Criteria based approach for assessment of policy instruments for deep renovation of residential building in the Netherlands

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Abstract

The building sector is responsible for more than 40 % of the energy use and 32 % of carbon dioxide emissions in the European Union (EU). Previous research has shown that the present rate of energy retrofit and refurbishment in Europe is far below (<50 %) than that is required to meet the EU's building related energy efficiency goals for 2020. Appropriate policy interventions for deep renovation is perceived as a catalytic agent in promoting energy efficiency and leveraging more investments in the building sector. EU directives regarding Energy Efficiency reflects in various member states' national targets and policy measures to improve the energy performance of the existing building stocks. Economic policy instruments seem to be influential in steering the deep renovation market, but this alone may not be sufficient for the sustainable growth of the market. There is a need for market-based approach to enhance the private sector involvement, both in terms of technical and financial capabilities. This paper evaluates the policy instrument used for promoting deep renovation of residential buildings in the Netherlands. A "Theory-based evaluation" technique has been used in analysing the content of the policy instrument, and the underlying theories and policies, at output and impact level. A set of the evaluation criteria have been applied for assessing such policy instruments in leveraging energy efficiency investments and their effectiveness in terms of energy savings. The assessments are done based on the meta-analysis of relevant literature and data sources, and finalized in consultation with the Dutch partners from INNOVATE (Integrated solutions for ambitious energy refurbishment of private housing) project under Horizon 2020. Further, the challenges for scaling up such existing effort for the sustainable growth of the deep renovation market has been explored.

Introduction

BACKGROUND

This paper evaluates various energy efficiency policy instruments for the renovation of existing residential buildings in terms of their relevance, efficiency and efficacy of leveraging energy efficiency investments, and effectiveness in terms of energy savings and GHG emission reduction. The building sector accounts for 40 % of the European Union's (EU) energy consumption and 32 % of carbon dioxide emissions. The EU aims to decarbonise its regional economy by 80 %–95 % by 2050 compared to 1990, in which building stock has a significant role to play (Maio et al., 2012; Filippidou et al., 2017). About 97 % of the existing building stock in Europe requires renovation/upgrade in energy performance to comply with the aforementioned decarbonisation vision (BPIE, 2017). Carbon emission of the Dutch economy was estimated to be 194.4 billion kg in 2014 of which 19 % is contributed by building sector with about 35 % of the total national final energy consumption (Oorschot et al., 2016). Dutch municipalities have targets to achieve carbon neutrality for the social housing stock by 2050 (Oorschot et al., 2018).

The Energy Performance of Buildings Directive (EPBD), Energy Efficiency Directive (EED), the Eco-design Directive and

eco-labelling (EC regulation no 66/2010), and the Renewable Energy Directive (RED) are some crucial EU legislation for the improvements of building energy performance in a sustainable way (Artola et al., 2016). These directives have set some binding measures or provide direction to the member states to improve energy efficiency of the building sector. For an example, EU legislation mandates that all new constructions will have nearly zero energy requirements by the end of 2020 (Murphy et al., 2012; BPIE, 2014). The member states have drawn up strategies showing their plan to foster investment in the renovation of building stock in line with these directives and have introduced support tools and policy instruments to encourage their citizens for deep renovation of their existing buildings. This is reflected in the National Energy Efficiency Action Plan with obligatory policies in the Netherlands (NEEAP- NL, 2017). The energy efficiency framework includes an obligatory regulation approach for new construction, but an incentivised and voluntary approach is followed when it comes to the improvement of existing dwellings (Murphy et al., 2012; Sebi et al., 2018). This paper explores how the EU directives regarding building energy efficiency have been reflected into national targets and policy instruments in the Netherlands, and evaluates the output and impact of those policy instruments.

REVIEW OF PAST WORKS

Policy assessment practices and research have been rapidly growing in Europe in the last two decades which have given an opportunity for further refinement and innovation in policies including energy efficiency (Perrels, 2001; Kirkpatrick and Lee, 2001; Radaelli, 2004; Adelle and Weiland, 2012; Bartiaux et al., 2014; Charlier et al., 2018). Charlier et al. (2018) has evaluated the effectiveness of a number of French public fiscal policies for renovation to reduce energy consumption and GHG emissions through a simulation model using partial equilibrium framework. Sebi et al. (2018) has reviewed the building retrofit policies of France, Germany and USA undertaking a cross comparison of the policies, and highlighting policy targets, their success, opportunities and the barriers. Bartiaux et al. (2014) has used a practice-theory approach to examine the effect of energy retrofit policies in Denmark, Latvia, Portugal, and Belgium. The paper argues that energy retrofit policies must be able to contextualize and realize social practices. A policy will be effective only if it co-evolves with understanding the social norms, knowhow, technologies, products, and other institutionalized procedures. Oorschot et al. (2016) analysed various mechanisms that influence the adoption of 'near zero energy building retrofits in the Dutch residential buildings. Laes et al. (2018) made a systematic review of quantitative studies on effectiveness of various EU policies in terms energy efficiency improvements or CO_2 reductions in the European building stocks. The paper highlights crucial role of economic instruments in meeting the objectives of energy efficiency policies. However, effectiveness of such policies depends on how they have been designed in conjunction with other regulatory policies avoiding free riding. Issues associated with deep renovation is complex and multi-dimensional in nature (Murphy et al., 2012; Mahapatra et al., 2013). Literature have acknowledged the fact that the combination of different policy instruments would be effective to deal with such complexities (Gunningham and Sinclair, 1999; Howlett, 2011). This paper conducts quantitative and qualitative analyses of the existing energy efficiency policy instruments for renovation of buildings in the Netherlands. The analysis evaluates synergies among the policies, efficiency in terms of leveraging energy efficiency investments, and effectiveness in terms of energy savings and GHG emission reduction.

Methodology

Theory based evaluation has been applied in various literature to evaluate energy efficiency policies for built environment (Harmelink et al., 2006; Harmelink et al., 2008, Murphy et al., 2012). In this paper, we have also adapted "Theory-based evaluation" technique for the evaluation of the policy instruments as prescribed by Harmelink et al. (2008) and Murphy et al. (2012). However, we have moved a step further in assessing the policy results at two different levels: (i) output level, which measures the deliverables directly associated with the policy intervention, and (ii) impact level measuring the direct and long-term effect from the output (See Figure 1). Output represents the tangible and direct results of the implemented policy, while impact represents long term and indirect effect of the policy in the social arena (See Table 1) (Knoepfel et al., 2011).

In the first step, we have characterized the content of the policy instruments referring to the prevailing policy documents and other relevant literature. Then the policy instrument is further analysed based upon the underlying theory. Finally, the policy is assessed against a set of selected criteria at output and impact level using data from secondary sources and consultation of experts from INNOVATE partners (KAW Architecten en Adviseurs and Reimart). While evaluating the policy with specific criteria, understanding the underlying objective of the policy interventions is important (Mainali et al., 2014). Criteria defining relevance, effectiveness, efficiency and efficacy, and the sustainability of the policy instrument are selected for the evaluation purpose.

Policy evaluation is a complex task that requires systematic structured thinking to transform the complexity into series of simplified logical criteria, which can be represented in the form of the following matrix (see Table 1).

Result and Analysis

RENOVATION STRATEGIES, POLICIES AND MEASURES

National strategies of the EU member states are designed to address the domestic needs, but EU directives influence them. Strategies are eventually translated into specific policy instruments and measures, which are designed according to the specific market conditions, understanding both demand and supply sides (Bukarica and Tomsic, 2017). Such policies instrument can be broadly categorized into regulatory instruments, de-regulatory instruments, informational instrument, technical supports, and financial incentives. In the following section, we will discuss the renovation strategies, policies and measures adopted by the Netherlands briefly.

The Dutch building renovation strategy is founded on Energy Agreement for Sustainable Growth 2013, which was signed by 47 stakeholders actively engaged in energy efficiency and sustainable energy generation. The government aims to achieve

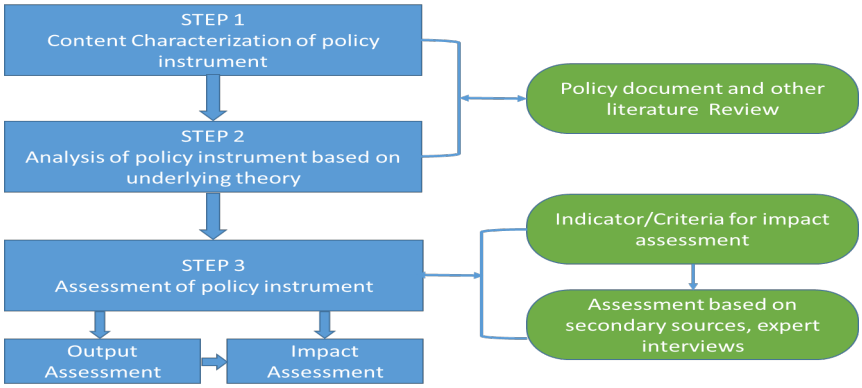

Figure 1. Methodological framework of the research. Authors' creation with adaptation from Harmelink et al. (2008) and Murphy et al. (2012).

Table 1. Policy instruments assessment matrix representing Criteria/categories at output and impact level.

Criteria for Policy evaluation (Categories)	Description	Policy Instrument Assessment	
		Output Level	Impact Level
Relevance	Measuring alignment of the policy instruments intervention with the national or regional priorities and goals.	✓	✓
Effectiveness	Measuring the changes as a direct or indirect result from policy intervention. Direct results are measured at output level and indirect results at impact level.	✓	✓
Efficiency	Measuring quantitative and qualitative outcomes with respect to capitalised used resources.	✓	✗
Efficacy	Measuring if intended objectives have been achieved through the policy intervention.	✗	✓
Sustainability	Measuring probability of continuing gains from the interventions	✗	✓

Note: ✓ (Criteria for Assessment level) Adapted from Weyrauch (2012). Evaluation of specific instrument based on these criteria/categories are discussed in the section Assessment of Policy Instruments prevalent in the Netherlands.

80–95 % reduction in CO_2 emissions by 2050 with the goals of (i) an average energy efficiency of 1.5 % per year, and (ii) specific commitments regarding energy savings in buildings. It aims at energy renovation of 300,000 existing dwellings a year and improve their energy label at least by two steps, i.e. 20 % to 30 % more energy efficient (SER, 2018; BPIE, 2014). The Dutch strategy on renovation focuses on (i) providing access to information and awareness on renovation; (ii) facilitating the renovation process; and (iii) providing financial incentives. The Dutch government assumes its role to be a facilitator by supporting and encouraging energy renovation, while citizens are supposed to make the investments.

The Dutch Building Decree 2012 has set the minimum levels of energy performance, expressed in terms of energy performance coefficient, for new buildings. This is the highest level suggested to be achieved by renovated buildings under a voluntary basis. However, since the year 2012, there is an obligatory requirement to provide a building energy performance certificate while renting or buying a dwelling (BRIS, 2018). Establishment of the national energy saving fund (NEF) and a revolving fund for financial institutions to provide low-interest loans to house owners and occupants for energy renovation are some financial policy measures. The NEF has been complemented through private funds from ASN Bank and Rabobank. The low interest rate loans offered under NEF are solely granted for energy-saving measures in houses and apartments. The amount of the loan for each dwelling can vary from minimum €2,500 to a maximum of €25,000 depending upon the depth of the energy renovation (SVn, 2017). There is a provision of capital subsidy scheme (SDE$^+$) for installing sustainable energy system such as geothermal systems and bio-based installations and a subsidy scheme (SEEH) for investments in energy saving measures for private owners. Besides, there exist tax rebate on labour costs for installing insulation and better window glaze for increasing energy efficiency, and mortgage specific to energy renovation up to 25000 Euro per dwelling (van Eck, 2018).

Besides, informational campaign on energy labelling, inclusion of energy efficiency aspect in the property valuation are some measures adopted for the promotion of energy renovation in buildings (NEEAP-NL, 2017). Various policy instruments/measures for energy efficiency improvement in the existing buildings in the Netherlands have been summarised in Table 2.

Table 2. Categorization of various energy efficiency policy instrument/measures in the Netherlands. (Source: SER, 2018; BPIE, 2014; BRIS, 2018; NEEAP-NL, 2017.)

Instrument categories	Underlying definition behind the instrument categories		Policy Instrument/measures in the Netherlands
Regulatory	Regulatory intervention that influence the volume of the energy used or emissions directly or indirectly.	a. rationing & prescription	• Building energy performance expressed in terms of energy performance coefficient (EPC). Voluntary EPC standards for deep renovation.
		b. performance standards and benchmarks	• Requirement of building energy performance certification during the time of renting or buying the house.
Informational Support	Supportive actions that increase the knowledge levels and market transparency by improving the accessibility to the information about the technology, products and available resources.		• The municipalities' energy points of contact • Ministry's national activation campaign named as 'save the energy now' • Inclusion of energy efficiency aspect in the property valuation • Informational campaigning on the energy labelling
Technical Support	Supports in R&D, capacity building in Energy efficiency, which lowers the transaction cost for energy efficient technical and organisational innovations.		N/A
Financial Support instrument	Fiscal instruments viz. taxes, subsidies and grants that influences the financial decision on energy renovation.		• Renovation loans under National energy saving funds • Capital subsidy for installing sustainable energy system • Subsidy for energy savings in social housing • Tax rebate on labour costs for installing insulation and glass • Mortgage specific to energy renovation

UNDERLYING THEORY AND ASSUMPTION BEHIND POLICY INSTRUMENTS

Bressers and Klok (1988) argued that there exists a causal relationship among the policy instrument under consideration, its intended outcomes (output and impact), and the surrounding circumstances under which the instrument is executed. Understanding such relationship is crucial in evaluating the policy instrument. Executed policies can have many outcomes. Some are limited to the immediate effects causing the intended behaviour changes or intended changes/responses in the demand of the targeted group. These changes/responses are the first step (defining the outputs of the instrument) towards realising the ultimate policy goals. This is followed by the effects created by these outputs in meeting those ultimate goals of the policy defining its impact.

Policy interventions designed in isolation may not be very effective. Evidences have shown that the potential energy saving is larger when interventions are applied in combination as they can mutually reinforce each other (Tukker et al., 2008; Gianluca and Sylvia, 2018). Therefore, a broad range of policy (regulatory, deregulatory, informational, technical and financial) instruments have been applied for improving energy efficiency of residential sector in the Netherlands as shown in the Table 2. The underlying principle and assumption behind some of those policy instruments are discussed in this section.

The core underlying principle behind the financial instruments are that the intervention become rational when there is a market failure i.e. market outcomes does not result in an efficient distribution of resources (Brown and Lee, 2017). Financial incentives are designed to meet the upfront cost that poses a potential market barrier for energy efficiency improvements. Subsidies, tax rebates, and access to soft loans are intended to motivate house owners for energy renovation (Wiese et al., 2017). Studies have shown that financial instruments are crucial in leveraging energy efficiency investments (Datta and Filippini, 2016, Datta and Gulati, 2014). However, if the instruments are not well designed it could lead to free-rider and rebound effects, resulting in the policy instrument not meeting the intended objectives (Wiese et al., 2017).

EU Energy Performance of Buildings Directive (EPBD) has urged member states to make *Energy Performance certificate (EPC)* obligatory during the selling or renting an apartment or a dwelling. This has been translated into national policy of the Netherlands. The underlying principle behind such certificates is to promote the opportunities for energy retrofitting

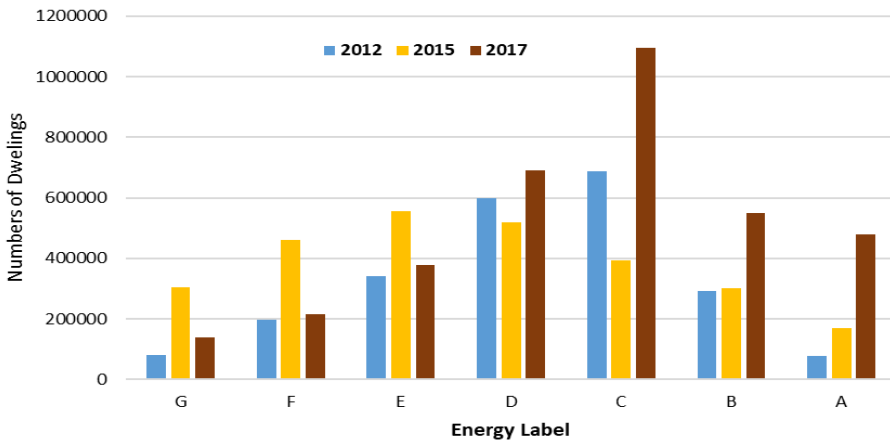

Figure 2. Building stock in the Netherlands as per their national EPC class in year 2012, 2015 and 2017 (authors compilation from NEO, 2018; van Hoek and Koning, 2018). Note: Class "A" being the most energy efficient building in all country cases, but the estimation method and requirement vary from country to country.

and increase the number of energy efficient buildings. The EPC comprises a list with suggestions for potential energy efficient measures appropriate for the specific building. The assumption is that well-informed house owners about the energy performance of their building will be encouraged for the energy renovation (Bartiaux et al., 2014). However, it is important to explore the quality of such EPC, and how effectively the suggestions within certificates have been translated into energy renovation in the Netherlands.

Building regulation is a regulatory instrument designed and implemented with the underlying principle that it will set minimum standards for the buildings including existing building needing renovation. Building regulations for existing buildings are designed with an assumption that all the buildings when goes through renovation will comply with these set minimum standards (Murphy et al., 2012). However, the principle question often discussed in many literatures is whether the rule set will always lead to compliance by the house owners or not (Heijden and Jong, 2013; Griffiths, 2003). To what extent the regulation is successful in meeting the goal of the energy efficiency (Adequacy)? Are the homeowners able to comply with the set regulations (Feasibility)? These are some key questions for evaluating the building regulations (van Rooij, 2006).

When the internalization of external costs is not considered in the energy price, the motivations behind energy efficiency and energy saving measures becomes low. Market-based instruments are designed to overcome this problem considering the externalities (Stiglitz and Rosengaard, 2015). Energy efficiency obligations or white certificate is one of such instruments that can address multiple market failures associated with energy efficiency (Giraudet and Finon, 2014).

ASSESSMENT OF POLICY INSTRUMENTS PREVALENT IN THE NETHERLANDS

In this section, we have used the logical criteria for assessment (policy relevance, effectiveness, efficiency, efficacy and sustainability) as mentioned in Table 1 to assess and evaluate some of the key policy instruments viz. Building Energy performance Certificate (EPC); Fiscal instruments (taxes, subsidies and grants) in the Netherlands.

Requirement of building Energy Performance Certificate (EPC)

Relevance: EPC as a policy instrument has high relevance both at policy output and impact level. The policy is in line with the EU's legislation Energy Performance of Buildings Directive (EPBD). The targeted output of the instrument to improve the energy label of 300,000 existing residences by two classes until 2020 is highly relevance in terms of energy savings and GHG emission reduction at impact level.

Effectiveness: The number of houses receiving EPC has reached 3.5 million in 2017, which is 1.27 million more houses compared to year the 2012 when the instrument became obligatory (NEO, 2018). More than 50 % of the total building stock is now registered in EPC system (van Eck, 2018). This represents the effectiveness of the policy instrument at the output level. The increment in the registration of dwellings at lower energy label are relatively low (viz. 10–15 % increment in F, E and D label) compared to higher energy label (59 % in C, 88 % in B and 518 % in label A) in between 2012–2017 (NEO, 2018). There has been decrease in the registration label in lower energy class in the year 2017 compared to 2015 indicating the fact that there is not only the increase in the registration of dwellings in the labelling system (see Figure 2), but also fair progress in improvement in their energy label. The social housing sector and newly built dwellings contribute largely to the higher energy label registrations demonstrating significant impact of EPCs in these buildings. In 2015, 2.7 million dwellings were improved at least one label up with the total investment of 10 billion Euro (van Hoek and Koning, 2018). There was a total energy saving of 30.6 PJ (at the impact level) and the cost for each GJ of saved energy was estimated to be 328 Euro (Authors estimation based on data from European Investments Bank; van Hoek and Koning, 2018).

Efficiency and efficacy: The obligatory requirement of EPCs for selling and renting the dwelling, and its energy label in accordance with their energy performance has created positive impact on public awareness. In principle, this should lead to a more correct evaluation of energy performance, property price in the housing market, as people would be better informed. Brounen and Kok (2011) claimed that prices of properties are higher by 10 %, 5.5 % and 2 % for A, B and C

label in comparison of dwelling with label D respectively, and lower by 0.5 %, 2.5 % and 5 % for E, F and G label properties respectively. This finding could be a strong argument to stimulate people to invest more in energy renovation increasing the efficiency of the policy. The energy label is valid for 10 years, and only a certified expert can issue it. The price for obtaining the energy performance certificate could vary from €140 to €210 for an average household (60–100 m^2) (Spyridaki et al., 2016). Not so many people were motivated in getting advices in terms of energy renovation paying this fee. From the Reimart database, it has been found that out of 175 EPCs requests from the dwellers, only 3 % of them actually invested in the energy renovation at the end. Obligation of EPC on selling a house were sometimes circumvented with mutual understanding between the seller and the buyer. The Dutch government felt public pressure to reduce the administrative cost of certification, and drastically simplified the implementation process and the certification method to lower costs. With the simplified process, the costs for obtaining the EPC has gone down to €10–40 for residential buildings. Dwellers can now obtain the EPC uploading the proof of efforts to increase energy savings (like photos or receipts), which will then be evaluated by experts and give the house a final energy label without actual visit of the building. This has drawn a serious criticism in recent years raising the concern over the deteriorated quality of EPC (Majcen, 2016).

Sustainability: The number of labelled homes show a steady improvement rate of about 4.2 % every year, which ensures the viability of the measure. However, experts have suggested making the energy labelling method more scientific having better correlation with the energy used in the buildings (Santin et al., 2016). The Dutch new policy for sustainable development is rather focused on making the state without natural gas heating. To make the labelling compatible with this new policy, the insulation level of most efficient houses (labelled A or B) needs to be ready to be disconnected from the natural gas grid and should be able to heat with an electric heat pump or with low-temperature heating sources. However, this does not necessarily align with existing EPC-calculation method, which needs attention. EPC has served as a bridging concept between various stimulation policies, all focused on lowering the emission and saving energy.

Fiscal instruments viz. taxes, subsidies and grants

Relevance: The Netherlands has enforced various sets of fiscal instruments viz. renovation loans, capital subsidy for installing sustainable energy system, tax rebate and mortgage specific to energy renovation. These sets of instruments are derived from the EU energy efficiency directives under article 12 and have clearly high policy relevance both at output and impact level. From Reimarkt's experience, one out of three dwellers that approach them for energy renovation drops out for the financial reasons. Most of these drop out (about 78 %) are not because they cannot afford the renovation measures, but due to their perception that the costs exceed the benefits. There is no clear obligation to improve energy efficiency at household level. In this pretext, the fiscal instruments clearly are part of a strategy of high relevance to stimulate (through subsidies, tax rebate) and facilitate (through loans and mortgage) energy efficiency improvements.

Effectiveness: The fiscal instruments are useful in drawing the interest of homeowners in energy efficiency and leveraging the energy investments in the market, which are crucial in achieving long-term impact in terms of energy savings and GHG emission reduction. In pursuant to Article 7 of the Energy Efficiency Directive, the Dutch government has established two revolving funds for the purposes of fleshing out the alternative policy measures for energy renovation. For example, the Dutch government's €75 million budget for private homeowners under the National Energy Saving Fund (NEF) has been supplemented by €225 million from private funds (€175 million from Rabobank and €50 million from ASN Bank) (SVn, 2017). Because of various fiscal policy measures, there has been a total investment of 111.4 billion Euro by 2015 in the renovation of private dwellings (van Hoek and Koning, 2018).

When it comes to the effectiveness of the subsidy for renovation, subsidy scheme for energy savings in social housing of Amsterdam is a good example as discussed by Meulen and Menkveld (2018). The city had allocated a budget of 33.1 million Euros for the period 2011–2014 with an expected total improvement of 16,500 energy label steps in the social housing sector (Output) and an expected impact to reduce 5.1 kiloton of CO_2 ($ktCO_2$) emissions per year. The subsidy of €4,100 per dwelling for the improvement of at least two label steps and a maximum of €12,300 for the major improvement in energy label (going from G to A) have been allocated. The city reached the targeted output of improvement of 16,500 energy label steps with the subsidy support to 5,131 dwellings by 2013 (even earlier than the targeted time). However, when the impact was evaluated in 2016, the scheme was only able to reduce 1.65 $ktCO_2$ per year (Meulen and Menkveld, 2018). The impact was far below than the expected values despite of achieving the expected output level.

Efficacy and Efficiency: The efficacy of fiscal instrument might be higher compared to regulatory instruments as they can directly stir the market and help in achieving the intended policy objective. Though the efficiency of fiscal instruments differs depending upon the types of the instrument in question, subsidies are extremely expensive for the large-scale impact. For an example, the subsidy scheme for energy savings in social housing of Amsterdam as discussed earlier, the cost was €1,000 for per ton CO_2 reduction, which was almost three times more than the estimated cost during the design of the subsidy policy due to the lower actual energy savings than expected (Meulen and Menkveld, 2018). Experts during consultation have opined that if similar amount of investment would have been made in the development of the market based strategy (by One-Stop-Shops, Energy Desks, process quality improvement of suppliers, production chain efficiency etc.), the impact could have been much bigger.

Sustainability: Fiscal instruments are instrumental in lowering pressure on the production chain bridging the gap between the dwellers' affordability and the investment cost. However, experts opined that subsidies seem to create a boomerang effect and driving the market, which has a negative impact in the development of sustainable market in a long run. One expert from Reimart mentioned that there has been no insulation subsidy since last two years and around 27 % of their business dropout cases are associated with homeowners postponing

their investment decisions expecting a new subsidy in future. Another study by Murphy et al. (2012) has reported that there has been free-riding effect of subsidy measures in one of the case studies.

The interest towards the energy efficient dwelling is increasing. Havlinova (2018) has estimated that premium buyers are willing to pay, on an average 3.1 % higher price (ceteris paribus) for an energy efficient dwelling, which is an increment of 2.5 % compared to the situation before Energy labelling policy was enforced. Though it is difficult to quantify the impact of the instrument like informational support, their role cannot be ignored in creating synergetic impact with other policies.

Conclusion

This paper evaluates various Dutch energy efficiency policy instruments for residential sector at output and impact level using "Theory-based evaluation" techniques combined with expert consultation. The instruments have been evaluated in terms of their relevance, efficiency and efficacy of leveraging energy efficiency investments, and effectiveness in terms of energy savings and GHG emission reduction from the renovation of existing building. The analysis shows that various regulatory and fiscal policy instruments are in place in the Netherlands, which reflects well the EU Energy efficiency directives and legislation. The regulatory instrument like EPC might be successful in terms of obtaining the targeted output of the policy in terms of numbers of registered dwelling in the energy labelling system. However, there actual impact of the policy is questionable and under criticism due to poor quality of EPC certification methods that the Dutch government currently have for existing dwellings. The probability of continuing gains from the "Energy Performance Certificates" will be higher if EPC policy is properly correlated with the energy used in the dwelling and is strengthened, for an example, by taxing houses with lower energy labels.

The fiscal instruments viz. soft loan and subsidies are useful in drawing the interest of homeowners in energy efficiency and leveraging the energy investments in the market. They are strong instruments to drive the market. The Amsterdam subsidy scheme example has shown that the policy instrument was successful to meet the expected output but was not as successful to meet the intended impact. Therefore, such a policy needs closure look in terms of aligning the expected outputs with the intended impact. A further exploration is required to understand the possible reasoning behind the differences in the actual and intended impacts of the policy.

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