to convince clients to invest in the building shell and only at the end to add systems. They aim for lower E-levels than the minimum requirements as a standard procedure. This type of EPC certifiers that are also the architects of the projects is more likely to certify a few projects per year. According to the Flemish Energy Agency, the number of EPC certifiers who realise less than five projects per year is diminishing in recent years. This profile of EPC certifiers is responsible for only 2 % of the total certificates released in 2018 [16]. At the same time, the other type of certifiers, who are specialised in EPB certifications and make the calculation for the majority of projects of other architects, are responsible for the majority of certifications. 12 % of the active EPC certifiers made 69 % of the total certifications in 2018 [16]. The interviewed certifiers also believe that fewer architects continue to have an EPB certification and usually, architects leave the aspects regarding energy performance to the EPC certifiers. Over the years, the EPB

certification for architects implied more training, discouraging architects with few projects per year to keep the license. Therefore, more architects should be engaged in the EPB certification process and at an earlier stage of the design.

## Conclusions

Given the more ambitious CO<sub>2</sub> reduction targets set by the EU, the European Green Deal emphasizes the importance of revising existing policies [1]. The property tax incentive in Flanders aims at promoting higher levels of energy efficiency in the residential sector. For a potential roll-out of the incentive in other regions and countries, its impact has to be assessed, as well as the interplay of the incentive with the EPB regulations.

The purpose of the interviews with EPC certifiers was to understand if the property tax subsidy plays a role in decision-making in Flanders. Findings show that clients and EPC certifiers are familiar with the property tax incentive, and it is used when the certifiers present the EPB calculations with scenarios with different levels of ambition to their clients. The incentive plays an important role in driving additional investments in energy performance compared with the minimum requirements. The E-levels required by the property tax incentive and the minimum requirements have changed over the years, and according to the certifiers, the incentive appears to be more effective when its level is closer to the minimum requirements.

The certifications are usually done after the building permit has been issued. Since energy efficiency measures are usually proposed by the EPC certifier, at this point, passive strategies that imply changes in the building design are conditioned by the building permit. For this reason, additional investments in systems are advised and chosen more often, such as PV panels, ventilation systems and heat pumps. Another cost-effective way of lowering the E-level without changing the design is the airtightness test. The airtightness test is optional, yet the default value is penalising in comparison with the actual value when the test is undertaken.

On the other hand, if the EPC certifiers are the architects of the project, it allows them to make the calculations at various stages of the design. If the architectural firm focuses on sustainability, the architects can initially incorporate passive strategies, then, measures in the building shell and only at the end, additional investments in the systems. Only such a holistic approach will allow achieving higher standards of energy performance than the required nZEB level for new constructions. Moreover, if one of the EU goals of the Green Deal and the New European Bauhaus is to build and renovate in a resource-efficient way [1] with a holistic approach, thus the property tax incentive should prioritize passive strategies and investments in the building shell over investments in the systems as it happens currently. Another issue is that the certification mostly takes place after the building permit has been issued. More architects should be engaged in the EPB implementation and at an earlier design stage. If the aim will be to promote higher standards of energy performance than the minimum required nZEB level, these are achievable only by applying a holistic approach at an early design stage.

The property tax incentive appears to be effective to encourage additional investments in energy efficiency, nevertheless, to achieve its full potential, its interplay with other policies and

the details of implementation have to be carefully considered by policymakers.

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