# Policy measures in the German heating sector: a review-based framework to study policy acceptance

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## Keywords

## Abstract

The development of innovative heating technologies and, above all, their diffusion is essential to reach national climate change mitigation targets in the building sector. Research has shown that primary energy use and $CO_2$ emissions could be greatly reduced by replacing conventional heating technologies with renewable energy heating systems such as heat pumps or solar-thermal heating.

The acceleration of the development and diffusion of innovative heating technologies requires appropriate policy measures. Those policies need to be effective and feasible. This in turn, is dependent on the acceptance of the policy by (parts of) the general public. As the building sector is prone to lock-in effects, public opposition to policies might inhibit necessary adoptions of efficient technologies. This means that the dimension of socio-political acceptance needs to be included into policy design, next to considerations on economic efficiency, and climate compatibility. While social acceptance has already been studied with regard to heating technologies, less attention has been paid on the acceptance of policy measures that would foster their deployment.

The aim of this study is to derive a conceptual framework to study policy acceptance, in particular for the heating sector. Therefore, we undergo four steps. First, we synthesize existing research on factors that influence policy acceptance towards innovative low-carbon technologies. Second, we review existing frameworks to study policy acceptance (for innovative technologies). Third, we propose a conceptual framework to study acceptance for policies in the heating sector. Finally, we review policies in the heating sector in Germany with a focus on policy characteristics that might influence policy acceptance.

## Introduction

In order to achieve the reduction in greenhouse gas (GHG) emissions required to mitigate climate change, a fundamental transformation of the energy system is necessary. As the European Commission decided to raise the 2030 GHG reduction target to at least 55 % compared to 1990 levels, a continuous discussion takes place in Germany on how national GHG emission reduction targets are to be achieved and enhanced. Following the German Climate Action Plan 2050 (BMU, 2016), GHG emissions are to be reduced by 80 to 95 % by 2050 compared to 1990. In addition, the German government introduced the Climate Protection Program 2030 (Klimaschutzprogramm) in 2019, with sector-specific and overarching measures to reduce emissions by at least by 55 % by 2030. The mitigation targets are anchored in the German Climate Protection Law (Klimaschutzgesetz). The Climate Protection Law specifies legally binding emission reduction targets for individual sectors by the year 2030.

Through the expansion of renewable energy (RE), a progressive decarbonization of the electricity sector is already taking place in Germany. The share of RE accounted to 38 % in 2018 (UBA 2019). However, space heating, process heat and hot water in the building sector, commerce and industry account for around 50 % of the total final energy consumption (BMWi, 2019). To date, fossil fuels have been predominantly used in the heating sector, while the share of RE sources account-

ed to 14.2 % in 2018 (UBA, 2019). The decarbonization of the heat supply in buildings, also referred to as the "Wärmewende", is one of the central challenges in the context of climate mitigation efforts. On the one hand, there is a need for a significant increase in energy efficiency, especially in existing buildings, and on the other hand, for the remaining heat demand to be covered by regenerative energy sources by adopting renewable heating solutions. To increase the share of RE in the building sector the development of sustainable, technological RE innovations and, above all, their diffusion in the heating sector is essential.

To achieve a rapid transition in the building sector is difficult, because it is long-term oriented and highly prone to lock-in effects. Furthermore, delays in political implementation might lead to path-dependencies that constrain the transition and impede the required GHG emission mitigation. To promote the diffusion of innovative heating technologies, the German government has already defined various measures. For example, according to the Climate Protection Program 2030, $CO_2$ pricing for transport and heating was introduced since 2021. These incentives complement existing concepts: e.g. $CO_2$ building renovation program, market incentive program (MAP), energy efficiency incentive program (APEE) or program to promote heating optimization.

The Projection Report of the German government 2019 (UBA, 2019), includes GHG emission savings projections for Germany based on the 2030 climate protection program taking into account policy measures that were adopted by August 2018. The report showed that the current policy mix would not be sufficient to reach the required 2030 target in the building sector. According to the Climate Protection Law the German government must submit immediate programs and new measures, if it becomes apparent that the sectoral emission targets cannot be met. Therefore, Germany needs to suggest new measures for the building sector in summer 2021.

In order to achieve the new 2030 climate protection target in the best possible way without overburdening citizens and companies, and to ensure the realization of a climate-neutral building stock by 2050, the entire set of policy instruments must be further developed and optimized. The German policy mix relies strongly on the use of subsidies to transform the German heating sector. In addition, carbon pricing has been introduced since 2021. The fixed price will gradually increase to EUR 55 by 2025. From 2026, the price will be determined in auctions with a price corridor of EUR 55 to 65 set for 2026. However, the price is considered moderate. This would suggest that a high rise after 2027 might be necessary. To overcome possible public opposition, this issue needs to be addressed early on and relevant factors of social policy acceptance be considered in policy design as well as in policy communication.

Either because domestic heating is a private domain or due to private house ownership, citizens are primarily the target group of policy measures in the building sector and are expected to change their behavior or to switch to new technologies to achieve overarching policy goals. Their response to policy instruments (e.g. acceptance or opposition) is critical to their successful implementation. A fundamental change, such as a transition from a conventional to a renewable heating system, will not be feasible if there is no support from the public. Public opposition and the associated reluctance on the part of elected representatives are factors that can hinder the successful im-

plementation of any long-term oriented policy program (Steg et al., 2005). The most efficient or effective considered policy measure to foster energy transition may not be the most equitable or just from the citizen's point of view. But what drives citizens to accept or even support new policy instruments? To answer this question, it would help to find the trade-off between highly effective and widely accepted policy measures. In this paper, we look into how the social acceptance of policies could be formalized to enable an assessment of policy measures in this regard.

The paper is organized as follows: Section 2 provides an overview on methods and scope of the study. Section 3 presents the results of our literature review on factors that influence policy acceptance. In section 4, we propose a framework on how policy acceptance might be approached. In section 5, we relate policies with factors of policy acceptance, and elaborate on the results. Section 6 sets out relevant policy implications and concludes the paper.

## Methods and Scope

In this study we specifically focus on policies that foster the deployment of renewable energy heating technologies. In terms of the technologies, we consider particularly promising technologies for the domestic heating in households as heat pumps or solar-thermal. We do not include district heating, because this comes with other dynamics in terms of policy design and involved actor groups. For the literature review on factors found to influence the acceptance of those policies, we use a broader scope and screen existing literature on social and public acceptance of climate or energy policies. In the next step, we apply the results from this branch of literature to study the acceptance of policies targeting the diffusion of renewable energy heating technologies. To do so, we review relevant policies found in the German heating sector that target the diffusion of renewable energy heating technologies and link the attributes of the policy measures to factors that determine policy and social acceptance. To bound the study, our analysis is intended to be illustrative rather than comprehensive. We are aware of the variety of disciplinary and paradigmatic perspectives within the field of acceptance research but focus primarily on those perspectives that we consider notable.

## Theory and Literature Review

For a successful implementation of technologies in a democratic society, understanding social acceptance is crucial. Attaining ambitious climate mitigation targets while accounting for public preferences and voting behavior poses a challenge to the governmental system. Public influence may lead to changes in funding, adaptations of regulations, or expected market demand (Burstein, 2003). However, social acceptance operates on diverse dimensions. Wüstenhagen et al. (2007) have formalized the research field of social acceptance and proposed the most acknowledged definition of social acceptance of renewable energy innovations. According to this definition, social acceptance can be divided into three dimensions: socio-political, market, and community (local) acceptance. (1) Socio-political acceptance concerns all societal actors and targets rather general political decisions and policy formulations. Socio-political

acceptance of policy measures (e.g., acceptance of regulations, taxes or subsidies, information campaigns) is an example of a social phenomenon that involves complex and dynamic interactions among actors. In addition to citizens, there is also a variety of actors who influence public perceptions of policy measures and interpret and shape the outcomes of public opinion formation (e.g., media, opinion leaders, lobby groups, political parties, etc. (Drews, van den Bergh, 2016). (2) Market acceptance refers to acceptance by consumers, investors and companies as adopters. It reflects the process of market adoption process of innovations, where goods and services that correspond with the market demand are likely to diffuse. (3) Finally, community acceptance comprises the specific acceptance of decisions, where mostly local inhabitants and public authorities are involved and where opposition occurs often from the "not in my backyard" syndrome (Devine-Wright, 2005). An understanding of the process of policy acceptance would therefore be beneficial to capture which aspects correspond to society's perceptions in the design of policies. In this paper, we set the focus on the socio-political dimension only.

The social acceptance of heating technologies has already been studied from the market acceptance point of view (e.g. Sopha et al., 2003; Globisch et al., 2020). The studies focus on the technological attributes of innovative heating technologies and consumer choices to understand the adoption potential of new technologies. The higher the benefits for the consumer with regard to the attributes of the new technology – the faster the diffusion of the technology might be (Rogers, 1962). However, less attention has been yet paid on the acceptance of policy measures that would foster the deployment of renewable heating technologies.

To embark on a path towards a low-carbon society, the state must define policies that would stimulate the process of market penetration for renewable heating technologies. The state has some policies at hand in doing so. According to Laes et al. (2018) measures to promote GHG mitigation in the EU residential sector fall into one of the following policy classes: economic incentives (taxes, grants, subsidies, etc.), regulatory instruments (e.g. regulations for heating and hot water systems), institutional frameworks (e.g. institutional framework describing the rights and obligations of tenants), and information measures (energy audits, labels, information campaigns). To be successful, policies need the support of different groups of the society (Grunwald, 2000). Public resistance and related reluctance among politicians to pursue unpopular policies are important obstacles to successful implementation of climate policies (Steg et al. 2006). Still, the distinction between policies leading to public support or opposition is far from being clear-cut and intuitive. While subsidies are considered to be an overall effective measure, public opposition might result with regard to the allocation of public resources. And, while one might assume high carbon taxes might lead to high public resistance, some studies point out that carbon tax might be less opposed when the use of revenues is fair and transparent (Hammar and Jagers, 2006, 2007; Maestre-Andrés et al., 2019).

In practice social policy acceptance is usually evaluated through survey investigations of singular policy measures. We argue that a formalized process of policy acceptance would help assess policies on the socio-political dimension and might complement empirical surveys and to improve policy design.

To be able to identify potentials for improvements of policy design in respect to socio-political acceptance the identification of factors that affect public support needs to be further highlighted.

Factors influencing political acceptance of climate and energy policies have been studied through empirical research. Empirical research on public acceptance of a policy can be approached from different sides. Social psychological studies focus on individual factors, such as attitudes, norms, and preferences with regard to certain policies. Alternatively, policy acceptance can be studied by setting the focus on the characteristics of the policy, such as perceived effectiveness, costs, or fairness (Steg and Schuitema 2007). Those often use stated preference methods to estimate Willingness to Pay (WTP) for policy measures. Socio-demographic factors are usually also employed as explanatory variables in both approaches.

Evidence on public preferences for climate change policy measures has been reviewed and summarized by Brännlund and Persson (2012). The results show that besides the efficiency of policy measures factors as equity, regional distribution and ideological preferences are equally relevant for individuals and impact their choice of a preferred policy.

Several reviews are available on the acceptability and acceptance of carbon tax. Saelen and Kallbekken (2011) reviewed public acceptance of fuel taxation. Their results show that support of fuel taxation is strongly correlated with beliefs about positive environmental consequences and distributional effects, rather than the economist view that individuals would vote according to their self-interest. Maestre-Andrés et al. (2019) provided an overview on empirical evidence on how public perception of the fairness of carbon pricing affect policy acceptance by reviewing studies from different countries. They found that perceived personal consequences, distributional effects and procedural aspects co-determine perceived fairness, which in turn affect policy acceptability. Another study by Carattini et al. (2018) identified barriers to public support of carbon taxes. The authors argue that when carbon tax policies consider socio-psychological factors in their design they are also more likely be positively perceived by the public.

An extensive compilation of factors that influence policy acceptance of climate policies has been conducted by Drews and van den Bergh (2016). They provide a cross-disciplinary overview of empirical and experimental research on public attitudes and preferences that has emerged in the last few years. They divide those factors that influence climate policy acceptance into three categories: (1) socio-psychological factors, (2) the perception of climate policy and its design, and (3) contextual factors. The category socio-psychological factors encompass factors that describe more general orientations, such as political orientation, values, general beliefs, etc. The category "perception of climate policy and its design" lists factors that are relevant to understand how public attitudes are affected by objective and perceived characteristics of policy instruments, such as information provision, economic incentives, and the coerciveness of measures. Finally, contextual factors comprise social, economic, institutional, and communicative factors, which go beyond the individual level and the question of policy design to shape public attitudes and policy preferences. Contextual factors include the important role of media and institutional actors, such as political parties, associations, and media. There is no doubt

that there are interactions among the identified factors within and between those three categories regarding their mediation and moderation effects. Given the different research contexts of the empirical studies, however, those effects are difficult to harmonize.

## Conceptual Framework

Our literature review showed that less attention has been payed until now on the formalization of factors of processes to study policy acceptance. One theoretical framework that illustrates political acceptance processes is the Policy Acceptance Model (PAM) that has been proposed by Pierce et al. (2014). PAM builds upon the Technology Acceptance Model (TAM), which is widely used to study technology acceptance. However, it might be questioned whether the same theoretical framework can be applied to policy as well as to technology acceptance as the involved cognitive processes are very different from each other at the individual level. Maestre-Andrés et al. (2019) find that the perceived fairness of carbon pricing has a strong influence on the policy's acceptance.

In this study we propose a framework for policy acceptance that emphasizes the specific attributes of a policy measure. The factors identified in the literature review will be the pillar for the theoretical framework. We especially use the research study carried out by Drews and van den Bergh (2016) as an orientation and starting point. In their research study, the authors provide insights into how public acceptance is affected by characteristics of policy instruments. They identify factors directly related to policy design and group those in the category "perception of climate policy and its design". For our framework we use the factors of this category and relate them to the group of individual`s socio-psychological and demographic factors to outline the internal process of policy acceptance. We assume that socio-psychological and demographic factors would have a strong impact whether an individual would agree with a specific policy objective. However, this attitude would be compared with the specific characteristics of the policy measure (objective attributes) and their perception by the individual (subjective attributes).

Factors that are related to policy design can be grouped on a scale: from factors that rather refer to objective attributes of a policy measure to factors that affect the subjective perception of a policy measure of an individual (see Table 1). Objective attributes would be the specific characteristic of the policy design depending on the policy type. Policy types relate to economic

incentives as subsidies, regulations, or information campaigns. According to empirical research (Drews and van den Bergh, 2016), the most important factors are the degree of coerciveness of a measure and the use of revenues derived from this measure (left). The degree of coerciveness is determined by the policy type. A further important factor is the financial burden for the affected parties, as well as the distribution of revenues. Subjective perception of the policy measure would include factors that determine the perception or the evaluation of the policy measure (right). Those factors include the perceived financial burden (personal costs) or the effort through behavioral changes for the individual (behavioral costs), the perceived effectiveness, and the perceived fairness of the measure. The factor fairness of a policy might, in some cases, be an attribute of a policy measure, but would rather be considered as an outcome of the individual's policy evaluation process. Empirical studies have shown that perceived effectiveness by an individual can have a significant effect on the acceptance of a policy measure (Kallbekken and Saelen, 2011; Lam, 2014; Tobler et al, 2012). However, the individual's judgement on policy effectiveness might strongly be influenced by socio-psychological factors: preferences for certain policies or beliefs about climate change might lead to higher perceived effectiveness, which in turn would to some effect influence the individual to accept rather coercive policy measures.

Figure 1 suggests a relationship between factors that influence the subjective perception and the specific attributes of a policy measure, which finally leads to policy acceptance of an individual. Objective policy attributes influence the perception and evaluation of a policy measure by an individual. The main factors relevant for the perception and evaluation are the perceived resulting personal burden, perceived fairness, and perceived efficiency of a policy measure. As empirical studies have shown, when an individual might expect higher personal benefits, such as lower financial burden through subsidies, there would be a positive correlation with acceptance. On the other side, the individual's perception of being more negatively affected through the policy measure that other groups might indicate that policy specific evaluation, such as fairness determines policy acceptance. However, we assume that the individual perception would differ among individuals and individuals might prioritize policy attributes in various ways. The prioritization would mostly be dependent on internal factors that consist of socio-demographic and socio-psychological factors. However, those assumptions need to be empirically tested and especially more knowledge is needed on the causality and interrelation of influencing factors on overall policy acceptance.

**Table 1. Factors influencing policy acceptance based on the attributes of a policy measure divided into two groups: objective attributes (left) and subjective attributes (right).**

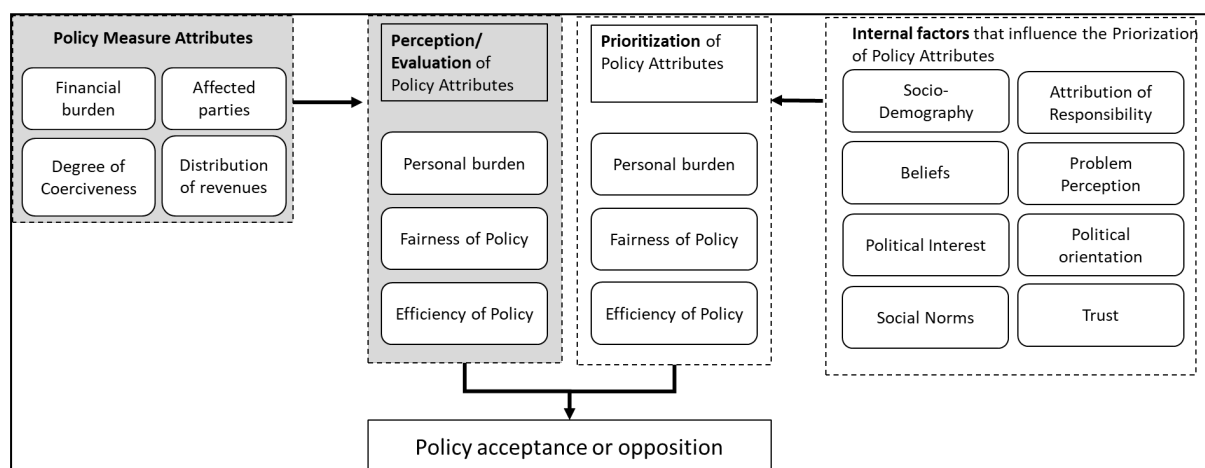| Objective attributes of the policy measure | Subjective attributes of the policy measure |
|---|---|
| **Degree of coerciveness**<br>Policy type (hard regulation, taxation, economic incentives, information campaigns) | **Perceived personal costs**<br>Monetary costs or behavioral costs |
| **Financial burden** | **Perceived (environmental) effectiveness** |
| **Affected parties by the policy measure** | **Perceived fairness**<br>Fairness principle (purpose related)<br>Fairness principle (social justice) |
| **Distribution of revenues** | |

*Figure 1. Proposed framework on policy acceptance formation based on influencing factors identified by Drews and van den Bergh (2016).*

**Table 2. Policies for the German heating sector targeting the indirect of direct diffusion of RE technologies.**

| Policy type | Name of the measure, strategy or objective | Status of implementation |
|---|---|---|
| Economic incentives (carbon pricing) | $CO_2$ Pricing heating and transport | 01. January 2021 |
| Economic incentives (subsidies) | Tax subsidies to promote energy-focused building refurbishment. | 01. January 2020 |
| Economic incentives (subsidies) | Federal Funding for Efficient Buildings Program (BEG) | Effective since 01. January 2020; federal funding started in 2021 |
| | Integrated in BEG:<br>• Marktanreizprogramm (MAP)<br>• Incentive Program for energy efficiency (Anreizprogramm Energieeffiziez)<br>• Support program for heating system optimization | Since 2015<br>Since 2016<br><br>Since 2016 |
| Economic incentives (subsidies) | Funding program to modernize urban buildings in districts | 2011 |
| Information campaigns | Energy consulting and public outreach measures | Implemented through the Building Energy Act (GEG) in 2019 |
| Information campaigns | Heating-Suitability-Check | 2020 |
| Regulatory instruments | National energy efficiency label for heating installation | Since 2016 |
| Regulatory instruments | Building Energy Act (GEG) | Since 2020 |
| Information campaigns, Economic incentives (subsidies) | Funding strategy for energy efficiency and heat from renewable energy resources | Planned for 2021 |

## Evaluation of Policies

While it is difficult to make assumptions without empirical research whether a specific policy would be rather accepted or opposed by the public, it might be possible to derive from specific policy measure attributes the relevant factors that influence the individual's acceptance of the policy. Focusing on the German heating sector, we compiled relevant policies that directly or indirectly target the diffusion of renewable energy technologies. We selected those policies that are included in the German Climate Protection Program 2030, the recent NECP, and EED reporting to have a representation of the current political development. The identified policies are compiled in Table 2.

Based on the policy description we evaluate for some of the measures which factors would, from a citizen's point of view, be relevant for the assessment of policy acceptance. The specific factors are: perceived coerciveness of the policy measure, effectiveness, personal burden, and fairness. Taking into account policy attributes, we only determine the level of relevance for those factors, meaning that they might affect policy acceptance either in positive or negative ways.

### $CO_2$ Pricing heating and transport

$CO_2$ price on the heating and transport sectors was introduced since 2021. It operates through a fixed-price system in which $CO_2$ certificates are sold to fuel-trading companies. At the same time, a trading platform will be established to auction the allowances and enable trading. In 2021 allowances are issued at a fixed price of EUR 25/t$CO_2$. The fixed price will gradually increase to EUR 55 by 2025. From 2026, the price will be determined in auctions with a price corridor of EUR 55 to 65 set for 2026.

This would suggest that a high rise after 2027 might be necessary. From 2027 onwards, a maximum emission quantity will be set, which will decrease from year to year. The policy measure is supplemented by changes in housing subsidies and tenancy law with the aim to avoid social hardship in the event of rising heating costs due to $CO_2$-pricing. Those changes would include a 10 % increase in housing benefit to avoid social hardship due to rising heating costs for eligible low-income households. In addition, changes to tenancy law are being examined. By default, the $CO_2$ price has to be paid by the tenant. It is currently being discussed whether a partial allocation of the $CO_2$ price to the owners would be possible. $CO_2$-pricing is a coercive measure and the general assumption would be that citizens would oppose any new taxes. Perceived personal financial burden would therefore play a major role. However, this factor might be balanced out if the policy measure takes into account a fair distribution of costs among tenants and offers financial support for low-income households. Perceived effectiveness might also be important, as the financial burden needs to be justified to the public.

### Federal Funding for Efficient Buildings Program (BEG)

The BEG, launched in 2021, bundles the previous programs to promote energy efficiency and renewable energies in the building sector and increases funding. The program would leverage subsidies for various programs to increase efficiency and enhance the use of renewable energy usage in the building sector. The BEG furthermore includes the scrapping premium ("Abwrackprämie") for the replacement of oil heating systems and is 10 % on top of the funding for a renewable energy device. Subsidies are not a coercive measure and is not likely to provoke public opposition. Perceived effectiveness and perceived financial burden would be relevant, as the measure promises the achievement of high GHG emission savings and leverages and provides financing. Perceived fairness is labeled as "medium" because concerns from the public might arise with regard to the allocation of public money if the program would not live up to its promises.

### Building Energy Act (GEG)

The Building Energy Act (GEG) creates a uniform and coordinated set of regulations for the energy requirements for new buildings, existing buildings and the use of renewable energies for heating and cooling in buildings. To this end, the separate regulations on building energy efficiency (EnEG, EnEV) and the use of heat from renewable energies (EEWärmeG) were merged and standardized. The GEG includes a regulation on the installation of oil heating systems, which bans their installation from 2026. The review of energy requirements for new and existing buildings is specified for 2023. The energy standards of residential and non-residential buildings will then be developed further in accordance with the results of the review. The affordability of construction and housing is an essential cornerstone to be considered. Given that this measure might imply many changes for house owners all factors could be considered relevant with regard to policy acceptance.

### Tax subsidies to promote energy-focused building refurbishment.

The tax incentive for energy-efficient building refurbishment has been introduced as an attractive funding instrument on January 1, 2020 to supplement the existing funding framework. The tax incentive can be used as an alternative to the existing loan and grant programs in the building sector. Funding is provided for individual measures on owner-occupied residential property that are also classified as eligible for funding under the existing building assistance programs. These include in particular the replacement of heating systems, but also the installation of new windows or the insulation of roofs and exterior walls. Eligible for funding are 20 % of the investment costs, as well as 50 % of the expenses for an energy consultant. The tax subsidies are a non-coercive measure which is likely to be accepted by the public. However, the effectiveness and fairness aspects might be relevant for the acceptance by the citizens with regard to the financing of the policy measure.

### Energy consulting and public outreach measures

Energy advice for residential buildings is being improved. Energy advice helps to include energy efficiency and renewable energies in the planning and decision-making process and thus to exhaust the efficiency potential. This measure also provides building owners with better information about the added value of energy refurbishment measures. In the case of this informative measures non-coercive measure there is less concern with regard to its acceptance by the public. Financial burden does not play a role as the measure does not imply private expenses and it is not likely that the effectiveness of the measure is questioned. Furthermore, the access is guaranteed for all citizens, therefore fairness can be rated as moderately important.

Table 3 summarizes our assumptions of which factors (subjective attributes) of a policy measure would be important for the individual's evaluation and therefore their acceptance of the policy measure. We distinguish whether the factors are less, moderately or very important. We do not assess whether those factors reflect the actual perception of the policy measure as this could vary among individuals and social groups and needs to be empirically tested. The proposed approach allows to consider whether the objective policy attributes correspond with the factors relevant for the assessment by the individuals. Nevertheless, it is necessary to test the influence of those factors through empirical research.

## Conclusions

To construct efficient policies, it is important to consider public acceptance in policy design. Empirical evidence points out that people evaluate policies based on their perception of policies. The perception of policies is, in turn, influenced by socio-demografic and socio-psychological factors. While usually the acceptance of policies is evaluated for singular policies, we propose to use a formalized way to assess social policy acceptance for policy evaluation that could be used independently. From our literature review, we derive factors that are decisive when it comes to policy acceptance and should be considered for policy evaluation and policy design. Furthermore, we proposed a framework on how factors that are important for the perception of a policy might interact with socio-psychological and demographic factors. The framework is based on relationships that we consider dominantly suggested and tested in literature. The proposed framework still needs to clarify assumptions on causality, such as through an experimental design and modelling. We exemplarily looked into policies that would enable the diffusion of heating technologies in households and iden-

Table 3. Assessment of factors that influence policy acceptance based on their importance on the evaluation and acceptance of policy measures.

| Policy measure | Policy Class | How important is this policy factor for the acceptance of the policy measure | | | |
| --- | --- | --- | --- | --- | --- |
| | | Coerciveness | Effectiveness | Burden | Fairness |
| $CO_2$ Pricing heating and transport | Economic incentives ($CO_2$ Pricing) | Very important (coercive measure) | Moderately important | Very important | Very important |
| Tax subsidies to promote energy-focused building refurbishment. | Economic incentives (Tax subsidies) | Very important (non-coercive measure) | Moderately important | Less important | Moderately important |
| BEG (Federal Funding for Efficient Buildings Program) | Economic incentives (subsidies) | Very important (non-coercive measure) | Very important | Very important | Moderately important |
| Energy consulting and public outreach measures | Information measures | Very important (non-coercive measure) | Less important | Moderately important | Moderately important |
| GEG (Building Energy Act) | Regulatory instruments | Very important | Very important (low effectiveness) | Very important | Very important |

tified the factors that would be relevant for the assessment of perceived social policy acceptance for different policy types. In this concern, policy design would require to account for those factors of social policy perception. In the case of rather coercive measures it is important to design policies that take into account fairness principles. Moreover, a transparent communication to the public explaining the benefits of the policy might be helpful. While, individuals might form their attitudes based on prior beliefs, information and elaboration on the advantages, distributive effects, effectiveness of the policy measure and how it targets fairness is important for attitude formation.

According to the latest projection report by German government 2019 (UBA, 2019), Germany is likely to miss the targets in the building sector set for 2030. Furthermore, the recent decision that the government's climate protection measures are insufficient to protect future generations by the supreme constitutional court might imply that to enhance carbon savings policy measures would need to be enhanced or new effective measures would need to be introduced in a rather short period of time. This might lead on one hand to policy measures with a higher degree of coerciveness e.g. more regulatory approaches and therefore possibly higher public opposition. On the other hand, the government could finance further subsidy programs, which would rather be accepted by the public. In this case, however, conflicts might arise due to the allocation of the national budget. To overcome barriers through public policy acceptance it would be necessary to account for social acceptability in policy design. In cases of regulatory measures, it would be necessary to include compensation (or other advantages) for highly affected groups. But also ancillary measures could help to promote acceptance. In the case of stronger subsidy programs to substantiate the financing of measure would be the determining factor for public acceptance.

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