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*Barriers to energy efficiency
and policy instruments for
improving energy efficiency.
Overview of literature*

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Barriers to energy efficiency and policy instruments for improving energy efficiency. Overview of literature, 2019, 69 p.

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INTRODUCTION

Energy efficiency gains the spotlight when energy sources, heat and electricity becomes more expensive. Resources and energy can almost always be paid less and can be achieved in a variety of ways: stopping consumption, reducing consumption, consuming effectively, taking advantage of the opportunities afforded by the energy market. The question is what needs to be done, what and how much resources needs to be invested to reduce energy costs while not reducing quality of life when it comes to taking energy efficiency measures in households, and not boosting the price of services and products when it comes to energy efficiency in industry and the services sector.

The easiest way to cut energy costs and who pays nothing is to consume less energy. However, at the level of both individuals and organisations, more efficient use of energy or energy saving does not take place: action to reduce energy consumption has barriers preventing decisions to conserve resources and invest in energy efficiency. If the energy efficiency theme is up to date at national level (for example, if it is too much energy consumed and costs too much for both the public and the State), the State may decide to implement measures aimed at improving energy efficiency and can be done by implementing energy efficiency policies. It is essential that national policies are able to successfully overcome barriers that prevent real action that is conducive to energy efficiency. The process of preparing, adopting and implementing energy efficiency policies is important at both individual and organisational level: both household and merchant decisions must be taken on investment in energy efficiency, the commitment not to overspend or to conserve energy by turning energy into actual action.

However, researchers who have analysed the effectiveness of energy efficiency support programmes (in fact, policy instruments) have concluded that the most important factor influencing decisions on energy efficiency is human attitudes and behaviour (Casado, Hidalgo, and García-Leiva 2017; Ebrahimigharehbaghi et al. 2019). At individual level, the willingness to take a decision on participation in the implementation of energy efficiency measures is closely linked to environmental and environmental concerns and the commitment to turn their attitudes into action [Gardner, Stern, 2002]. Today, environmental and climate issues have been raised at an ideological level and there seems to be no doubt that energy needs to be saved and the environment should be treated with care, but when assessing the activity and involvement of citizens and organisations in the implementation of energy efficiency measures, it should be concluded that this view does not translate into action [Allen, Dietz, McCright, 2015] [Trotta, 2018].

In the 80 s of the 20th century, the researchers concluded that a positive and gentle attitude towards the environment did not yet mean that an individual or an organisation would turn this positive attitude into actual, real action. Treatment of the environment and environmental problems may be positive, but action may not follow. The fact that attitudes are translated into actual action entails both internal and external barriers, and therefore the main and at the same time the most difficult task is to find policy instruments that remove or eliminate barriers by allowing positive environmental action [Labanca, Bertoldi, 2018]. One of the main problems that people treat environment and energy is sloppy: resources that are common to everyone, even collectively, can afford to behave sloppy by polluting, overspending and depleting them [Gardner, Stern, 2002]. The spillover effect of resources is reinforced by the possibility for an individual (or an organisation) to benefit more compared to other users of the resource. Consequently, the researchers conclude that the effectiveness of various resource conservation programmes (policy instruments) depends on attitudes and behaviour (action) and interaction with barriers affecting behaviour [Wilson et al, 2015] [Svensson, Paramonova, 2017] [Gardner, Stern, 2002]. Energy consumption and participation in energy efficiency-oriented activities are also influenced by human values, attitudes and internal and external barriers.

In this survey¹ research and policy literature on attitudes, causation and interaction between actions, barriers and policy instruments, the role of policy analysis in policy making and decision-making, while focusing on the main objective of this analysis – taking into account the contribution of researchers to research energy efficiency barriers and policies, helping policy makers in Latvia to draw conclusions on the factors, what needs to be taken into account in the development of energy efficiency policies intended to be implemented in real life, involving real people and organisations. It is recommended to read this material sequentially, starting with an overview of human value, attitudes and causation, and continuing with a list and analysis of specific policy instruments to overcome them, including in the context of Latvia, in order to obtain a complete picture of the impact of all these factors on policy choices and the effectiveness of implementation. The survey shall be supplemented and illustrated by the annexes listing the barriers to energy efficiency identified in expert seminars and the types of policy instruments and instruments for preventing or overcoming barriers identified in research literature.

¹ This overview is considered to be a draft. In the course of the project, the review is and will continue to be improved, taking into account the need for additional research, including for the modelling of scenarios.

1. ENVIRONMENTAL CHALLENGES AS A “SHARING TRAGEDY”

The introduction to the survey already highlighted the important role of attitudes, behaviour and action in tackling and tackling environmental problems. Energy consumption and all related processes play an important or even key role in the anthropogenic impact of the environment and climate. Energy efficiency is therefore one of the most important elements in reducing this anthropogenic impact, and it is closely linked to human behaviour, both at personal level and being part of larger bodies, interest groups, organisations, businesses, institutions. Energy consumption can be easily monetised and should serve as a powerful motivational factor in cases where energy costs are too high (with the reservation that “too” is a relative concept which should take into account the social and economic characteristics of the energy user) or are acceptable to the user, but could be less if the user were to implement the energy user. more efficient behaviour, such as using more energy-efficient devices or changing your energy habits. However, action to reduce energy consumption is not taking place. Leading researchers to address the environmental impacts of human behaviour point out that energy saving (as a resource) is also seen as an environmental issue, and therefore the causes of insufficient efficiency of energy efficiency programmes should be addressed in people's attitudes and actions towards the environment (resources), by putting in place and demonstrating the hypothesis that environmentally friendly behaviour primarily takes place because people have free access to resources that do not belong to a particular owner or are shared by many, without being penalised for the depletion of resources. The researchers call this problem a sharing tragedy (the tragedy of the commons), analyse its causes and factors (barriers) that influence the overspending of resources (including energy) and prevent decisions and resource-less behaviour.

The concept of “sharing tragedy” (*in Latvian today, “sharing” is used in another sense – sharing is an assisted solution for sharing resources with a view to increasing efficiency in the use of activities and resources, and is aimed at preserving the environment*) was introduced by the University of California biologist Gareth Hardin. Hardin's article on the subject, published in Science in 1968, is probably the most quoted, the reference and republished article on the social and behavioral dynamics of environmental problems. Hardin's argument logic is simple – he assumes that every individual is centered on himself, i.e. behaving primarily in a way that achieves exactly his own interests. When consuming natural resources, every individual benefits financially or otherwise. Moreover, no one sees anything wrong in it, because the amount of resources is huge and the individual's impact on it is seemingly negligible. Therefore, everyone is inclined to consume as much of the resource as possible as quickly as possible. Such an approach does not create problems if the world is not repopulated and the intensity of resource consumption generated by human activity is low. With increasing population and increasing use of resources, resource stocks are shrinking extremely rapidly and can be destroyed in full [Hardin, 1968]. One example known to the Latvian audience is the radical depletion of the resources of certain fish species (such as Baltic Sea cod) in the Baltic Sea as a result of intensive catches.

.1. Four solutions for changing behaviour

Gardner and Sterne refer to William Oful in their analysis of changing human attitudes and behaviour, concluding that coordinating individuals' behaviour in the name of common good is an eternal problem and that only a few simple methods of promoting socially acceptable behaviour by individuals have been identified over the centuries [Gardner, Stern, 1996, 2002]. 1) the use of laws, regulations and incentives; 2) educational programmes that seek to achieve social behaviour by informing people and seeking to change attitudes; 3) promoting socially

responsible behaviour through non-governmental processes that work well for small social groups and communities within; and 4) the use of moral, religious and ethical arguments for achieving socially desirable behaviour [Ophuls, 1973]. In order to better understand the context in which participation in energy efficiency measures should also be discussed today, a brief explanation of each option is provided below.

Laws, regulations and incentives

In this option, laws, rules and incentives are applied to promote the social behaviour of an individual and to prevent antisocial behaviour (“incentives” in the English literature). An example that is relevant to today's situation and not environmentally related: national laws and local government rules determine how cars are used – what is the maximum permitted speed, what stopping signals, stopping restrictions, etc. Another example: legislation requires citizens to pay income tax. In these two examples, laws and regulations are put into life by means of fines or other threats. On the other hand, other laws and regulations to encourage people to act socially responsibly and in the public interest use the principle of reward, whether it would be monetary or non-monetary. An example of environmental problems, referred to by Gardner and Sterne, the US tax legislation in the 1970 s provided for substantial income tax exemptions for taxpayers who had installed energy-efficient solutions (for example, heated house attic or installed a highly efficient heating system oven) or solar power plants at their home.

A fundamental feature of laws, regulations and incentives is that laws, regulations and incentives encourage people to act in the public interest because such behaviour is also in the interests of individuals themselves, whether monetary or non-monetary. For example, privatisation as an environmental problem-solving approach is the same as laws, regulations and incentives. This means that the individual is interested in acting in their own interests, so if acting in their own interests also means acting for the protection of the environment, such a solution will work effectively.

Although the method of laws, regulations and incentives encourages individuals to act in the public interest by making them the personal interests of each individual, the other three types of solutions (education, community influence, moral and ethical arguments) seek to achieve the individual's socially responsible behaviour in a significantly different way. By applying these methods, it is assumed that, under certain circumstances and under the right conditions, people will be willing to act in the public interest, regardless of whether such behaviour is in their narrow personal interests. Hardin, in principle, rejects the use of two of these three methods and ignores a third. He prefers the first method – the effects of laws, regulations and incentives. Hardin's choice is based on his assumption that people are irreparably selfish and therefore act primarily to pursue their personal interests [Hardin, 1968].

Education and information

The second method provides that people are educated about social problems at school, through the media or other channels for the transfer of information. Education programmes are characterised by two main directions: firstly, they illustrate the nature and severity of the problem, trying to change people's attitudes to the problem. In other words, education tries to convince people that the problem is so serious and so important that they need their immediate and personal involvement. Secondly, informing and educating as a method highlights concrete actions that each individual can take to help solve a particular problem.

Small social groups and communities

The third method requires people in a small group or community to establish and maintain their own rules and rules of behaviour with a view to solving a group or community problem without State involvement. An environmental example: a small group of cod fishermen travelling from one port in fishing shall come together and agree on rules of action to help maintain the cod population. The method provides that fishermen participating in this group would respect the rules partly because each other is observed daily and there is social pressure to comply with the rules agreed upon. However, and this is important, they would also respect the rules due to mutual respect and care for each other's fate and also due to their duty to the other members of the group. All these processes work most effectively when fishermen know each other well and establish a close group or community.

Moral, religious and ethical arguments

The fourth method involves the use of principles of religion, morality and ethics to promote the socially responsible behaviour of individuals. For example, in Christian religious traditions, the ten commandments contain references to the prevention of certain acts (e.g. killing and fraud) and the desirability of other actions (e.g. paying homage to parents). To apply this method, Western states could adopt and implement environmentally-friendly religious or moral norms and practices. Various authors have encouraged such norms to borrow from American Indian faith systems and codes of morality that have helped these societies long live in harmony with the natural environment.

1.2. Which of the four methods of changing behaviour should be used?

Historically, I have been treated differently by one of these methods. For example, Ofül points out that the philosopher of English politics, Thomas Hobbs, has defended the first approach, namely the use of laws and regulations. In contrast, the French political philosopher Jean-Jacques Ruso had been a supporter of the third method, believing that it was most effective to use the interest of small groups and communities. Neither Hobbs nor Ruso wrote about tackling environmental problems, because in their times the problems we encounter today simply did not exist. However, the two have addressed a more general problem, writing on how to encourage individuals to act in the public interest and how to eliminate individuals' behaviour that threatens the common good of society.

What is important, though, is that the approach of "sharing tragedies" author Gareth Hardin is consistent with Hobbs's position. He considers that only laws, regulations and incentives (including a method such as the privatisation of resources) can provide environmentally-friendly action for the general public. Of course, Hardin maintains such a position mainly because he believes that people are innate egomaniacs and that they are more inclined to act solely by their own interests. He therefore concludes that the most effective method is what can turn human egotism into environmentally-friendly behaviour, or in other words, makes environmentally-friendly behaviour the most appropriate for the individual's own interests. Hardin rejects the ability of educational programmes and religious, moral and ethical standards to make action changes because he considers that these methods are too weak to overcome the limitations of human innate egoism on action for the sake of society and the preservation of shared resources. Hardin does not mention in his assessment the third method, which provides for a socially important and influential role for a group or community of society.

This analysis looks later in detail at the various policy instruments to remove or overcome barriers to people's involvement in energy efficiency measures: by synthesising the results of research from different authors, it is concluded that the authors are united by the fact that the most effective use of multiple policy instruments helps to overcome barriers to action and that the use of individual policy instruments is ineffective or doomed failure [Helgesen, Sandbakk,

2012] [Wiese, Larsemn, Pade, 2017]. Similarly, Gardner and Sterne note, when assessing attitudes and the most effective methods of changing behaviour: none of the four methods mentioned above is likely to work effectively. No single method taken will be able to address the “sharing tragedy” and the problems it poses – depletion of natural resources, environmental pollution, exponential population growth and other problems. The use of a majority of four or at least methods can be successful [Gardner, Stern, 2002].

When assessing the potential role of religion in building a positive mass awareness for environmental problems, there are not many sources to study the Christian vision of the world of affiliation and the veracity of the Bible of literal faith in the relationship with human worries about the environment. The results of these studies, although interesting, do not allow unambiguous conclusions to be drawn. For example, the Christian religion of the West has not played an important role in the knowledge of environmental problems and has helped to successfully prevent environmental damage. Gardner and Sterne assess, in a concentrated way, whether, at different times, different cultures and associated religions, morals and values have focused on protecting the environment or against protecting the environment. There are researchers who have said that the handling of many cultures other than so-called Western cultures in environmental matters has been as bad as Western cultures. For example, Thomas Derr argues that the ancient Egyptians, Assyrians, North Africans and Aztec in some cases damaged the environment so thoroughly that the damage caused began to threaten the existence of their civilizations.

Against the idea that environmental protection-related values and beliefs can prevent harmful effects on the environment, there is serious environmental damage caused by individual crops characterised by religious teachings aimed at protecting the environment. Derr points out that some American Indian tribes have been characterised by relentless action against the environment, although their tribal belief systems and moral codes have contained references to the preservation of the environment. The author also points out that, in general, eastern religions such as Hinduism in India and Daoism and Buddhism in China have not helped to prevent major damage to the environment in these countries. Gardner and Sterne offer to look at several examples of how countries with historically strong religious systems have failed or wanted to use this potential to achieve a more environmentally friendly treatment.

Hinduism in India

Although Hinduism is clearly characterised by a gentle attitude towards nature, India's environmental performance is far from excellent. Deforestation and killing of animals and birds have caused damage to nature. Pumping vast amounts of water for irrigation of agricultural crops over 10 years has lowered water horizons by as much as 27 meters. Overactive irrigation, rural grazing and deforestation have seriously damaged large areas of land. About a third (until the publication of the first version of Gardner and Sterna's book in 1996) has been degraded as a result of potentially productive ground water erosion, wind erosion and salvation. Deforestation and desertification have resulted in increasing periods of drought and flooding.

Another factor has played an important role in reducing the influence of religion: in India and many other developing countries, in response to Western ideas, a development philosophy adopted and actively implemented, following demand from international markets and pressure from international lenders to return money borrowed to finance development needs. For example, local forests are being felled to plant trees of commercially valuable species instead, generating profits for forest developers and enabling international loans to be returned. Such changes have resulted in a reduction in the amount of available fuel wood and fodder for the population, as well as increased flooding in downstream rivers, as local species have been felled and this has contributed to soil erosion.

Another important factor is the growing consequences of population growth, industrial development and urbanisation. An exponential increase in the number of people and the consequent need to produce more food, clothing and more housing dominate any religious statement that calls for the respect of nature.

Daoism and Buddhism in China

Before the Communist Revolution in 1949, China dominated three religious, philosophical and moral traditions – Daoism, Buddhism and Confucianism. Both Daoism and Buddhism contain standards relating to environment-friendly treatment. But pressure from overpopulation, industrial and urban development, like India, depressed religious assumptions about environment-friendly attitudes and led to sustained and increased environmental degradation. Paradoxically, it is environmental problems, particularly in the urban environment, that have stimulated China to focus on environmental issues, including the use of renewable energy resources and energy efficiency, at the beginning of the 21st century.

How to explain the poor environmental situation in pre-revolution China, where Daoism and Buddhism were predominant religions that underscore conservation of nature? Yi-Fu Tsaun mentioned the increase in population as the main cause. As the population grows, forests have been felled to acquire areas for agricultural production, raw materials for construction and wood and coal for housing heating. If it is necessary to choose between deforestation and going to the standards of religious rules on environment-friendly treatment and the possibility of people being frozen or starved, then the choice is quite clear. This conflict of interests is later explained in the context of the application of positive and negative incentives, where the country should choose which policy instruments to use to encourage the involvement of citizens in energy efficiency measures, stressing that incentives that put an individual in the face of so-called impossible choices (e.g. by making it easier for socially disadvantaged people to use their limited resources to invest in energy efficiency whether it is necessary for the purchase of clothing or food products) is likely to be unresponsive and will not be effective or effective in achieving the results required.

However, the causes of this non-compliance were more complex than could be seen from the above, and population growth, industrialisation and urbanisation were not the only factors involved. There were also many political, economic and social factors involved, which, in addition to religious and moral statements, define behaviour in every culture and country and apply to both developing countries and industrialised countries. The government, in the name of development, can also disrupt sustainable relations between the local population and the environment, as has happened in India. In addition to the government's suppression of the traditions of Daoism, Buddhism and Confucian in China, the environment was sacrificed in the name of development, for example by implementing an intensive industrialisation policy based on the use of energy produced by burning coal without emission control. Now, in fighting the negative environmental impact of fossil energy, the Chinese authorities are spending huge resources. Many of the political, social and economic forces and processes that have been mentioned have an impact in any country and certainly help to explain India's poor performance in environmental matters.

1.3. Environmental-oriented religious movements – development and potential future trends

Traditional religions are not able to have a positive impact on environmental protection in some of the population in major countries, but there are also attempts to develop alternative religious organisations in the world. For example, four religious and moral-based movements were formed in the 1980 s in the United States: modern Christian and Jewish Ecotheology, which

highlights the aspects of preserving the environment of traditional articles; the Catholic theologian Thomas Barry's environmental-focused religion, which contains references to Eastern religions and modern scientific ecology; the movement of deep ecology; created by Arne Naesz, Bill DeVal and George Seshin, a movement that offers a new worldview and urges fundamentally changing Western lifestyles and values; and ecofeminism, which expresses the view that moral and practical links between tackling environmental problems in Western cultures and ending gender-based prejudices and discrimination against women are inextricably moral and practical. [Gardner and Stern, 2002].

These four religious and moral movements overlap with each other to some extent, and they are not mutually exclusive, which means that those who support this movement could be so well involved in more than one movement at a time. It is important to note that movements differ from one another in terms of how much they are or are not a full religion. Both the Ecotheology and the Berean movement are full-fledged religious movements while deep ecology and ecofeminism are morals, ethics and values-based movements with some religious elements.

Ecotheology

There are few things in Christian faiths that support the overexploitation of the environment and many things that emphasise the responsibility of people to respect and take care of Earth, its ecosystems and the life forms adjacent to humans.

Works by Thomas Barry

Catholic monk and "cultural historian" Thomas Barry believes that the survival opportunities of Western civilisation depend on its ability to form a radically new religion and to get followed by it. Bernie stresses that the new religion needs to include an environmentally friendly worldview and cosmology (the story of creating the universe and the role of people in it).

Deep ecology movement

Although the movement of deep ecology has elements of spiritual and religious nature, like the movement of Thomas Barry, it is based on the principle of determinative philosophy and worldview and creates a certain lifestyle. The author of the deep ecology philosophy is the Norwegian philosopher Arne Naesz.

Ecofeminence

The people of the movement believe that environmental problems and sectarianism (discrimination against women) are related problems and can only be solved together and at the same time. Like in Western cultures, men have traditionally viewed women as less valuable, so too has nature been seen as less valuable and serving human. Consequently, the enslaving of nature and woman is closely linked and these problems cannot be solved individually.

The four movements have two common features: 1) a worldview similar to today's scientific ecology (or belief systems) and 2) the orientation of eco-central values.

From the perspective of policy-making and energy efficiency policy instruments, it is important to assess whether such movements have the potential of mass movements with the ability to change not only people's attitudes to energy saving but also behaviour, actual behaviour. Gardner and Sterne point out that three important factors need to be considered to assess whether environmental movements and religious, moral and ethical strategies can be successful. Firstly, the values and worldwide view underpinning public support for environmental protection should be carefully considered, as well as the potential for this aid to be more eco-central and more environmentally based. Secondly, it should be assessed whether changes in

values and beliefs will remain and become permanent. Thirdly, the impact of changing values and beliefs on people's actual behaviour should be assessed, such as the impact on people taking energy-efficient action at home and on the steering of their own personal car, purchasing environmentally friendly goods and services, participating in recycling programmes for raw materials, choosing to limit their family size, supporting environmental protection government programmes, voting about environmental problem-solving party candidates and the like.

Are environmental values and environmental views changing?

There are a lot of public opinion survey data on beliefs and values related to the environment. Data show that an ecocentric worldview of the 1990s era Western community hasn't been too common. However, these same data show that there are surprisingly strong and growing worries about the state of the environment in both the West and many development societies. There is also evidence that these worries are associated with deep values and beliefs, potentially pointing to more ecocentric orientation and the formation of today's ecological world vision, as well as similar fundamental changes in society's overall values.

Are values and beliefs sustainable?

If developed countries, as Inglehart and Danlaps point out, really experience a change in values to a postmaterial value system, then will these changes be sustainable? The permanency of changes in fundamental values and key orientations in favour of the environment depends on what causes these changes.

The first theory, the presence of which can be seen in the works of Inglehart and Dunlap, talks about satisfying human needs. The origins of this argument are in the works of psychologist Abraham Maslow, who argues that human beings have a hierarchy of needs, ranging from basic needs to food, air and protection to "higher" needs as dignity, social status, self-assessment and self-expression.

The second theory suggests that environmental value changes are caused by science-based information that shows that everything is interrelated in nature and visual material, including photographs of Earth taken from space, showing how fragile Earth is.

The third theory talks about the fact that value changes don't happen across society, but in cohort, smaller groups of people who have roughly similar ages and shared growing experience. For example, the children of the U.S. Great Depression were materialistic because of their experience, and the children born in the post-war were postmaterialistic because of their experience. Similarly, children of Earth Day adopted the views and values of the new ecological paradigm, while their predecessors, who did not grow up with the development of the environmental movement, did not accept such values. This theory provides that the future of ecocentric values and ecological thinking are much more uncertain.

There are too many unknowns to be sure to say which of these three theories is the most accurate, but all of them are linked by one common thing. In particular, it is very difficult to change environmental values and ways of thinking about environmental and human interaction in adults. This is why changes in the way society thinks and changes in value orientation take place very slowly, even for generations, while the changes that have taken place are sustainable and lasting [Gardner, Stern, 2002] [Allen, Dietz, McCright, 2015].

1.4. Factors limiting the effects of values and beliefs

In formulating the idea in the words of Sterna and co-authors, the key to people's response to any environmental problem is the value of people in the system and their specific views on the impact of environmental problems on things that are close to or expensive to them: There is a

significant correlation between the values of respondents and their actual political behaviour. In studying the effects of perceptions on behaviour, Sterne concluded through surveys that respondents' views on the negative consequences of environmental problems have an impact on their willingness to act.

Changes in human values may have a significant impact on their readiness to support environmental policy and to act for the environment. However, a personal norm that causes someone to feel obliged to act for the environment does not result in concrete action. When changing the moral norms, values and views of the environment-related society, the impact of such changes on the environment can be limited by more factors (this is a barrier to action detailed below). Let's say that by tomorrow morning, all citizens with personal cars would consider their moral obligation to reduce fuel consumption. When morning arrived, many would still live in a private house in an extra-city, depending on private road transport. These structural factors would significantly limit what people can do for the environment, based on their values and environmental beliefs. The market situation would limit their chances of real action even further: many may be prepared to change their family car to a much more economical one, but they cannot afford it, because technology that is very environmentally friendly has only recently arrived on the market and costs are expensive or not widely available. For example, the slow circulation of electric vehicles in Latvia illustrates this problem. Similar structural and market factors make it difficult to fight. Moreover, they change very slowly and disorganised activities of individuals are individually acceptable, but can hardly affect changing these factors.

There are other barriers that can be removed more easily. For example, many people do not know which of their day-to-day activities are linked to the largest energy consumption or to the creation of waste harmful to the environment. Without such information, it is unlikely that people will take active action to turn their values and beliefs into action, but if they had such information, action would follow. One negative example – electricity consumers in Latvia have probably not noticed that the electricity market has been open to competition for households for four years, so nearly half of electricity users have not even tried to take advantage of the opportunities created by the market to save real money. A valuable and positive example of reinforcing the interaction between knowledge, awareness, attitudes and action is the Green Freedom Society, in cooperation with the municipality of Cesis, the project launched in 2019 on the development of a waste-free environment in Cesis. In order to ensure that the population of Curs sorts waste and does not create unnecessary waste, a variety of techniques are combined which will eliminate both the so-called internal and external barriers, which would otherwise hinder people's environmentally friendly behaviour.

It should be concluded that the four different approaches considered (the religious and moral approach is only one of four) can reinforce each other by combining more impacts than simply the sum of individual influences.

2. ROLE OF EDUCATION – PROVIDING INFORMATION AND CHANGING ATTITUDES

One of the first steps in tackling action barriers is to provide information to target groups on resource and energy savings. In the book “50 simple things you can do for Earth” (Earth Works Group, 1989), there is a new advice on how to save water and energy. The recommendation comes amid a broader discussion about the impact of shower heads on water consumption. The tip includes several paragraphs explaining that a shower can consume nearly a third of the total amount of water spent at home and that a small leaky shower head can reduce water consumption by up to 50%, thereby also reducing the need to heat more water and do so more frequently than needed. Both the specific advice on water saving and the entire book seek to change people's attitudes to nature by providing practicable information.

Behavioural and social sciences studies show that the assumption that education is sufficient to solve social problems is too simplistic and can even be misleading. Studies show that education can help, but rarely enough to achieve the desired outcome, which depends not only on attitudes but also on behavioural changes. Education can change attitudes and specific views on the environment and energy spending, but it cannot change ethics or values quickly or easily. Moreover, education is unlikely to be effective enough if it conflicts with fundamental principles of human ethics or fundamental values. Controlled research shows that efforts to change attitudes and attitudes to environmental problems through education have overall little impact on behaviour and actual behaviour.

The theme of energy saving is not new in the context of human behavioural change, it has been studied regularly. Gardner and Sterne refer to an example when authorities in the U.S. state of Virginia sought to soften the threat to energy security by telling energy consumers about the possibility of reducing energy consumption and so becoming less reliant on outside conditions. In 1977, due to restrictions on the supply of natural gas, some merchants and educational institutions had to stop working to conserve heating fuels, the State Administration of Virginia organised three-hour workshops in several communities with a view to educating people about energy saving at home. The workshops consisted of lectures, lectures, visual presentations and discussions, and aimed at persuading people and showing them that they could manage more energy efficiency and save a considerable amount of energy at home.

However, changed attitudes and beliefs and commitments to be more energy-efficient did not alter actual behaviour and did not change in real action. Visits to the houses of the workshop participants six weeks after the event revealed that only one in forty participants had lowered the temperature of the water heater thermostat and only two participants who had already warmed boilers before the workshop, as recommended at the workshop, were the only ones for which boilers have been warmed. The only changes in behaviour involved setting up small leaky shower heads: They were installed by eight out of forty participants in the workshop. By comparison, water-saving shower heads were installed by only two out of forty people from a home adjacent to the workshop, but whose residents did not participate in the workshops. So even though the workshops changed people's attitudes, beliefs and even action plans (albeit temporarily), education in itself could not lead to significant changes in actual action.

Why did these efforts not lead to the expected outcome? One of the most likely explanations: a mismatch between attitudes and behaviour. There may be many reasons why people cannot act in such a way that action reflects their values and attitudes. Let's say someone wants to reduce their spending on energy consumed, but this man simply does not know how much you can save by warming down a particular building or by installing a more efficient heater or other electrical appliances. There may be no means for this man, or there is no desire to change a fully and well-functioning heating system in the name of noble goals, instead using the funds for other topical needs. As well, the cause may be mistrust among builders, or this man,

as a housing tenant, has no right to take decisions on changes to the building or apartment infrastructure [Abreu, Oliveira, Lopes, 2017]. In other words, the more such barriers, the less impact on actual action will even have on a close individual's belief that energy needs to be saved. Gardner and Sterne refer to another study: a survey of households conducted in Massachusetts state shows that a positive attitude towards energy saving will result in action that does not require much investment and is easy to do, for example by lowering the maximum temperature of warming electrical thermostats. However, the more complex actions are to be carried out and the higher the potential cost of action, the weaker the relationship between attitudes and behaviour. In this context, an analysis by Rosenova has to be noted, which shows that, for example, in the UK, energy efficiency measures based on behavioural change could provide an additional 6 per cent of future energy savings in households by 2035 compared to 2015 [Rosenow, 2018]. In other words, behavioural change has significant potential for improving energy efficiency in the household sector.

Research on attitudes and action on the environment shows that while correct treatment contributes to action to address environmental problems, attitudes only act as a marker that action will follow, and only under certain conditions. It is more likely that action will follow attitudes in situations where a strong barrier, usually an external barrier, often linked to the availability of funding, is removed.

Table 1: A model of resource consumption behaviour with examples of energy saving in the household sector shows that there are two main types of barriers that discourage people from taking action, even if they have a positive attitude to protecting the environment. The table proposed by Gardner and Sterna allows a better understanding of causation in the list of barriers and policy instruments presented later in this survey, including the expert workshops referred to in this material in the interaction relationships between the barriers and policy instruments identified in the Latvian situation.

Table 1

Resource Consumption Action Positiveness Model with examples of energy saving in the household sector

Level of causation	Factor	Examples
7	Household situation	Income, education, number of people in the household.
6	External incentives and barriers	Energy prices, size of housing, tenant or owner status in housing, available technologies, complexity and costs of energy saving behaviour.
5	Values and World View	A new ecological paradigm, biostatic altruistic values, postmaterialism, ecocentrism.
4	Attitudes and beliefs	A concern for the national energy situation; a view that households can improve it; a view that neighbours expect you not to pollute nature.
3	Knowledge	Knowledge that the water heater is one of the largest sources of energy consumption; knowledge of improving attic silences.
2	Attention, action	Remember to seal the windows and door frames with additional thermal insulation material before the heating season.
1	Action to use resources or save resources	Reduced use of air cooling equipment, purchase of high-efficiency heating appliances, lowering thermostat temperature levels during heating season.

The proposed causation table allows you to perform a number of important sightings. Firstly, the proposed framework shows that if there is a break in the chain of causation between attitudes (level 4) and action or behaviour (level 1), for example, if there is insufficient knowledge (level 3) or if there is no need for attention or determination (level 2), positive environmental behaviour is not followed by actual action. Such barriers exist for the people themselves (so-called internal barriers) and should therefore be addressed or removed by action addressed directly to the individual. Information programmes are designed to remove knowledge-related barriers at level 3. Other programmes are intended to raise the level of attention and commitment.

Secondly, the proposed frame identifies barriers to be sought outside the individual. External barriers, which appear at levels 6 and 7 and relate to the socio-economic situation of the individual, available technologies, social and political institutions, economic forces and inconveniences, are pre-treated and may therefore have an impact on the development of a positive attitude towards the environment. Public opinion polls show a weak but persistent link between socio-economic factors such as the level of education (level 7) and environmental concerns (level 4). External barriers can also prevent the expression of environmentally supportive attitudes. If recycling of waste is too complicated, there is no response to the positive treatment of waste recycling. In the same way, a positive attitude towards energy saving is not followed by actual action, where action has high costs, is complicated or disallowed by ownership status. All these barriers were also mentioned by experts in two workshops organised by Riga Technical University, which discussed in more detail in the section on energy efficiency barriers.

External barriers may also hamper the expression of values (level 5). In the examples mentioned by Gardner and Sterna, the assessment of the potential of Indian Hindu and Chinese Daoist religions in order to achieve environmentally friendly behaviour has shown that environmental-friendly values were not strong enough to overcome the pressures of poverty, oppression and the fight for limited resources (level 7 factors). Such external factors at individual level are very difficult to change.

Under what conditions can we expect that attempts to change attitudes and beliefs will also lead to environmentally friendly action? The simple answer is that when the barriers affecting actual behaviour and behaviour will be low or eliminated in full. In the case of consumer behaviour, the barriers are low in the case of costly and ready-to-use solutions. Examples include well-thought and convenient waste sorting and recycling programmes, or simple and inexpensive solutions to reduce energy consumption in households.

What can be achieved by educational measures designed to change attitudes if the external barriers are high? In the short term, such measures cannot be achieved much in themselves. In the short term, therefore, the most hopeful role of educational activities is to help overcome individuals' internal barriers to actual action, and in particular barriers such as ignorance, incomplete or misleading information.

2.1. Efforts to change behaviour through information

The lack of information can be a serious internal barrier to action, because it is not always clear to people how to translate their attitudes into actual action. This is particularly relevant in the context of environmental protection, since it may be difficult to see through personal experience the relationship between behaviour and its effects on the environment. In the 1970s, in the wake of the early boom of today's environmental movements, researchers and governments began to use the commonly known wisdom in practice that, if people were to say what needed to be done, they would act for environmental protection. Such an approach had very limited success.

If a person does not have information on the necessary improvements to achieve higher energy efficiency, it is difficult or impossible to objectively assess what measures can deliver the

best return and how much it can cost. An objective assessment may be carried out by an energy audit. Gardner and Sterne, in their analysis of factors affecting behavioural change, referring to the observations, pointed out that energy audits both removed a barrier to the lack of information that prevented action, but did not remove external barriers that prevented households from energy-saving behaviour due to their cost. As a result, only those behaviours whose only significant barrier was awareness changed. Accordingly, offering energy audits did not solve the problem of behavioural change. The policy pursued was only partly successful and required a substantial contribution of resources and trained personnel to communicate directly with households. Moreover, the attempt to change people's behaviour through energy audits did not result in a change in behaviour in relation to those activities with the greatest potential for energy saving, because they were precisely the actions hindered by all major external barriers. Anderson notes that in terms of industrial energy efficiency and audits of small and medium-sized enterprises, the impact could be different, since energy audits can help to obtain information and determine the relevance of energy consumers to a certain level of energy efficiency, which in turn can help clarify the motivation of economic operators and develop energy efficiency policy tools to improve energy efficiency in the industrial and service sectors [Backlund, Thollander, 2015] [Andersson et al, 2018].

2.1.1. Feedback

One way to make the impact of information more efficient is to link it directly to human behaviour. Already in the 1970s, psychologists began experimenting with a method that predicted that instead of telling people what they needed to do to save energy, higher-quality information about how much energy they used to be. As part of the experiments, households were given a regular (usually daily) feedback on how much energy the household spent and what energy costs would be at the end of the month at the current consumption. [..]

The feedback theory is a simple application of the learning theory used in psychology (operant learning theory). If people are motivated to save energy or reduce energy spending, they will implement and repeat any actions that generate benefits or provide a reward (reward). But it is difficult for people [themselves] to identify which actions or behaviour are most effective because energy savings cannot be directly visualized, and cash savings become visible only once a month at the expense of the energy supplier. It's too rare for people to understand what exactly they have or haven't done to cut the bill on energy. Receiving feedback teaches people to understand how to save energy. In the context of learning theory, feedback acts as a slow-coming signal that financial savings can be made, an amplifier. Feedback provides more specific and useful information than a general brochure or even an expert audit of energy consumption, because it is directly related to the actual behaviour of the household and makes it possible to understand how much energy the household has ultimately saved, rather than just giving an approximate theoretical estimate of how much it could save.

The effectiveness of feedback on energy consumption is influenced by a number of factors. In order to make daily behavioural changes, feedback should be sufficiently regular, and it is the most effective if it is provided just before and after the individual has performed energy-saving activities. Feedback should be related to behaviour in a way that is understandable. For example, feedback on energy used for heating and cooling rooms should be adjusted according to climatic conditions. If this is not the case, significant changes in the need for room heating or cooling will simply *conceal* the effect of people's energy-saving activities. It is also necessary to use easy-to-understand and familiar units of measurement, such as euro savings. Finally, feedback works more effectively when it comes to a source of energy consumption that accounts for a significant proportion of expenditure in the household budget. In other words, information works more effectively when people have a strong financial motivation to learn from it.

In controlled conditions, feedback testing in households at the end of the 1970s showed that energy consumption was reduced by 10% immediately after the use of the feedback method started and that energy saving continued for at least several months, as well as for feedback. The immediate energy savings show that changes have been made by changing consumer behaviour instead of setting up a more efficient heating system or starting to use new and more energy-efficient household appliances.

However, although frequent feedback as a method works, its scale and effects are limited, mainly because this method encourages people to consume less energy but does not encourage the purchase of more energy-efficient technologies that could provide the same standard of comfort only with less energy costs. Consumers will start to consider sacrifice sooner or later, thanks to feedback. In addition, the feedback method only works if the participants in the method are well motivated.

2.1.2. Modelling of action by audiovisual material

It is possible to make information more efficient by means of a presentation that combines behavioural psychology and communication research concepts, for example by providing audiovisual material (video) to target groups. Gardner and Stern refer to an experiment that studied the impact of the video on the individual's behavioural changes after watching the clip. The clip scenario was designed so that energy saving was presented as a positive action. To demonstrate the desired behaviour, television was used as a visual-speaking environment and modelling-based behavioural technique: the demonstrations were carried out by people with whom the audience was able to easily identify and repeat. In the context of the technological solutions of the 21st century, it is not only about video, but also about other modern audiovisual solutions that can be delivered to the target address to a computer, phone, tablet or other visual means of information broadcasting.

An experiment with a carefully built information campaign resulted in more than 20% of energy savings in the target group, but the issue is whether intensive investment of time, finance and human resources through meetings, feedback, producing a dedicated video with energy-efficient action models is cost effective.

Similar to the feedback method, modelling also achieves a reduction in energy consumption by means of behavioural change rather than by improving the technologies used. Therefore, the results could be difficult to repeat in situations where people have a lower level of motivation, such as low energy prices or lack motivation to worry about the environment, or people are wealthy enough to choose to use more electricity than a jumper to feel warm at home.

2.1.3. Formulating messages

Another way to make information effective is to pay detailed attention to how environmentally friendly activities are described. Richard Winnett referred to energy "efficiency" rather than "saving" because Winnett and his colleagues believed that their audience would perceive "saving" as a necessity or even a requirement to sacrifice, but would think of "efficiency" as a desirable and achievable goal [Winnett, 1985].

Susan Yates performed an experiment for psychology studies in 1982, prompting households to heat water heaters. Some participants in the experiment were outspoken, saying they were losing a certain amount of money without carrying out silences. Another part was told they would get a certain amount of money if the silences were carried out. The amount to be lost and obtained was the same, but a more positive response to the warming proposal was in a group where people were told how much they would lose. Yates conducted his experiment by referring to the principle of loss and perspective studied by Keatman and Tversk that people take

the opportunity to lose something more sensitively than the possibility of obtaining something equivalent [Kahneman, Tversky, 1979] [Yates, 1983].

Feedback, video modelling and message formulation methods are one common thing: they all provide information in a personalised, attentive and audience-motivating way. Such methods are able to reinforce the effectiveness of educational programmes, but they are unable to eliminate all internal barriers that prevent the continuation of environmentally friendly attitudes in actual action.

3. BUILDING AND STRENGTHENING LINKS BETWEEN ATTITUDES AND BEHAVIOUR

Table 1 *Resource Consumption Action Positiveness Model with examples of energy saving in the household sector* above shows that, even in the case of environment-friendly attitudes, knowledge does not provide a real environmentally friendly response, the Resource Consumption Action Model with examples of energy saving in the household sector shows that even in the case of environment-friendly treatment. People don't always act even when attitudes are right and there are no external barriers either. For example, people who stockpile recyclable materials can be mentioned, but they are never actually delivered at the recycling site. Another example is the owners of homes who want the city's waste collection service to collect compostable waste, but they themselves forget to place it in the designated places on the day the waste is collected.

In order to turn people into real action, they must pay attention to environmental issues in their daily lives, overcoming laziness or inertia of behaviour, which makes them resist any new and unaccustomed action, to take action in a situation where new and hitherto uncommitted action competes for time on the agenda, and to keep in mind that action must be taken. to be implemented at a specific time. However, there are ways of removing such internal barriers and promoting environmental behaviour. These methods help people to act in the way they act for environmental protection or know certain information because of their attitudes. Such methods can maximise the benefits of education.

3.1.1. Reminders and calls for action

The easiest way to get people to act according to their beliefs is to ask them to act. Presumably everyone knows such environmentalist slogans as “Only You Can Prevent Forest Fires”, “Keep Your Land Clean”, the word game with litter (garbage) and little (small) similar spells in English “Every Litter Bit Helps” (on the trash box) and alike. Latvia's analogue could be slogan of the so-called Pigman's campaign, “Don't throw garbage in the woods – you will become a pig”. Gardner and Stern point out that these slogans are fictional not to change someone's attitudes and provide information, but to simply remind readers and listeners of things they most likely already know and willingly do. The role of these slogans is to help overcome internal barriers to actual action such as laziness or forgetting.

Although slogans are often used in marketing (both commercial and social), studies show that such, perhaps witty, but at the same time, non-specific reminders have little impact on the actual behaviour of people (consumers). However, it has been observed that the call for action is effective when expressed in terms of time and distance close to where concrete action by people is expected. For example, an invitation printed on chewing gum wrapping paper known to nearly every chewing gum user “Keep your land clean”, illustrated in addition by a drawing in which a human figure throws a paper-wrapped chewing in a garbage bin, works well because it calls for action immediately and at the place of use of the product. The author of the survey has seen another ingenious way of combating unnecessary consumption of napkins in the Scandinavian countries – to raise and invite visitors to canteens and cafes not to take more napkins from the custodian than necessary and not to throw away any unused napkins in waste – the napkins are printed with the words “Please use me appropriately”.

There is a great chance that people will simply ignore or not trust messages delivered to the audience in the wrong way and by the wrong messenger. Gardner and Stern note in their analysis of consumer behaviour that many studies on energy saving and waste recycling show that, for example, in the U.S. written communication is ineffective with audiences with lower socio-economic status.

3.1.2. Public commitments

Action to protect the environment can also be stepped up by means of a public commitment to environmental action. A public commitment strengthens people's private, personal commitment to accomplish something. The principle developed from the theory of cognitive dissonance suggests that when you take something to do without a visible external force or without reward, people consider the action they are committed to. People based on their own internal motivation are more likely to continue their actions or behaviour even when their commitments are exhausted.

Table 2

Impact of a public commitment on participation and the amount of paper collected in an experimental paper recycling programme

Condition	Number of households involved	Participation rate		Amount of paper collected (in pounds)	
		First 2 weeks	Next 2 weeks	First 2 weeks	Next 2 weeks
Information	9	3	4	70	57
Minimum public commitments	9	10	4	210	54
Strong public commitment	9	13	11	247	166

In Table 2 “Impact of a public commitment on participation and the amount of paper collected in an experimental paper recycling programme”, Gardner demonstrates that public commitments to action have a stronger impact than simply providing information, while a firm public commitment is more effective than a minimum public commitment. Personal commitment is not only a link between attitudes and behaviour, it is also a link between knowledge and action (see Table 2: *Resource Consumption Action Positiveness Model with examples of energy saving in the household sector*). Therefore, stronger personal commitments resulting from public commitments also make the role of information and information more effective as a method for changing behaviour.

3.1.3. Highlighting attitudes and standards

Another way of removing internal barriers to action is to draw people's attention to the attitudes and beliefs that people already have, but which people do not associate with the situation in which they find themselves at a given moment.

Literature has studied ways to more effectively apply different strategies to link attitudes, information and commitments. Gardner and Stern also refer to Hoper and Nielsen's experiment with three different strategies for promoting participation in a garbage sorting and recycling program, where the target group was a relatively “typical middle-class neighbourhood” in the U.S. capital of Colorado state in Denver. Randomly, the districts of the neighbourhood selected by the researchers were divided into four groups, each subject to different experimental conditions. One group only received informative pages with information on the waste sorting programme and a description of what waste can be sorted and recycled, as well as the next seven waste collection dates. Information leaflets were distributed to participants during a twice seven-month experiment. The other group received informative pages and one to three days before the garbage was collected, also a call-in bright yellow with garbage collection dates. The third group

received leaflets, calls and, in addition to the members of this group, was also contacted by a programme volunteer from among the residents of the block, recalling the programme and encouraging neighbours to return waste for recycling. The fourth was a control group and no one was contacted by its members. Even before the active phase of the experiment, all households in the neighbourhood were observed for 17 months, during which it was concluded that less than 1 per cent of households observed had recycled. On the other hand, during the 7-month experiment, the participation of the control group grew to 2%, in the group of informative leaflets up to 10%, in the group whose members received both leaflets and calls up to 21%, and in the group, which was overlooked by the quarterly volunteer, up to 28% in addition to providing information.

The results of the experiment showed that the lack of information was a barrier to participation and that closing was also a barrier helped by reminders and calls for action. The involvement of the block's volunteer leaders also provided added value – showing an example of what other neighbours might want to repeat later, similar to Richard Winnet's educational and instructive videos. It is also possible that, where the leader of the block was reminded of the collection of waste, a social norm started to form, which postulated that sorting and recycling of waste was an obligation or normal practice, and that waste would not be sorted or recycled would not comply with the new social norms. Participants in the experiment were asked the same questions before and after the experiment. One block of questions was whether the participants thought the neighbours were expecting them to sort the garbage, and whether they themselves expect neighbours to sort the garbage, linking the answers to outside public norms. The second block of questions was about the members' own internal norms and looking forward to their own actions – Hoper and Nielsen asked whether the experimental participants felt an internal obligation not to dispose of recyclable waste with total waste, instead transferring it to recycling.

During the experiment, both norms (external and internal) grew stronger in households in those blocks where additional information materials also served as the leader of the block, but did not increase in other blocks. If this logic is followed, participation should remain high in those experiment quarters where the leader of the block worked, even if households were not given more information materials and reminders. Although Hoper and Nieson did not follow the experimental groups for more than 7 months, they concluded that in areas where the leaders of the block had been operating for two years before the experiment, their involvement in sorting and passing waste increased from 21% at the beginning of the experiment to 34% at the end of the experiment, although households in these particular blocks were not addressed at all. This shows that information provided at Community level in the right context is able to influence behaviour more effectively and possibly also with a more permanent effect than when information is supplied to individuals without additional social interaction.

3.2. Conditions for the effectiveness of information

The success of information programmes is affected by not so much by the information provided itself as by the ability to ensure that the information supplied is actually used by people. In other words, the most important aspects are the attraction of people's attention, the reliability of information in the audience view and the increasing involvement of programme participants in real activities.

3.2.1. Attracting people's attention

People are flooded with information and people cope with this flood of information, ignoring most of the information they encounter and selecting only the most important. Research into citizens' behaviour by receiving information from different sources shows that information from energy companies that is sent in addition to another bill is ignored by people, developing the

habit of ignoring and discarding, by default, everything that is not related to paying the bill. Gardner and Sterne point out that changing the sender also changes the response of the recipient. For example, information on energy saving that will be sent from the public service regulator is likely to reach the recipients' awareness, as citizens are not accustomed to receiving shipments from the regulator [Gardner, Stern, 2002].

There are different ways to draw people's attention. One of the most effective ways to promote energy-saving programs is to transfer information from someone to someone. Similarly, the invisible make-up of energy feedback programs, which translate information about electricity or gas use into a daily message, draws attention. The effect is also reinforced by the use of a compelling medium or technical means (e.g. television). In video presentation, the information can be presented in a more visually appealing and perceptible manner than when trying to explain it orally.

It is important to refer the message to the audience in terms of time and physical distance as close as possible to the point where and where we want to expect actual action, otherwise the message recipient may not receive the message at the moment it would have been best received, or the dead factor will work in a negative way.

It has been observed that the most appealing cases depend on the audience. They may also depend on socio-economic differences or on other factors. In the evaluation of building warming programmes, work with local groups – congregations, neighbourhood organisations and other similar organisations – is the best way to promote the visibility of the programme. Community groups are recognisable and therefore trusted, and therefore the message passed through such groups is better targeted. Working with local groups is also important because differences in opinion within the group often prove to be the most important barrier to decision-making in favour of energy efficiency measures.

3.2.2. Credibility and trust

Information should be reliable to ensure that its effects are effective. Part of the credibility depends on the source of the information. It is most likely for this reason that the same message about energy saving received from the service provider is less efficient than if received, for example, from the public service regulator. For the same reasons, the message from a community organisation or leaders also reaches citizens better than the information sent by the service provider, whether it would be about energy saving, energy audits or other energy efficiency-related topics. Citizens simply do not see tips to spend less energy as reliable when they come from an energy supplier, because the natural reaction is a suspicion that it is in the interests of the energy supplier to sell as much energy as possible to the public. Trust and trust also depend on the ability of citizens to verify the information they have supplied. This is particularly relevant in situations where information on energy use needs to be provided, but it is not possible to demonstrate, in a visible way, the impact of action on the outcome.

3.2.3. Involvement

Information becomes effective only when it is used by people who are interested in using it. The method of leader of the neighbourhood block, which has already been mentioned, is also effective because these leaders are meeting with neighbours and other neighbourhood residents and telling them about sorting and recycling waste. Participation and participation can also be reinforced by crisis situations.

Examples of the impact of information and information on actual actions highlight a number of general principles to be taken into account if the effectiveness of information needs to be reinforced, but the nuances depend on what changes and behaviour should be achieved. In order to make full use of the potential of awareness-raising activities, this requires a creative approach

that provides credibility, attracts audience attention and stimulates engagement. In order to achieve this, it should be started by carefully clarifying and exploring the audience's perspective and the specific situation. This can be done by regular polling of the target group or by ideally involving the target group in the development of the programme to be implemented. The involvement of the Community with neighbourhood and block leaders is one example of how to use such an approach successfully and effectively. This principle might also be used, for example, in Riga, where neighbourhood associations are actively developing, bringing together the most active population who do not care about the environment in which they live.

3.2.4. Use of public communications for the dissemination of information

One of the most efficient ways to disseminate information is to use existing channels for communication and information. In California, for example, it was observed that solar collectors were more purchased and installed by private house owners who knew someone else who had purchased and installed a solar collector. It demonstrates the role of public links and impact channels in the efficient dissemination of information. Similarly, in the agricultural sector, for generations, information on the best agricultural solutions is being passed on and disseminated. The principle is relatively simple: first, well-recognised and respected people are identified within the community, then works with them to make them a new solution and technology users. Once these point-of-view leaders have concluded that the proposed solution works well, the relevant technology and solution in the community are spreading without additional effort. Information that comes from a recognizable and trusted person automatically receives attention and has high credibility due to the source of the information.

3.3. Summary and conclusions on education and information

In the short term, education works effectively when the main barriers to action are within the individual's own internal barriers. Educational measures are effective in cases where relatively simple low-cost barriers need to be removed to ensure that people, for example, throw municipal waste into sorting boxes or change the temperature of the thermostat to consume less energy for home heating. The results of studies and experiments show that when environmental protection requires more serious effort and means (and in the case of environmental issues, that is what is most common), education alone is not enough. In order to achieve the desired change of behaviour in such cases, additional measures should be taken to remove external barriers.

Although external barriers preventing individuals from acting limit or fail to provide efficacy in the short term, education may have significant indirect positive effects in the long term. Indirect positive long-term effects of education may appear through changes in people's political behaviour. On the other hand, behaviour (participating in elections) can change the policy of the authorities, which can reduce or eliminate external barriers to action in favour of environmental protection or energy saving.

Similarly, attitudes to environmental protection can influence behaviour in the long term. Gardner and Sterne note that a whole generation of voters and environmental activists in the U.S., influenced by a number of widely known scientists and scholars, have exerted pressure on government institutions, corporations and politicians to achieve new policies on air and water pollution, energy and land use, thereby changing the approach and action to exploit environmental resources. Some of these policies also remove barriers that prevent attitudes and beliefs at individual level from being turned into action. One example is that policy changes have helped to reach the market for more energy-efficient cars and household electrical equipment, making them available to all buyers with high levels of environmental awareness.

Education can only activate behaviours that match a person's deepest values. Environmental values and ethical beliefs have been embedded deeper and more broadly than

environmental attitudes. They are also harder to change. Therefore, educational efforts aimed at changing attitudes are unlikely to succeed if they go against individuals' personal ethics and values. Education programmes are more effective when they take into account the principles of communication psychology and they also directly address the relationship between attitudes and behaviour. It should be noted that the availability of information and the use of information are not the same.

As with energy efficiency policy instruments, which are more detailed in this survey, education works most effectively directly in combination with other engagement strategies. External barriers such as the costs and complexity of action prevent education programmes from achieving their objective. Education programmes also act most effectively when they allow more than just education to be done.

Experience of health measures has shown that although education as a method in the short term and taken individually in itself looks ineffective; it can nevertheless play an important role in achieving behavioural changes. The success and effectiveness of the use of incentives and other methods to change behaviour related to the environment are often critically influenced by the quality of information provided to people, by the level of attention paid to society and by the desire to support the use of incentives or other methods aimed at changing behaviour. Short-term educational activities are an important source of information and long-term environmental education strategies can be essential for building public support for environmental issues, which in turn requires many environmental policies to be effective. None of the strategies taken individually will be sufficient in itself. Consequently, the main issue is not how much can be achieved through education alone, but what role of education and place in a complex strategy geared towards changing behaviour.

4. USE OF INCENTIVES

In order to take decisions on the use of the best solutions for addressing people about environmental problems and energy saving, it is necessary to understand the factors which barriers prevent decision-making, the logic of reasoning, when deciding in favour of one or other choice. A simple example is transport habits. One of the easiest ways to minimise individual negative environmental impacts is not to use personal road transport, particularly to move alone. However, it is not always possible because of a variety of circumstances. The possibility of choosing to act more naturally friendly without the use of a personal car is influenced by important factors such as time, distance, convenience, available alternatives, action costs. These factors have a significant impact on decisions on choice of movement – whether it would be for shopping purposes, visiting friends and relatives, or on holiday travel. These factors, which are important barriers to even more environmentally friendly behaviour by an environmentally-friendly individual.

The main idea is that people's choices about how to move are part of the decision-making process stemming from their particular situation, needs and circumstances, which are often more personal or meaningful than turning environmentally friendly attitudes into actual action. In other words, behaviour detrimental to the environment is not necessarily caused by a lack of proper (environmentally friendly) treatment.

Gareth Hardin, in his analysis of the *sharing tragedy*, mentions these all factors by pointing out that people are destroying environmental resources if it just pays off. His theory doesn't say that people are insensitive or immoral. Tragedies lie in human nature – we have no choice. Hardin says that whenever people [as a species] have the freedom to access and use valuable but scarce resources, we are in a situation where, in the name of our own and our family's personal welfare, we inevitably destroy that resource base.

Hardin, an example of the pattern of behaviour of crab fishermen, shows that a more active use of a resource in common use provides more food or money than behaviour that can be described as normal (opposite more active). As a result, those who, for religious, ethical, moral or environmental reasons, will not try to catch as many crabs as possible will not change anything, because if they are not caught, someone else will do it. In some ways, whoever chooses not to fish crabs is even penalised for doing so, because the amount of crabs caught by other fishermen is so high that the price of crabs falls and it also lowers the income for a fisherman who chose to act in an environmentally friendly way. The same is the use of personal road transport: if we decide not to go to work with our own car, we are punished for choosing to ride a bicycle, because everyone else pollutes the air, because they choose to drive.

The root of the *sharing tragedy* is people's desire to provide themselves personally, as an individual. This characteristic, combined with free access to exhaustible resources, acts as a powerful barrier to more environmentally friendly action and usually ends in harming the environment. Resources cannot be rendered inexhaustible. Creating or changing the attitudes of environment-oriented religions is unlikely to work because others, those who will not change their morals or attitudes, will deplete resources and become rich at the expense of those who will treat the environment gently. Hardin argues that there are only two solutions to this situation: limiting access to resources or making resources expensive. Both solutions share a common feature: they change the individual's incentives for action, or the negative and positive conditions that govern the individual's behaviour and force action to pay off the maximum amount of resources from a limited total amount of resources, rather than trying to get themselves as much as possible without counting on the reserves of resources. It is about changing external conditions with a view to changing incentives that can be both positive and negative. It is precisely by changing incentives that Hardin recommends a way to address environmental problems. It should be noted

that Hardin's argument that a man of his own nature is self-centred and acting in accordance with his own egotistical needs is controversial.

4.1. Theory of environmental incentives

The psychological bases of Hardin's proposed solution lie in Skinner's learning theory. Skinner points out that behaviour is learned in a process in which people [and animals] repeat behaviour as a result of the consequences of their actions. If anything rewards an individual, it is repeated as long as the individual does not reveal more rewarding (rewarding) behaviour. Skinner, in many experiments, came to the conclusion that animals repeat the behaviour that is rewarded, stop the behaviour for which awards are no longer taking place, and stop the behaviour that is being punished. In other words, behaviour is adjusted in response to its consequences.

It follows from Skinner's theory that there are two reasons for the *sharing tragedy*. One reason is that the award for the use of natural resources comes to who uses these resources, while most of the costs are borne by those who do not use resources. The tragedy arises because behaviour changes only as a consequence of these same *behaviour (the concept of "behaviour" used here is synonymous with the concept of "action")*. People do not stop them rewarding because their actions harm others. They stop taking action only when they stop benefiting from behaviour. Therefore, if natural resources have free access, they are depleted. The second reason for the tragedy is that the time award is much closer to action than the cost of action. Skinner's experiments have shown that the effects of action on future behaviour are significantly reduced by removing the effects of time from action.

4.2. Economic theory of external costs

Tackling environmental problems cannot rely solely on the impact of market forces, because the environment is a public good or a collective commodity. A single individual cannot own clean air and no one can invoice air pollutants for clean air use. Exactly the same is with clean water, a beautiful sight, endangered species, a layer of ozone, etc. Hardin points out that it is unrealistic to expect people to contribute voluntarily to the preservation of the environment due to the problem of so-called "free-riders" (the concept used in social sciences in English): it is more beneficial for an individual that someone else pays for a clean environment, because no one will already deter non-payers from having free access to all the resources available. Anderson points out that the same problem also applies to industrial energy efficiency [Andersson et al, 2017]. In Latvia, these principles can be observed in operation, for example, in multi-apartment buildings, where the charge for heat during the heating season is charged not by the amount of energy consumed, but by area of square metres. Consequently, energy-efficient citizens are being demoted to investing in energy efficiency measures, since others, without investing funds, benefit precisely those who do not take any energy-efficiency measures, since the same cost of heat per square meter is calculated for all.

Economists offer environmental challenges in a number of ways and all of them use the principle that external costs related to protecting environmental resources are *internalised* or internal. The idea is that if people who benefit from environmental damage were to be paid for the damage caused indirectly to the environment, then they would have an incentive to preserve the environment in good condition [Gardner, Stern, 2002].

One way to house external costs is to establish ownership. The second way is for the State (with the assistance of ministries, agencies or other institutions) to auction the right to use natural resources up to a certain level or amount that is not considered to be environmentally harmful. The third way is to charge people and organisations a fee for the amount of resources

they use too much or above the specified limit, so that the external costs of the use of resources (related to the recovery of the stock of resources) are priced in the country. If the price is set correctly, people will reduce the use of the resource enough to compensate future generations for the potential burden of not using resources, but at the same time not to the extent that the existing generation would be unfairly penalised for such a solution. Of course, economists' proposals are often difficult or impossible to implement: there are environmental elements that cannot be privatised (such as climate), quota auctions and taxes are opposed by politicians (and the public), and setting the right price for damage to future generations could be almost impossible (because it would be difficult to reach an agreement between the various involved the groups concerned).

4.3. Incentives for co-driving and public transport

From Table 3, *Rewarding and punishing aspects in the use of personal car and public transport* are clearly readable, why most people choose to drive their own car instead of using public transport. The benefits of driving own car are higher than those from public transport. The same factors would apply if individual driving was compared with co-driving (using a passenger car or van), although some of the factors in the table would change. The lack of a balance of incentives explains people's behaviour and at the same time also gives room for ideas on solutions that would help achieve a change in behaviour.

Table 3

Rewarding and punishing aspects in the use of personal car and public transport		
	Rewarding	Punishing
Driving own car	Shorter journey time; Prestige; The flexibility of arrival and departure; Privacy; Route selection; Cargo capacity; Predictability; Deferred costs; The pleasure of driving a car;	Traffic jams; Fuel and auto maintenance costs;
Use of public transport	The possibility of getting new friends; Time for reading.	Weather dependency; Discomfort; Noise; Squalor; Unkind personnel; Go far to a stop; Hazard (crime factor); Immediate costs; Unpredictability; The possibility of a limited movement of the cargo; Restricted route selection; Bustle; Limited time planning flexibility; Low prestige (not always and everywhere, and urban culture is

		changing and public transport is becoming <i>stylish</i>); Long journey time
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Many of the barriers to co-driving and the use of public transport are so-called structural barriers, because they are built into society in a literal sense, by planning and constructing buildings, roads, streets and other infrastructure in a certain way. The removal of such external barriers is not in the individual's power, which is why policy planning (and it also directly applies to urban planning) plays an important role here.

4.4. Reducing energy consumption at home

4.4.1. Changes in energy prices

The economics theory predicts that people find ways to save money when something starts to pay expensive. In other words, if consumers overspend energy, it means that the price of energy is too low. There are indications in the literature that it has been concluded in the 1990 s that there are two ways to make people save energy through censors. One way is to eliminate the volume price that stimulates consumption: if, for marketing purposes or for any other purpose, the energy trader offers the consumer to spend more electricity to obtain a lower price per kilowatt-hour, such behaviour works contrary to the desired effect: more electricity and energy savings are being spent and energy efficiency is losing weight. The other way is to set a differentiated price for electricity for different times of the day. Today there are still energy traders who, in terms of turnover, promote higher consumption as a prerequisite for better price. It is possible that this problem can be solved by regulatory methods if other energy saving motivation does not work. The way to motivate users to spend less energy (which is based on electricity) is already being actively applied in practice – electricity is traded on the stock exchange (in the case of Latvia, in the Nordic and Baltic electricity exchange Nord Pool), where the price of electricity is set for each hour of day. In higher demand hours, or so-called *peak hours*, the price may even be much higher than in the rest of the day. Consequently, free markets are regulated by a demand-supply mechanism for energy consumption, reducing consumption by price at a time when demand is usually the highest (usually in the morning hours and after the end of the working day). However, it should be noted that this method works only if the consumption is recorded using a smart meter and the invoice changes according to the actual electricity consumption in the given hours of the day.

However, the application of price differentials to change energy consumption habits does not work *by default* – the information, interpretation and education aspects already discussed have an important role to play. Gardner and Sterne refer to the example of an analysis of the effects of a differentiated pricing of electricity consumption in households in the early 1980 s: it was found that the price of electricity hours had a relatively minor impact on consumption changes in the so-called peak hours. Although electricity prices were up to 2 to 8 times higher in peak hours than in the rest of the day, only two percent of households changed their consumption habits and reduced electricity consumption in peak hours. The commitment to act – which can measure the importance of households for reducing electricity consumption in peak hours and whether it can be considered as a moral obligation for households – was characterised by only 11 per cent of households surveyed. One of the reasons why price differentiation had a limited effect was that consumers did not know or believe that price differences were so significant. Households knew there were real incentives to use electricity more outside peak hours, but how much these incentives were no longer important. The findings after examining these examples: the effectiveness of price incentives depends on how well the chosen price incentive for people

will be explained [Gardner, Stern, 2002]. Similar conclusions can also be reached regarding the behaviour of electricity users in Latvia – it is typical to complain about as expensive electricity, but according to the Commission on the regulation of public services, about 40 per cent of households² will still settle the price of electricity supply for the so-called universal service four years after price deregulation and market opening for free competition for electricity. has been on average twice the price of the electricity market.

4.4.2. Financial awards

Two types of financial incentives used by authorities and also by energy suppliers are linked to the subsidy of loans. In one case, for purchasing more energy-efficient household appliances, the money is lent with lower loan interest than usual, while the other applies discounts. No energy efficiency programme is effective without some support, and more support can lead to a more successful implementation of the programme. However, the effectiveness of the programmes is not limited to incentives, since the effectiveness of financial incentives may vary even more than once. The stronger the financial incentive, the greater the role non-financial stimulus factors play.

Gardner and Stern point out that if people really seriously assess their energy use, a big financial incentive has a significant impact on behaviour, but the extent of the incentive plays a small role in attracting people's attention. Attracting people's attention is a very important information task (marketing exercise), particularly when a financial incentive is offered under the energy efficiency programme. The general logic is that if the financial incentive is already relatively large, it is more likely to invest in information and education than to try to further increase the financial incentive, in the hope that it will attract more attention and lead to the programme being implemented.

The analysis of the studies shows that the programmes implemented by the United States have been systematically less efficient than the programmes implemented in Canada and Western European countries [Gardner, Stern, 2002]. The study concludes that the most likely explanation for this is the procedure for how people can use financial incentives. Programs in the U.S. have used the same two-step procedure. In order to get support (incentive), citizens had to apply for the energy audit of the building first. It should then be expected that the audit will be scheduled and carried out, the recommendations of the energy audit should be put in place and that an application for reimbursement of expenditure or borrowing may be submitted only afterwards. The programmes implemented in Canada and Western Europe did not provide for the performance of the energy audit as a mandatory prerequisite for receiving aid, providing only for the energy efficiency measures to be taken, which are compensated by the submission of a check certifying the performance of the work. In this case, it was decided whether to risk a beneficiary implementing measures that are not the most suitable for improving energy efficiency, while at the same time ensuring that more homeowners are involved in the support programme. Such a more user-friendly procedure made the support program more successful because energy users had to take one step less to get support. In other words, such a procedure reduced the barrier to actual action by making a closer link between attitudes and behaviour, which required less user attention.

² Moderator: 40% of households overpay for electricity, Chairman of the Public Utilities Commission Roland Irst interview in LNT Morning broadcast "900 sekundes", June 2, 2019, see: <http://www.la.lv/video-40-majsaimniecibu-ieverojami-parmaksa-par-elektribu-saruna-ar-rolandu-irkli>

4.4.3. How to make energy saving comfortable

Ease of action is crucial for the implementation of energy efficiency measures in housing, since the decision to take energy efficiency measures and the implementation of such measures is not easy at all. Insufficient knowledge, uncertainty and the need to focus on the choices made work as important barriers to real action. Often people choose not to make any improvements to housing if all energy-related systems work and nothing needs to be repaired. Energy efficiency measures, while reducing energy consumption in the long term, require time and effort, as long as no additional resources are required. It is therefore important that energy efficiency programmes for buildings specifically highlight the amenities that will be acquired when implementing energy saving measures.

One possible strategy is to compensate or give energy users more energy-efficient household appliances. Such a strategy is similar to that mentioned by Gardener and Sterna, for example, with information measures that achieved the expected outcome only when, together with information on water saving, water flow limiters were granted to residents for shower heads, figuring out how to use them correctly.

It is rare for the citizen to think that investments in energy efficiency will bring greater economic benefits than putting money in a bank or investing in securities. Moreover, it would be beneficial to borrow money to invest in energy efficiency. Yet most people don't do it and have many reasons for it. For example, people have to learn a great deal of new and specialised knowledge about how to choose the most appropriate energy efficiency solution, which would not be the most expensive one; how to choose not a costly but reliable performer; how and where to borrow funds to pay jobs and so on. Nor are people planning to live in housing for the next 10 or more years, so complicating the repayment of investments. In such cases, investment in energy efficiency will not pay off unless the investment significantly raises the value of real estate in the secondary market. People also don't see investment in energy efficiency as one of the alternative options for financial investment.

Energy Service companies (ESCO) can help overcome all these barriers at once, taking responsibility for building renovation and financial commitments, improving the energy efficiency of buildings, increasing the value of real estate and the quality of life of the people of the building and reducing energy costs. However, financial incentives do not work automatically on their own – they need substantial information support and a smart marketing campaign. In order to overcome barriers to energy efficiency and to contribute effectively to energy saving, even in situations where energy prices are high or rising, energy efficiency support programmes must combine all the key factors that help to overcome the barriers: convenience of service for the user, lower costs and information and education.

It should be noted that structural barriers are difficult to overcome even the most successful energy saving programmes based on financial incentives. In the multi-apartment building sector, the most serious problems are in the rental housing segment, since tenants of rented dwellings generally do not have the right to take decisions on energy efficiency measures.

4.5. Principles for creating effective incentives

The development of efficient energy efficiency programmes must respect a number of important principles:

- The financial incentive must be sufficiently large;
- The incentives must be in line with the barriers to effective action to improve energy efficiency;
- People (target audience) should be aware of the incentives available and be informed and aware of what action or behaviour they need to change;

- There should be incentives that people trust, since lack of confidence can prove to be a major barrier to the effective implementation of the energy efficiency support programme;
- It is necessary to find politically acceptable forms of support. If the planned stimulus involves new or higher costs, it may be expected to receive less political support. Efforts should also be made to create positive and supportive incentives and not to introduce measures based on penalties;
- The incentive system should be designed in such a way that the target group of energy efficiency measures (population) does not want to avoid participating in measures. Avoidance concerns both the positive (rewarding) and negative (punitive) incentives;
- Communication with the audience should be developed to identify the barriers to people's involvement in energy efficiency measures that are more disruptive and have a negative impact on their actual behaviour. It is recommended that people targeting measures be involved in developing energy efficiency support programmes for direct views;
- The evaluation of the programme of measures must be carried out continuously. The development of support programmes is most often through a method of attempting and failing. In many cases, the authors and introducers of the programmes are reluctant to carry out evaluations, fearing that negative comments on the programmes could lead to closure. However, the evaluation is intended to address shortcomings and shortcomings and to improve support programmes, rather than testing with a view to continuing or closing the programme.

4.6. What can be done through incentives – conclusions

Incentives can help overcome specific external barriers to energy efficiency action. Individual-oriented incentives may not be worked if the barriers to action stem from the structure or shortcomings of the social system. Incentives may be more effective if they are designed to involve communities, organisations and economic operators, including because there are situations where decisive decisions to take energy efficiency measures are more appropriate at the level of the organisation than at the level of the individual (household). Similarly, without an organisation-level involvement in support programmes, it may not be possible to involve an individual in the process.

Under certain circumstances, incentives can reverse what is needed: if the incentive starts to limit people's ability to take decisions and act, then it starts to be treated as punishment. For example, raising the price of energy resources for low-income citizens can put them in a position to choose to pay for winter heating or purchasing clothing. Therefore, incentives work best in combination with other behavioural techniques. In some cases, incentives only work if community resources are involved, whether it would be for the credibility of energy efficiency measures or because cooperation requires an organisational environment representing the interests of people whose behaviour the authorities want to change in favour of energy efficiency action.

5. POLICY ANALYSIS ROLE

The first part of the survey focused on the analysis of the factors in research literature related to the causes of barriers (energy-efficient action) and rooted in people's attitudes, beliefs, beliefs and outcomes in behaviour and behaviour or lack of action. The second part of the survey shall be based on the information and analysis provided for in the first subparagraph in order to focus on the analysis of already barriers and policy instruments and to allow conclusions on causation and the choice and use of specific policy instruments to overcome barriers.

The implementation of the various sectoral policies should ideally be aimed at achieving the objective. In order to achieve the objectives or objectives, a policy analysis is carried out both before (*ex-ante*) and after (*ex-post*) policies or policies [Hodwood, Gunn, 1984] [Pereira, da Silva, 2015]. Classically, policy analysis has many phases where each has its own purpose and purpose, ranging from deciding on the need for new decisions to a policy assessment and its subsequent continuation, transformation or termination [Hodwood, Gunn, 1984]. Whether the most appropriate ways of achieving policy objectives are analysed and evaluated in the context of social sciences or physical sciences, in practice, any decision-making is related to the need to clarify whether a decision on policy implementation is to be taken, how the decision should be taken, what policy instruments will be best suited for achieving the objective pursued. take decisions or decisions already taken.

A wide-ranging change in sectoral policies and more generally in society is a task of government, and changes are made by applying a specific combination of policy instruments or several policy instruments, depending on the situation and objectives to be achieved. In the context of the need for change and management, the policy instrument is a mechanism used by public administration to achieve the desired effect or result. Energy efficiency has traditionally been considered to be a sub-sector of the energy sector, but in today's context it has become a so-called horizontal aspect covering all sectors of the economy, an important element of society and also of individual activity, similar to the environmental impact of activities and products or services.

5.1. Genesis of barrier causes

Depending on the sector (households, producers and service providers), energy efficiency on the final consumption side is perceived *without inspiration* by linking it to increased costs, additional obligations, inconvenience in the context of changing energy consumption habits, reduced profits and other conditions and factors whose origin and functioning mechanisms were dealt with in the first part of the survey. In other words, the fact that energy efficiency cannot be improved has a variety of causes (obstacles, barriers), including both those related to national decisions, such as the regulatory environment, and consumer behaviour, values, willingness and willingness to participate in energy efficiency improvement measures [Gardner, Stern, 2002] [Wiese, Larsen, Pade, 2017].

Literature focuses on practical accessibility-related barriers and policy instruments, many of which relate to the availability of funding or the regulatory environment. Less attention is paid to factors related to the interaction between consumer values and attitudes and the correlation with decisions resulting from actual action. The literature analysis leads to the conclusion that the analysis of barriers and policy instruments provides an understanding of the types and causes of barriers and policy instruments that prevent or eliminate the causes of barriers, but does not in itself respond to questions concerning the motives for the behaviour of energy consumers – values, attitudes (endogenous factors) and external barriers to actual action (exogenic factors) [Labanca Berca], [Gardner, Stern, 2002]. The assumption that changing the attitudes of energy consumers to energy saving will make consumers more energy efficient is a restriction: changing attitudes does not guarantee a real change in behaviour or behaviour, even

if the consumer's attitudes and values change. The change in attitudes does not necessarily result in action, particularly if the actual behaviour of the energy consumer is affected by external barriers [Gardner, Stern, 2002], [Wilson, Crane, 2015]. Therefore, policy instruments focused on education and information can only affect action in combination with other policy instruments that help to remove external barriers to the transformation of values into actual action. The studies concluded that the costlier the energy efficiency measure, the lower the correlation of attitudes and values with actual action [Caird et al., 2008] [Ramos et al. 2016] [Trotta, 2018].

Various aspects of energy efficiency have been analysed in many publications with a wide scope of content. An important focus is on the analysis of energy efficiency costs and benefits, barriers and policy instruments. The analysis of narrower and more specific topics has a different focus, dominating the analysis of economic factors and paying less attention to social and environmental factors. This difference may be explained by the fact that a classic way of measuring the meaning of energy efficiency measures is through a prism of costs and benefits: the analysis of micro and macroeconomic impacts produces a more comprehensible outcome that can be expressed in figures and directly calculated investments and savings while the value of the energy consumer and the attitude to energy saving impacts on barriers secondary role has been given to the barriers.

Since the country plays an important role in improving energy efficiency, both in policy-making and in terms of financial support, the analysis of economic impacts is needed for both short-term and long-term budgetary planning. Making financial contributions more difficult by referring to social and environmental benefits and making it more difficult for decision-makers to justify. Even if energy efficiency investments are delivered as environmental benefits due to the reduction of CO₂ emissions to produce energy, such as heating buildings, the reduction of emissions on the national side is primarily seen as a number to be achieved so that the State does not have to pay a penalty for failing climate objectives, rather than the long-term benefits for the environment, population and the economy.

For example, publications addressing costs and benefits identified more than 20 different benefits, broken down into four major groups: microeconomic, macroeconomic, environmental and social benefits and also costs [Kamal et al, 2019] from the implementation of energy efficiency measures. In other words, different energy efficiency policy instruments are almost inevitably addressed in terms of costs and benefits, since energy efficiency is more viable [Rosenow, Bayer, 2017], not only to gain an idea of the cost of concrete measures, but also to build a message more effectively for target groups [Casado, Hidalgo, García-Leiva, 2017] and to identify specific markets. a combination of policy instruments best suited to the circumstances.

5.2. Barriers to energy efficiency

In literature, barriers (obstacles) to improving energy efficiency tend to be divided into different categories, but different categories should not be considered as a restriction in the analysis of the relevant barriers; it is also necessary to find the most appropriate instrument for energy efficiency policy in the specific context. The purpose of categorisation is to systemise barriers by different characteristics and impacts in order to identify policy instruments or groups of instruments to prevent, overcome and eliminate different barriers. The barriers to the implementation of energy efficiency measures are based on three large groups [3]:

- 1) barriers related to knowledge and awareness;
- 2) barriers related to economic factors and financing;
- 3) barriers related to the institutional structure and the regulatory environment.

The authors of the breakdowns of barriers and policy instruments used to overcome them are always developing in more detail, including already specific policy instruments such as GHG emissions and energy consumption taxes, subsidies, marketable and non-marketable

authorisations (allowances), technology standards, deposit or compensation systems, bans on individual products, voluntary agreements, public investments, support for research and development [3].

Energy efficiency plays a key role in the EU's energy and climate policy, culminating in the EU Energy Efficiency Directive (EED) (2012/27/EU), in which energy efficiency measures are divided into seven groups:

1. the use of buildings utilised for State administration functions as an example of energy efficiency measures,
2. public procurement,
3. energy efficiency obligation schemes and their alternatives,
4. energy audits and energy management systems,
5. the accounting of consumption and the information to be included in the invoices,
6. improvement of efficiency in heating and cooling supply; and
7. energy transformation, transmission and distribution.

The EED has a comprehensive approach, referring to a broad range of measures to be taken, not limited to narrow themes and the use of specific policy instruments, so as not to create additional constraints on the implementation of energy efficiency measures.

The IEA's barriers are divided into five groups of factors, including market, financial, information and knowledge, regulation and institutional and technical factors as the main barriers to energy efficiency. [International Energy Agency/OECD, 2010]

Table 4

Barriers to energy efficiency

Type of barrier	Example
Market-related factors	<ul style="list-style-type: none"> – Market organisation and price distortions do not give consumers the opportunity to assess the fair value of energy efficiency. – The problem of distributed incentives that arise in situations where investors cannot receive/do not feel the benefits of improved energy efficiency. – Transaction costs (project costs are high compared to the benefits of [achievable] energy efficiency).
Financial factors	<ul style="list-style-type: none"> – Immediate costs and reduced benefits reduce the willingness to invest in energy efficiency measures. – Investments in energy efficiency are perceived as complex and risky, with high transaction costs. – lack of awareness on the part of financial institutions that energy efficiency brings financial benefits.
Information and knowledge-related factors	<ul style="list-style-type: none"> – lack of awareness and understanding on the consumer side so that rational decisions can be made on [energy] consumption and investment in [energy efficiency].
Regulatory and institutional factors	<ul style="list-style-type: none"> – Non-motivating energy tariffs (prices) for investment in energy efficiency, including, for example, declining consumer prices at different levels. – The incentive structure encourages energy suppliers to choose to sell energy rather than invest in cost-effective energy efficiency solutions. – Institutional prejudices against supply-side investments.
Technical factors	<ul style="list-style-type: none"> – Availability of energy efficiency technologies suitable to local conditions (which can be afforded).

	– insufficient performance for identifying, developing, deploying and maintaining investment in energy efficiency.
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Other authors, in their analysis of the severity of the barriers to energy efficiency of the commercial sector, are classified into seven groups, giving the majority of the causes directly behavioural/action-related barriers leading to and reinforcing organisational and competence-related barriers [Cagno et al, 2013]:

Table 5

Barrier categories	Barriers
Behaviour/behaviour related	Incomplete assessment criteria; Lack of common objectives; Lack of interest; Other priorities; Inertia.
Organizational	Low energy efficiency status; Difficult decision-making; Lack of internal control; Contrary interests; Lack of time;
Competence related	Identification of shortcomings/gaps; Identification of opportunities; Implementation of measures; Difficulties in acquiring external skills/knowledge.
Information related	Lack of information on costs and benefits; The reliability of the information source; Information incomprehensible to suppliers of technological solutions; Incomplete information on energy efficiency contracts.
Awareness	Lack of knowledge and ignorance.
Economic	Low availability of capital; Investment costs; Hidden costs; Risks related to the implementation of measures; External risks; The implementation of the measures does not pay off.
Technological	No adequate technology/technological solutions are available; No technology is available.

5.3. Policy instruments and performance determinants

Energy efficiency needs to be able to “sell”, energy efficiency needs to be seen in the context of market relations. This approach is supported by an analysis of the types of messages used to convince the audience about the importance of energy efficiency: combining information on recommended energy efficiency practices with information on economic benefits gives a more compelling impression and motivates more action than using a single call for action or economic justification alone. Similarly, specific and targeted messages motivate the audience to invest in energy efficiency better than generic messages [Casado, Hidalgo, García-Leiva, 2017]. The literature analysis shows that 1) policy makers primarily assess which barriers are the most significant barrier to actual action by energy consumers, 2) policy makers make the message to

energy consumers based on the policy instrument *to be sold*, which at policy makers' discretion will make the most of the improvement in the average level of energy efficiency.

Policy makers need to know exactly what, and how, the policy instrument to be implemented will affect whether the required outcome will be achieved. Prior assessment (RTU - modelling, *ex ante* evaluation) is recommended before introducing more serious policy changes or policy instruments with potentially broad impact. The following *ex-ante* assessment of the impact of the implementation of policy instruments has a dual objective: 1) anticipating the functioning of policy instruments and 2) gaining insight into the expected impact of the policy instrument on energy efficiency indicators and the cost-effectiveness of the instrument in question.

When assessing the efficiency of EE PI by sector, there are differences in the assessment of the effectiveness of the application of different EE PIs, which confirms the hypothesis that there is no single universal ideal energy efficiency policy instrument that can equally be applied to both industrial and service sector and household consumers. As the barriers to improving energy efficiency vary across sectors, different policy instruments are applicable and appropriate to the specific needs. For industrial consumers, the barriers to investment in improving energy efficiency will be different from small households, and therefore should be overcome by different PIs. There is one common feature for all sectors: focusing on energy efficiency measures is strongly encouraged by coercive measures and high energy prices. Thus, if energy efficiency policy instruments are increasing or high energy prices (primary resources or converted energy), it will make it easier to achieve the objectives of the policy instrument [Johansson, Thollander, 2018].

In the case of industrial consumers EE, the concurrency of the implementation of various PIs has a critical role to play in order for economic operators to show a minimal interest in investing in energy efficiency. Unlike the household sector, industrial consumers can be stimulated by reputational factors that reinforce other incentives by requiring the merchant to take measures to improve energy efficiency. It is also important for EE PIs to be implemented in the right order, for example from information, continuing with confidence building and dialogue, and ending with changes in the regulatory environment. The involvement of the target group representatives and organisations in the planning, establishment and implementation of PI also gives an aggravating effect to EE policy measures [Blok et al, 2004] [Johansson, Thollander, 2018].

Other authors, when analysing the effectiveness of energy efficiency measures in energy intensive industries in the Netherlands, conclude that, for example, the long-term investment agreement on energy efficiency works if highly achievable targets are set, a number of policy instruments are being implemented at the same time and that the implementation of energy efficiency measures is monitored transparently. Similar findings are also reached by other researchers analysing industrial energy efficiency in Sweden, looking specifically at the Swedish Energy Efficiency Improvement Programme in the energy intensive industry: the long-term agreement scheme works best together with the tax reduction [Wiese, Larsen, Pade, 2018].

A literature analysis of policy instruments that have been applied, applied or could be used to improve energy efficiency shows that the most frequent error or failure in energy efficiency policy is to try to achieve the desired result by implementing only one single policy instrument [Blumberg et al, 2012] [Piccadas et al, 2015]. On the other hand, when designing combinations of policy instruments, it is important not what policy instruments policy makers choose to implement but how different policy instruments are applied together (at the same time), thus creating the necessary reinforcement effect [Cunningham et al, 2013]. Literature focuses mainly on the analysis of individual policy instruments, with less focus on evaluating combinations of policy instruments [Kern, 2017], while some authors have focused directly on the analysis of interactions between policy instruments.

Wiese, Larsen and Padea have looked at policy instruments, analysing scientific articles and assessing the benefits and disadvantages of different PI, concluding that policy implementation is taking place in a difficult environment and that no separate energy efficiency policy instrument is able to achieve the necessary results and achieve the energy efficiency objectives set. A combination of several policy instruments should be used to achieve the objectives, where different policy instruments reinforce each other when simultaneously or in a specific order overlaps [Wiese, Larsen, Pade, 2018]. A matrix of interaction between the various policy instruments illustrates the reinforcing and weakening effects of the instruments examined in literature (see *Interaction between energy efficiency policy instruments* in Table 6).

Table 6

Interaction between energy efficiency policy instruments

Policy instrument mix	Debilitating	Reinforcing	Reference
Energy tax and energy efficiency standards	X		Boonekamp (2006); Braathen (2007)
Energy tax and subsidies	X	X	Boonekamp (2006)
Energy tax and EEOS/white certificates, financial incentives, regulatory environment, voluntary agreements, energy efficiency labelling schemes		X	Child et al (2008); Rosenow et al (2016)
EEOS/white certificates and financial incentives	X	X	Child et al (2008); Rosenow et al (2016)
EEOS/white certificates and voluntary agreements	X		Child et al (2008); Rosenow et al (2015)
Financial incentives and energy efficiency standards	X		Rosenow et al (2015)
Subsidies and access to capital	X		Rosenow et al (2016)
Information measures and all other policy instruments		X	Boonekamp (2006); Braathen (2007); Child et al (2008); Harmelink (2008); Rosenow et al (2016)

Other sources analysing the effectiveness of the various energy efficiency policy instruments indicate that policy instruments (PIs) that are best suited and suited to the relevant market conditions should be pursued, since such PIs will best allow existing barriers to be overcome and strengthen those market forces that ensure that the desired or necessary results are achieved. In this context, it is important to identify and assess the factors that hinder or contribute to the interaction between the implementation of energy efficiency policy instruments, which can be divided into three large groups [Cunningham et al, 2013] [Rosenow et al, 2015] [Wiese, Larsen, Pade, 2018]:

- 1) the management mechanism for the introduction of PI,
- 2) the scope of the PI; and
- 3) the time and concurrency allocated for the implementation of the various PIs.

Energy efficiency policy should be able to respond to market signals for energy efficiency and adapt to real conditions. The level of market development shall be determined taking into account the assessment of the energy efficiency market of the various players involved. In order to identify the level of market development as accurately as possible, both the supply side and the demand side should be assessed. To this end, two main points need to be clarified:

- 1) what is the supply of energy efficiency goods and services currently available?

- 2) do consumers want to buy more energy-efficient goods and services in different end-use sectors?

The need for policy instruments on energy efficiency (EE) stems from the assumption that, like other sectors of the economy, there are barriers or barriers to energy efficiency. Targeted policies (using the most appropriate policy instruments in the current situation) help to overcome the barriers. When the barriers are removed or overcome, policy implementation should lead to improved energy efficiency being placed under the influence of market forces without requiring further specific policy measures.

Similar to the use of policy instruments in other sectors, the implementation of energy efficiency policy instruments and the achievement of results require a certain amount of time. The effective use of each policy instrument comes to an end, because the policy has achieved the intended or desired objective, or needs to be revised or terminated (to be terminated), as data and other information show that the forecasts are not fulfilled [Hogwood, Gunn, 1984]. Ideally, the use of PI is terminated due to developments in the energy efficiency market that enable the necessary energy efficiency targets to be achieved, relying solely on market forces, players and processes. The choice and use of policy instruments should be justified by prior assessment and comparison with alternative options. Before deciding on the application, each policy instrument should be assessed on a number of criteria [Wiese, Larsen, Pade, 2018]:

- 1) Importance: what obstacles/barriers will the specific PI remove or what market impacts [pa] strengthen?
- 2) Impact of implementation: how will the policy instrument be implemented and what will its effects be?
- 3) Admissibility and awareness: are target groups aware that a policy instrument is in place or will be introduced?
- 4) Consistent approach in the implementation of the policy instrument chosen: how does the specific PI affect other policy areas and where concessions can be made to achieve the main objectives of PI?

In order to successfully implement a policy instrument based on market principles (demand), it is necessary to assess the consumer's willingness to adopt and use energy-efficient technologies and energy-efficiency services. To this end, it is necessary to clarify the answers to at least three questions [Wiese, Larsen, Pade, 2018]:

- 1) the extent to which the target groups are aware of the potential for energy efficiency improvements and energy efficiency-related benefits;
- 2) the existing level of availability of energy efficiency technologies and services;
- 3) the existence of levers affecting the wider use of energy-efficient technologies and services (regulatory environment, incentives, counselling).

6. SIMULTANEITY, COORDINATION AND SEQUENCE OF POLICIES

An analysis of the literature and applied research on energy efficiency barriers and policy instruments shows that the three main factors determining the success of energy efficiency measures are [Wiese, Larsen, Pade, 2018]:

- 1) simultaneous application of several policy instruments,
- 2) mutual coordination of different policy instruments,
- 3) the correct sequence of planning and application of policy instruments.

When it comes to the simultaneous or sequential implementation of different policies, the targeted or random combination of different instruments must be considered. Combinations of policy instruments can be divided into four groups [Rosenow, Kern, Rogge, 2017]:

- 1) combinations of policy instruments in which the instruments are mutually reinforcing.

2) combinations of policy instruments in which the instruments are incompatible (weakening).

3) combinations of policy instruments in which the instruments are mutually reinforcing if implemented in the correct order.

4) combinations of policy instruments, in which the mutually reinforcing or weakening interaction of instruments depends on the context of application.

It is also noted in the literature that policies are not developed, and policy instruments are not planned *from scratch*, in an empty space where policy makers and decision makers can build an ideal energy efficiency policy model. Decisions on policymaking are made and policy instruments are implemented in an environment that is always political in nature (politicized), other policy instruments are already being implemented, which have been decided in advance, with the involvement of various actors who already have an idea of which policy instruments are good or invalid, or what should be done in the future. Combinations of policy instruments are not considered to be good or bad in themselves, and the context and analysis of the interactions between the policy instruments, individuals and organizations involved are important [Rosenow, Kern, Rogge, 2017] [Flanagan et al, 2011].

A similar finding was made in discussions with energy efficiency experts in two workshops. First, within the project, an expert hearing was held in a closed workshop (RTU, March 20, 2019) on barriers to the implementation of energy efficiency measures and policy instruments that would allow overcoming the identified barriers. Experts were asked to freely name barriers to energy efficiency without prior preparation, stratifying them by consumption segments. In the literature, researchers tend to identify three typical consumption segments, in the context of which they consider both barriers and policy instruments: households, industrial enterprises (producers), the service sector (i.e., the tertiary sector). In turn, the experts addressed in the workshop identified the following segments:

- 1) households,
- 2) small industrial consumers,
- 3) large industrial consumers,
- 4) the state and local governments,

noting that the tertiary sector can be attributed to the small industrial consumer segment and that the division of sectors by ownership can help to define more precisely,

- 1) what are the most typical barriers for each sector,
- 2) what are the effects of these barriers; and
- 3) which policy instruments are the most appropriate for preventing or overcoming barriers in a particular segment.

On April 3, 2019, a wider circle of experts and involved persons in the open workshop organized by RTU on energy efficiency barriers and policy instruments confirmed and supplemented the above. In addition to the two activities implemented within the project, the conference on financing energy efficiency organized by the Ministry of Economics and the European Commission (April 10, 2019) contributed to the identification and overcoming of barriers related specifically to the financing of energy efficiency measures.

In total, more than 50 different barriers were identified in four consumer segments (households, small industrial, large industrial and state and municipal), some of which converge or overlap. Barriers were identified that apply equally to several or all segments. A detailed list of barriers, barrier impacts and policy instruments that can remove barriers are summarized in Annex 1.

To successfully overcome or eliminate barriers, the causality of barriers needs to be analysed and the most appropriate policy instruments for overcoming barriers in the specific energy efficiency market conditions need to be identified. There are also generic policy instruments that can be applied to or applied to almost any situation, but the risks associated

with the use of generic instruments are noted in the literature. First, policy instruments can be divided according to their type and nature. In the literature, policy instruments are most often divided into the following types of policy instruments: regulatory instruments, information instruments, technical support, financial incentives, cooperation instruments, voluntary agreements, and obligation schemes [Casado, Hidalgo, García-Leiva, 2017] [Tsagarakis et al, 2012] [Girod et al, 2017] [Kivimaa, Kern, 2016] [Fresner et al, 2017].

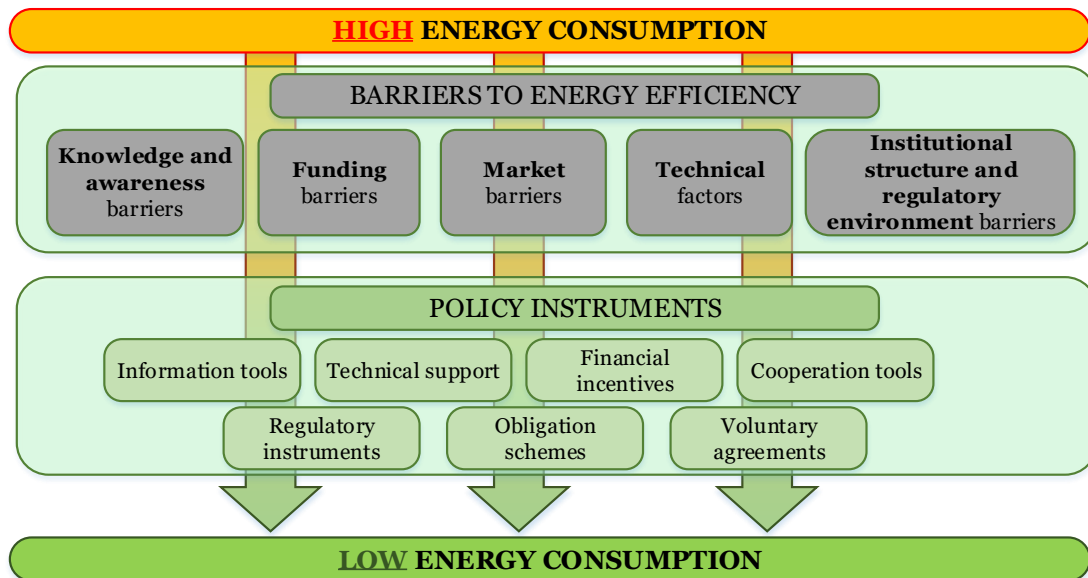


Fig. 1 Policy instruments to reduce energy efficiency barriers

Second, policy instruments can be further divided into two groups, depending on which side of the market they are on, demand-side and supply-side. Some instruments can affect both sides of the market, affecting both supply and demand.

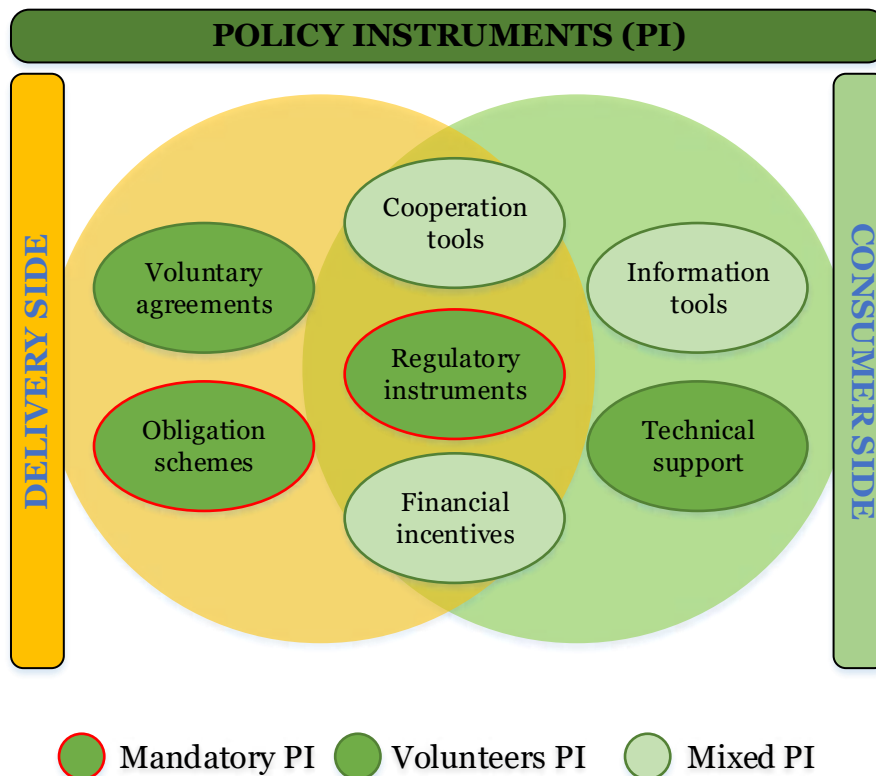


Fig. 2 Policy instruments to reduce energy efficiency barriers

A more detailed description of groups of policy instruments and examples of instruments can be found in Annex 2.

Still other authors divide energy efficiency improvement policy instruments into three broad categories - communication, economic and regulatory incentives. However, a more detailed list of policy instruments is like the policy instruments identified by other authors: GHG emissions and energy taxes, subsidies, tradable or non-tradable permits, technology standards, deposit or compensation schemes, product bans or restrictions, voluntary agreements, public administration investment in energy efficiency and support for research and development [Blok et al, 2004]. The International Energy Agency's (IEA) analysis of policy instruments and barriers to energy efficiency notes that each situation is specific, but that there are many common features and factors that allow generalized and widely applicable conclusions and recommendations [International Energy Agency / OECD, 2010] (see Annex 5 for details on the instruments).

If the imposition of penalties is chosen as a policy instrument for energy efficiency, especially in industry and services, then for such an instrument to have a real impact and be motivating, the penalty must exceed the average cost of complying with energy efficiency requirements [Nabitz, Hirtzel, 2019]. For example, if a merchant does not comply with the requirement to perform an energy audit within a certain period, then the penalty must exceed the costs of the energy audit.

6.1. Factors in the application of market - based policy instruments

On the other hand, if policy makers decide in favour of choosing market-based policy instruments, then it should be considered which instrument would be most effective in the given market conditions:

- 1) price-based instruments - affect the price of goods and services by reflecting their relative effects (e.g., taxes and subsidies).
- 2) [rights-based] quantitative instruments - determine the amount of energy savings (or any other public benefit) that the parties involved must achieve (for example, obligation schemes for energy service providers with or without tradable certificates).
- 3) market stimulus tools - improve the circulation of information in the market (for example, labelling schemes, smart metering of energy consumption, introduction of informative bills).
- 4) Energy saving obligation schemes (as a mandatory measure, with the possibility to choose alternative measures) in the new EU EED. In such schemes, energy suppliers or traders are obliged to save a certain part / percentage of the amount of energy supplied by implementing energy efficiency measures on the customer side.

6.2. Solutions specific to the manufacturing and services sector

When it comes to energy efficiency in manufacturing and services, obligation schemes (OS) for service providers are the way and one of the most common choices for addressing energy end-use efficiency. However, OS also has risks and limitations associated with company profile, performance, and other factors [Abeelen, Both, 2012]. Before deciding to introduce a policy instrument, related to the obligation of service providers, the advantages and disadvantages of service obligation schemes need to be analysed. For example, the International

Energy Agency lists the advantages and disadvantages as follows [International Energy Agency / OECD, 2010]:

Table 7

Arrangement of advantages and disadvantages of OS

Advantages of OS	Weaknesses of OS
Availability of capital (although there are state-owned capital companies with depleted capital due to too low a level of product pricing).	Potentially low match (overlap) of commercial and public interests.
Existing cooperation with final consumers (including bill payment systems and consumption data).	Potentially insufficient interest / interest in increasing costs, raising the price of a service / product, or reducing sales.
Visibility (provided that the service provider has been positive and reputable to date).	-
Wide range of services and service delivery network (in the license area).	-
Responsibility for forecasting energy consumption and compensating for peak demand.	-

Achieving the energy efficiency of buildings in the services sector is a major challenge. Many office buildings do not achieve the highest energy efficiency during their construction, but the costs of energy efficiency deficiencies are offset by building owners and operators by including additional costs in the rental bill, as tenants have limited influence over the energy efficiency of rented buildings or premises. The problems are exacerbated by the insufficient impact of market forces on the energy performance of service sector buildings: it is not yet common in the market to request information on energy efficiency. Tools that provide a full cycle of energy efficiency implementation, including assessment, labelling, setting minimum standards and penalizing non-compliance, are considered effective [Deloitte, 2014] [Johansson, Thollander, 2018].

One of the main reasons why energy efficiency policies fail is the lack of involvement of target groups in policymaking. Without involving different target groups in policymaking and without the wider public interest, there is a risk of not noticing important nuances in existing processes and of gaining sufficient feedback from the environment that the policy initiative (policy instrument) should influence and where the policy initiative should be implemented. It also misses the opportunity to inform the public (target groups) about new policy initiatives and to create a sense of ownership (or at least co-ownership) of the initiative, which plays an important role in the willingness and acceptance of new initiatives (read policy instruments) by target groups.

For example, before deciding on the introduction of policy instruments (especially market-based ones), several important aspects of the energy efficiency market need to be assessed:

- 1) availability of energy efficient technologies and solutions on the market (electrical appliances, equipment, electrical systems).
- 2) the presence of such merchants in the market that are engaged in the development, consultations, and installation of energy efficiency solutions.
- 3) availability of full-service energy service merchants.
- 4) availability of commercial sources of financing (e.g., bank loan programs).

Cialani and Perman list and illustrate seven different policy instruments [Cialani, Perman, 2013], ranging in scope and content from relatively general target group education on the importance of energy efficiency to specific legally and financially binding solutions (see Annex 3).

It is also important to maintain a balance between coercive and incentive instruments. Depending on the presence of coercive elements, policy instruments can be divided into three groups [Bukarica, Tomsic, 2017]:

- 1) mandatory policy instruments - these instruments are mostly of a regulatory nature, which means the involvement of state institutions in the control of compliance and observance of requirements and in the punishment for non-compliance with requirements.
- 2) mixed policy instruments - these instruments combine information, advice with taxes or direct costs on the consumer side.
- 3) Voluntary policy instruments - these instruments use information and advocacy and are usually backed by some benefits, such as tax or financial incentives.

Data from the European Commission on the manufacturing and services sector (or MVU) (experts chose to use the “small industrial” and “large industrial” categories in workshops organised by the RTU) show that all EU Member States have a policy to improve energy efficiency in the MVU sector. The information available to the EC accounts for more than 220 different policy measures implemented in the industrial and commercial sectors. In this case, policy measures are also divided into two general categories: financial and information, education and teaching, which points to the use in practice of combinations of political instruments involving information and education [Commission, DG Energy, 2017] [European Commission, 2017], which broadly coincides with the above-mentioned findings that policy instruments should be combined policy effectiveness is always ensured when any policy instrument is combined with education and information.

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Barriers identified by experts for energy efficiency measures in Latvia

Segment: households		
Barrier	Impact	Policy instrument
The paradox of grant availability.	Take action when/if it is not possible to obtain a grant (100% of the cost of EE measures).	Grants up to 85-95%, with an even symbolic (5-15%) co-financing by the consumer; Other financial instruments where there are no available grants using EU funds; Public funding during the intermediate funding period.
Project implementation is a difficult process.	Reduces the motivation to start warming or renovation..	Information and courses for home elderly, <i>match-making</i> potential customers with ESCO or another EE service provider.
“We're old” syndrome.	Lack of support from seniors who are afraid to lower quality of life in the name of a future that may no longer apply to them.	Informing seniors in a comprehensible manner and language, providing funding for this purpose for technical support (similar to auditing or project preparation); Support for the operator's cooperation with the implementation of ESCO EE measures.
A rational message [that energy efficiency needs to be invested] does not work. In real life, the investment in EE and the increase in property valuation are not working [enough]. Facade stripping is not equal to EE (in the context of property appreciation).	Skepticism about necessity, high levels of doubt and alienation.	Informing by means of a language that is personally addressed (not just rational arguments); Explaining the life cycle and value changes of property.
The [historical] debts of the building freeze energy efficiency measures. Rental conditions for apartments (non-payer problem).	It is not possible to borrow money or to meet the administrative conditions for funding [from State or EU funds, commercial companies, etc.].	Provide for the possibility to write off very old debts in whole or in part, provided that the EE measures are agreed.
Low income levels, living in frugally uncommoditized conditions, do not pay to invest.	A low level of confidence that the last cent given away will be worth the benefits.	Combining rational information and an irrational message to reach the less wealthy people;

		Financial instruments suitable for different targeting segments (e.g. views and support can be targeted at the amount of social security contributions, etc.)
High capital investment, long repayment periods (impacts on decision-making).	Funders (banks, other creditors) did not want to deal with energy efficiency financing; With this in mind, citizens are demotivated to decide in favour of the implementation of energy efficiency measures.	Financial instruments — Long-term aid, e.g. by channelling the aid as an incentive for credit institutions to reach a certain level of activity of EE measures.
Resource relatively cheap on investment (a long payback period), low energy prices.	Energy resources are relatively low and therefore the maturity of investments in demotivates both citizens and credit institutions.	Stop attempts to substantially reduce the price of energy resources by administrative means; Increase excise on fossil fuels and/or price CO ₂ on all headings of expenditure (while addressing risks of social inequality).
Taking decisions on the energy performance of buildings (no association, no meeting). If changes cannot be achieved, those who want changes will change their place of residence and form ghettos, and the situation is further deteriorating.	No decision is taken on the implementation of EE measures, weak managers do not support the motivated minority initiative.	Change the conditions by making decision-making more effective and effectively excluding the possibility that a decision is not taken at all.
Bad fame for warming (process, result, aesthetics). Mistrust/disbelief in anyone and anything (neighbours, municipality, ESCO, etc.). Untrue information and ignorance-based prejudices about ESCO's ability to secure the promised EE, the impact of rumours on ESCO's reputation.	Fear of moving the situation, mistrust of activists and ESCO.	Use of good examples (both in the use of silencing and ESCO services) in communication to address the audience; Quality monitoring obligations, penalties in case of non-compliance with quality requirements; Highlighting poor quality projects.
Expensive. Level of household income/financial availability.	Can't "pick up" the project, fears of taking on commitments because there are concerns that they won't be able to perform.	Special grants, loans at preferential rates at reasonable conditions.

Būvnieki "uzmetīs".	There is also a lack of confidence in ESKO's solutions and a choice of favour than not to do so.	Informing the audience about the construction process; Telling good examples, involving builders' representatives in information activities.
Weak manager	Demotes the initiative and interest of the people, sometimes even latent acts against the interests of the people.	Provide for an obligation for operators to initiate energy efficiency measures on the property under management (so-called cooperation instruments).
There are other more important problems.	The implementation of EE measures shall be permanently suspended for a later period.	Provide for support for measures that can be implemented at the same time (e.g. repair of the water pipeline and sewer or roof at the same time as EE measures).
The use of financial instruments (ESCO, low-rate loans) is not promoted. Availability of funding [not] to ESCO companies (to eliminate the "stop-and-go" model), financial instruments (these - and long-term).	When and when financial instruments are available, citizens and building owners are passive and do not apply for funding to implement EE measures.	Planning the availability of financial instruments to apply for EE measures is convenient and beneficial for both the final consumer, ESCO and credit institutions.
The inability of the population to agree (different layers, education, income), the problem of multi-apartment buildings to agree.	Difficult or impossible decision-making on the taking of EE measures.	Forcible warming with grant support; Coercive motivation, but certainly together with educational measures, otherwise loud negative opinions damage the reputation of the measure; The State implements energy efficiency measures in multi-apartment buildings without any decision and puts the price into costs.

Segment: small industrials (includes services)		
Barrier	Impact	Policy instrument
Capital scarcity or other acute CAPEX.	Merchants choose not to take EE measures because the available PIs are not sufficiently stimulating.	Combine PIs, e.g. financial instruments with fixed-term tax breaks; Plan anticyclical EE support measures to reduce the range of activity in EE.

High expectations for the repayment period.	The assumption that investments in EE will pay off quickly, in short time, although in reality more serious investments only pay off in the long term.	Informing the audience about the different scope of the EE measures and the different costs and reimbursement periods.
Energy efficiency in terms of technology change and science (EE is viewed in isolation from knowledge).	The audience has no understanding of EE and its various potential scopes.	Provide benefits/benefits for economic operators who demonstrate an initiative to take EE measures (e.g. partial compensation for the EE project, or a term reduction of CIT, or a one-time discount to CIT.
The implementation of EE measures will affect the quality of the product to be produced.	Does not choose to invest in the improvement of EE.	Education and information on the impact, limitations, benefits of EE measures;
Energy efficiency is expensive. There is no understanding that EE is good for the company.	Does not choose to invest in the improvement of EE.	Education and information on the impact, limitations, benefits of EE measures; Combine with other PIs, e.g. co-financing or fixed-term tax allowance [s]; Look for economic incentives for price-sensitive sectors.
Production must not be stopped.	Does not choose to invest in the improvement of EE.	Education and information on the impact, limitations, benefits of EE measures; Provide for some kind of incentive/support if the merchant wishes to take EE measures, but it is not possible to do so without a temporary cessation of production.
There is no room in the service segment – it is not worth investing.	Operators working in leased spaces shall not invest in EE unless it directly increases costs and reduces profits.	Coercive EE measures for residential owners or the obligation to implement EE measures if a tenant who has concluded a contract for a period longer than X months/years is willing to invest in EE; Support for leasing and leasing facilities. For example, CIT Discount or RET, depending on the size of the

		investment (measuring the aid intensity).
Other priorities (basic manufacturing process, basic duties, no time, lack of interest in doing something extra).	The decision to invest in EE is not taken under the pretext of other concerns. The possibility of improving EE as a subject does not reach the level of enforcement by hanging on to a lower level.	Provide for types of aid for economic operators deciding to implement EE measures: fixed-term CIT or RET discounts, or investment compensation, or preferential lending facilities.

Industrial big

Segment: big industrials		
Barrier	Impact	Policy instrument
High expectations for the repayment period.	The assumption that investments in EE will pay off quickly, in short time, although in reality more serious investments only pay off in the long term.	Informing the audience about the different scope of the EE measures and the different costs and reimbursement periods.
Bad examples (few good examples).	Economic operators are afraid to risk and invest in EE measures unless there are indications that inefficient use of energy causes direct losses and energy costs cannot be priced into production/service.	To inform about the good examples; Analysing bad examples, reporting errors and avoiding similar errors; Free advice on Industrial EE.
Energy efficiency is an imposed thing.	Active resistance to the implementation of EE measures.	Energy-influenced final energy decisions (CO ₂ , excise) that give financial incentives to invest
Energy costs represent a small part of production costs.	Investment in EE is not considered to be paying off or needed. Even if energy pays something, it can be priced into the final product.	Excise on fossil fuels; Aid (reduced X tax, cheaper borrowing, unique investment aid) for investment in EE measures.
A complicated decision-making process within the company.	Decisions do not reach enforcement drivers.	Informing business management (decision makers) about the impact of EE; Tax incentives if EE measures are implemented.
Lack of specialists (education).	There is no knowledge and understanding of the impact, role, reimbursement of EE measures and no decision on the implementation of EE measures.	Informing and educating decision makers on EE activities and impacts; Tax incentives if EE measures are implemented.
Expectations of cheap energy sources, seemingly	Assuming that energy [always] will be cheap,	Not to take decisions that would reduce energy costs for

easier to lobby for cheap resources.	investment decisions in EE are not taken, instead spending resources on administrative control of energy costs (lobbying).	specific economic operators at the expense of other groups (e.g. by redeploying the MPC burden from large industrial customers to the SME segment).
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Segment: State and local governments		
Barrier	Impact	Policy instrument
Absence of standardised procurement and construction contracts for the renovation of buildings (with energy efficiency requirements).	The preparation of contracts requires more time than would be needed; In the case of procurement, “delayed” contract projects whose quality may not be higher shall enter into circulation; Too much flexibility in the requirements leads to a situation where different contracting entities obtain different EE results in similar situations.	Preparation of standardised documentation including mandatory energy performance requirements.
Does not move towards raising industry standards by creating samples (NRE, agencies).	Weak progress in the mid-level lifting of EE, as the requirements can be interpreted with a view to meeting minimum requirements.	Include higher than minimum requirements in standardised processes. More favourable budgetary conditions should be laid down for sites which aim to achieve higher than minimum objectives.
Lack of capacity in project writing (limited human resources).	Few[er] projects, although there could be more than if there were additional human resources and existing resources were [more] more knowledgeable..	Budget resources for the implementation of energy efficiency measures (project preparation, monitoring, etc.)
The specific nature of the procurement does not allow the best available technical solutions (BATS) to be reached.	The procurement includes requirements arising from available funding and therefore does not focus on the use of the best available technology.	Amend the regulation by promoting the focus on achieving the BATS, not to focus on the “cheapest” solution.
Lack of awareness and knowledge of benefits.	EE does not enter the list of priorities and is not even planned to be implemented in a specific future.	The introduction of energy management as a mandatory requirement (with a transitional period and possibly assessing the scale of the organisation).

It is not possible to enter into long-term contracts to raise private funding.	Local governments do not plan or take EE measures, the implementation of which requires financial commitments for more than 5 years	Amend the framework by allowing commitments over 5 years, if necessary for the implementation of EE measures.
There is a belief that residents only want fountains and flower beds.	EE measures do not come to the agenda for priority work.	While creating other incentive conditions for EE (policy instruments), include an assessment of the need for EE measures as a requirement when judging/deciding on the use of funds.
Not sufficiently closely followed for optimal energy consumption, EE is not a priority for the municipality.	EE measures do not come to the agenda for priority work. Budget planning simplifies the approach to calculating energy consumption and creating procurement conditions (no assessment of the possibilities of market instruments).	The introduction of energy management in all municipalities (including public administration, e.g. NRE, but not only).
Lack of awareness (education).	There is no knowledge of energy efficiency, investment, benefits and impacts.	Introduction of energy management.
No money (no readiness to seek money).	EE's activities and investments in EE are not planned and implemented, not even on the agenda, EE has no chance of becoming a priority.	The inclusion of EE measures on the agenda in the form of EE as a category to be discussed by default; Plan anticyclical EE support measures to reduce the range of activity in EE.
"The government's money is not my money."	Investments in EE are not considered valuable because energy is paid from the local government budget, not personal.	Implementation of energy management requirements (in particular decision-making algorithm, roles, responsibilities, sequence).
There is no one in charge (from the municipality).	EE solutions are not on the agenda, not planned, not directed for decision-making.	Implementation of energy management requirements (in particular decision-making algorithm, roles, responsibilities, sequence).
It is accustomed that there will be nothing to do with the law.	Not achieving EE targets (optimising, reducing energy consumption) is not seen as something reprehensible.	Implementation of energy management requirements (in particular decision-making algorithm, roles, responsibilities, sequence).
Short design and planning periods.	When resources become available, EE measures are	The planning of EE activities in the context of long-term

	planned on an <i>ad hoc</i> basis, creating “fast” solutions that do not have a wider context.	budgetary planning, with resources to finance EE in good time; The availability of EU funds to finance EE measures should be considered as a bonus by linking investments to the organisation's general budget.
Hasty, ill-considered decisions (e.g. content and outcome of CCFI EKII funding projects).	Funding is used for activities that are indirectly related to energy efficiency or not at all.	Implementation of energy management requirements.
Complicated decision-making process.	A variety of factors deter municipalities from taking decisions on the implementation of EE measures.	Change of regulation and implementation of energy management.
Depending on the decision-maker's understanding, education in the economy, environmental concerns.	EE is not on the decision-making agenda, the potential for energy savings is not properly assessed.	Implementation of energy management requirements (in particular education, decision-making algorithm, roles, responsibilities, sequence).
At the individual level there is no desire to change your habits – “I’m just an employee”, “tenant-owner” problem (barrier related to non-interest).	No energy saving in organisation/optimal use, no motivation to change energy consumption habits; Tenants of spaces are not motivated to take care of EE, owners don't care about consumption because it can be priced into the rental of spaces.	Energy certification requirements for buildings and spaces and the introduction of energy management requirements. Granting favourable conditions to tenants when they invest in EE measures (transfer of EE activity burden from owner to user).
Lack of internal communication.	Information on energy consumption and potential energy savings does not come from employees to decision-makers and vice versa.	Implementation of energy management requirements (in particular decision-making algorithm, roles, responsibilities, sequence).
Other priorities.	EE does not enter the decision-making agenda, does not plan for EE measures and the necessary resources.	Include decisions on energy efficiency on the default decision-making agenda (as a requirement).
Previously investments by the municipality do not allow investment in the same building.	EE measures are not planned or are scheduled in the too distant future, depending on available information on the availability of funding.	Amend the framework allowing and motivating investment in energy efficiency to budge in line with the results achieved without

		imposing restrictions on re-investment.
Legislative barrier (Energy Efficiency Law v Public Procurement Law). Technical economic justifications for small and large projects.	It is not possible to assume a long-term financial commitment to implement EE measures (maximum 5 years). 3 years? ³	Amending the regulation (State Budget Act, Local Government Budget Act), enabling long-term commitments over 5 years to be made; Consider <i>one-stop-shop</i> projects on more flexible conditions (there is a reserve to finance all qualified projects).
There is no ambition at national level (big targets) for significant improvements in energy efficiency.	EE measures do not come to the decision-making agenda.	The decision to budget energy efficiency measures in compulsory expenditure.

Segment: Applies to all segments		
Barrier	Impact	Policy instrument
In general, there is no understanding that audits and projects are an intellectual investment.	Potential customers of energy efficiency measures (targeting) expect the analysis and valuation of the situation to cost nothing or almost nothing.	Informing; Technical and financial support for audits and project preparation.
Energy resources are not expensive enough to feel it fundamentally and decide to invest in energy efficiency.	There is not enough motivation for investment decisions in energy efficiency in almost all consumer segments.	The CO ₂ tax, priced at all costs, while providing a compensation mechanism for tackling risks of social inequality.
		Adjust the design standards of the AVK.
Regulatory requirements do not follow technological development, analysis and renewal of the LCS.	Designers and builders do not have sufficient incentives to choose LCS solutions; Due to limited funding, a regular and high-quality review of regulatory	Regular renewal of the LCS by investing adequate resources.

³ The Law on Local Government Budgets:

Article 22 (1) Local governments may, on the basis of a council decision, take short-term and long-term loans and assume long-term liabilities. The decision of the local government council with which the local government commits long-term commitments also provides for sources of financing for the fulfilment of such obligations. Long-term loans within the meaning of this Law shall be loans, the repayment period of which exceeds the limits of one financial year.
Article 23 For the purposes of budget and financial management, in order to cover a temporary shortage of local government financial resources, local governments may take short-term loans from the State budget to be repaid by the end of the financial year in which they were taken.

Article 24 In order to implement economic and social programmes that require investment, municipalities can take long-term loans. Such loans may not be used to finance local governments' permanent (current) expenditure.

Detailed information on local government loans is available on the Finance Ministry's website.
http://www.fm.gov.lv/lv/sadala/pasvaldibu_finansu_uzraudziba/

	requirements (LCS) cannot be carried out.	
A limited range of policy instruments and sources of financing, a restriction on combining different sources of funding.	Difficulties in financing comprehensive EE projects or even in general any EE measures requiring relatively high resources.	Provide flexibility for combining the various sources of funding (consistent analysis of combining policy instruments as a significant incentive for the energy of EE measures).
Restrictions on combining public and private capital.	Low third-party funding, inactive PPP segment, does not take advantage of PPP.	Changes in the regulatory environment - laws, regulations of the Cabinet of Ministers, guidelines ("5 years problem/the problem of feasibility study") - Law on the State Budget, On the Local Government Budget, Regulation of the Cabinet of Ministers to allow combining EU ERDF programs with private capital (currently only for apartment buildings). Creating a simplified decision-making matrix - PPP/EPC.
There is no leadership in "driving forward" energy efficiency message.	The unwillingness to take on the role of "pioneer" also hampers the compliance of the public sector's 3% annual renovation commitments.	"Political Ambassador for Energy Efficiency"; Addressing, informing, educating MP and BOM.

Classification of Energy Efficiency Policy Instruments

Breakdown of energy efficiency policy instruments	
Category	Instrument type
Regulatory environment	Minimum energy consumption standards (MECS) for energy-consuming products; Construction codes.
Circulation of information	Energy labelling (certificates) for buildings, cars and equipment; Information campaigns and centres; Smart metering of consumption and information bills.
Technical support	Energy consumption audits; Education and teaching.
Financial instruments	Subsidies (grants); Loans (on preferential terms or subsidised); Fiscal instruments (tax breaks, tax recovery possibilities); OI for energy saving; Penalties (for failure to comply with obligations or standards).
Cooperation instruments	Public procurement; Wholesale of goods and services; Technology procurement; Repurchase / recycling schemes.
Voluntary agreements	Voluntary agreements.
Duty schemes	Obligations schemes for suppliers/distributors; Energy reduction certificates (so-called white certificates); Investing carbon sales income in improving energy efficiency (so-called "carbon sales") <i>Cap-and-Invest</i> too.

Classification of Energy Efficiency Policy Instruments

Breakdown of energy efficiency policy instruments (Cialani, Perman, 2013)	
Policy instrument	Content
Communication with consumers	The efficiency of energy consumption, as well as the reduction and sorting of waste, is greatly influenced by citizens' behaviour and habits. But changing consumer behaviour has huge potential for improved energy efficiency. Long-term behavioural change can be ensured by education and teaching, ideally from school to school, but also through the re-education of adults, including employees.
Loans	Loans with more favourable conditions or reduced interest rates for energy efficiency measures and are intended to finance all or most of the investment needed.
Grants	Energy efficiency improvements. As a general rule, it is applied to situations where the use of renewable energy sources should be financed, heating or building confinement should be carried out, or the heating system should be modified (e.g. using biomass, heat pumps, cogeneration, solar power, temperature regulation), energy-efficient electrical appliances, windows and doors should be purchased, district heating should be installed.
Subsidies	For energy efficiency improvements: silencing, lighting, efficient equipment, fuel switching, introduction of DHS systems, CHP.
Third-party funding	The investment needed at once is made by the bank or ESCO, and the user pays back the investment over the long term.
Trade (so-called white or energy certificates)	Option for electricity and natural gas retailers selling services/products to households: obligation scheme for energy network infrastructure companies to market certificates without possibility. Typical use: silencing, heating, hot water production, lighting, ventilation systems, energy-efficient appliances
Reduced taxes	Individuals or corporate tax breaks. Reduced IIN or UIN in proportion to investments in energy efficiency.
Tax Discount	Different personal tax credits to the owner of the building against investment in energy efficiency.
Reduced VAT	Reduced VAT rate for energy efficiency materials and products.

Barriers for improving energy efficiency

Barriers to energy efficiency	
Type of barrier	Example
Market-related factors	<p>Market organization and price distortions do not give consumers the opportunity to assess the fair value of energy efficiency.</p> <p>The problem of distributed incentives that arise in situations where investors cannot receive/do not feel the benefits of improved energy efficiency.</p> <p>Transaction costs (project costs are high compared to the benefits of [achievable] energy efficiency).</p>
Financial factors	<p>Immediate costs and reduced benefits reduce the willingness to invest in energy efficiency measures.</p> <p>Investments in energy efficiency are perceived as complex and risky, with high transaction costs.</p> <p>Lack of awareness on the part of financial institutions that energy efficiency brings financial benefits.</p>
Information and knowledge-related factors	<p>Lack of awareness and understanding on the consumer side so that rational decisions can be made on [energy] consumption and investment in [energy efficiency].</p>
Regulatory and institutional factors	<p>Non-motivating energy tariffs (prices) for investment in energy efficiency, including, for example, declining consumer prices at different levels.</p> <p>The incentive structure encourages energy suppliers to choose to sell energy rather than invest in cost-effective energy efficiency solutions.</p> <p>Institutional prejudices against supply-side investments.</p>
Technical factors	<p>Availability of energy efficiency technologies suitable to local conditions (which can be afforded).</p> <p>Insufficient performance for identifying, developing, deploying and maintaining investment in energy efficiency.</p>

Energy Efficiency Policy Instruments

Energy Efficiency Policy Instruments (International Energy Agency/OECD, 2010)	
Policy instrument	Example
Pricing mechanisms	Variable/variable rates in situations where higher consumption leads to higher unit prices.
Regulatory environment and control mechanisms	Mandatory measures such as energy audits and monitoring of energy consumption. Minimum energy consumption standards (MECS). Energy consumption reduction targets. Energy efficiency investment obligation for private companies.
Fiscal measures and tax incentives	Grants, subsidies and tax incentives for energy efficiency investments. Direct procurement of energy-efficient goods and services.
Promotion and market transformation mechanisms	Public awareness and promotion campaigns Including energy efficiency in the content of school teaching. Labelling of electrical equipment and certification of buildings.
Technological development	Developing and demonstrating energy efficiency technologies
Commercialization and Performance Lifting	Establishment of Energy Service Companies (ESCO). Training programmes. Developing the energy efficiency sector.
Financial support	Conversion funds for energy efficiency investments. Preparatory [financial] tools for projects. Financing tools.