Policies
to Promote
Sustainable
Consumption
Patterns

EUPOPP Work Package 3.2

Impact Assessment Paper

Minimum energy performance standards for buildings in Germany

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SEVENTH FRAMEWORK PROGRAMME

Policies to Promote Sustainable Consumption Patterns

Impact assessment of the minimum energy performance standards for buildings in Germany

The following analysis is part of the EUPOPP project's work on evaluating European policy instruments for sustainable consumption (SC). It forms part of a series of ten in-depth impact assessment papers. All assessments have been carried out in accordance with the EUPOPP Impact Assessment Tool.

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1. Setting the scene/introduction

1.1 The minimum energy performance standards for buildings in Germany

The main instrument which will be analysed in this paper is the minimum energy performance standards for buildings in Germany. These standards are part of the energy saving ordinance (*Energieeinsparverordnung* [EnEV]). This ordinance sets standards for different parts of the housing sector, e.g. air conditioning, heating systems and building elements such as walls, windows, doors etc. In this analysis, only the latter – minimum energy performance standards for building elements and buildings – will be discussed. All other elements of the EnEV will only be analysed, if they seem relevant to the context of the EnEV, be it as a hampering or as a supporting factor.[1]

In general,Without telling any details in this part (for that please see chapters 2ff.) the aim of the EnEV is to influence the heating behaviour of all people living or working in heated buildings[2]. As there is only limited access to different sources of heating and there are also limited possibilities to influence the heat requirement in terms of the temperature at which people feel comfortable, the prize of heating energy is only to a limited extent useful to reach the target. No matter what prize – people have to and will heat to a certain degree. Regarding this, minimum energy performance standards are a very promising instrument to influence the energy demand required for heating, because they are not affecting the actual consumption behaviour (which would mean to lower the temperature, but the heating energy demand to reach the respective temperature. As the traditional aim of consumption policies is targeting the consumers' behaviour, the minimum energy performance standards are an unusual example of sustainable consumption policies. Thus, the main aim of the EnEV is to change the framework of consumption within a specified area (heating) of the housing sector.

The origins of the EnEV date back until the late 1970s when the so called *Wärmeschutzverordnung* (heat insulation ordinance) was implemented. In 2002 this ordinance was merged with the *Heizanlagenverordnung* (heating system ordinance) to become the new EnEV (Friedrich et al. 2007: 20). So far the EnEV has been revised three times: first in 2004, then in 2007 and last in 2009. In 2009 the level of the minimum energy performance standards was increased by around 30%. Another main amendment was extending the energy performance certificates to buildings which were built before 1995. For 2012, a new EnEV revision is planned (BMU 2007: 3). Then, the minimum energy performance standards are again supposed to be increased by around 30% compared to the latest version of the EnEV (EnEV 2009). However, it is not sure, whether this course will be continued with a new government coalition in place from 2009 on. Further changes to the EnEV have to be awaited.

[1] This holds for all other instruments, mechanisms etc. outside the EnEV.

[2] For a detailed description see the following chapters.

1.2 The policy context

1.2.1 The EU context

When looking at national instruments in EU member states it always has to be noticed that there could, and most often will, be some supranational regulations or approaches on how to tackle issues on the public agenda – this is also the case for minimum energy performance standards for buildings. The concerned community rules are part of the Energy Performance of Buildings Directive (first version: EC 2002/91), called EPBD. The EPBD sets no specific standards in terms of limit values, but it sets a framework within which national regulations may vary. This frame's broadness is expressed by merely stating that each member state has to set minimum standards for the energy performance of buildings which come into force when building new houses and when renovating existing buildings to a certain extent (Art. 5 and 6). However, building and renovation should occur within a cost-effective framework. The EPBD also obliges the member states to demand energy performance certificates (Art. 7 I) – another context factor of the German minimum energy performance standards (see below).

However, besides the energy performance certificates there have been no consequences of the EPBD for Germany so far, due to those national regulations which have been in place for a relatively long time (see chapter 1.1) (Friedrich et al. 2007: 53). Though, there will be further consequences caused by the revision of the EPBD. In July 2010, a revised EPBD (2010/31/EU) entered into force including regulation on (1) demanding zero energy for newly built houses by 2021 (Art. 9 I), (2) demanding random sample controls of energy performance certificates (Art. Annex II), (3) and demanding also strategies to support zero energy standards for the renovation of existing buildings (Art. 9 II), (4) the level of minimum energy performance standards has to be at a cost-optimum (Art. 4). But again, no explicit limit values have been prescribed and therefore consequences for the German legislation are likely to be inconsiderable (apart from new buildings).

1.2.2 The national context

At the national level in Germany a broad set of other policy instruments which aim at improving the energy efficiency in the housing sector, especially regarding the energy performance of buildings. Only the most important should be discussed here (Table 1).

The most important national policy related to the EnEV is the energy saving law (*Energieeinspargesetz* [EnEG]). The EnEG is the basis for authority of the EnEV and therefore creates the judicial framework for energy performance standards. Allowing the government to set energy performance standards within an ordinance (§1 II) and prescribing the cost-efficiency of these standards (§5 I) is the plain function of the EnEG. Additionally, penalties for noncompliance are set within the EnEG (§8) and a hardship case for exemption from the standards is to be set (§5 II).

As mentioned before, another nstrument regulated within the EnEV is the energy performance certificate (*Energieausweis*) (§16 ff.). The energy performance certificate was already included in the EnEV before the EPBD was developed. Nevertheless, the EnEV has been changed according to EU law in 2007 to extend the duty for an energy performance certificate to all buildings which are to be sold or rented. These energy performance certificates contain information on the energetic condition of the building in question as well as data for comparison. In Germany, so far, there are two kinds of certificates available: consumption oriented (based on the average consumption of the last months) (§19) and demand oriented (based on calculation regarding the construction of the building) (§18).

The last policy instrument to be mentioned is the funding scheme of the Reconstruction Loan Corporation (*Kreditanstalt für Wiederaufbau* [KfW]). The KfW is a public-law institution (§1 I) which partly works like a "normal" credit institute and partly by order of the government (§2) (KfW-Gesetz [Law of the KfW]). Because of its public-law status it has a higher rating than other institutes and additional subsidies from the government budget make it possible for the KfW to offer credits with a low interest rate and long duration. In the construction sector, the KfW offers several financial support programmes for those interested in building or renovating energy-efficiently. Its most important funding schemes are: "Energy efficient construction" (*Energieeffizient Bauen*[3]) and "Energy efficient rehabilitation" (*Energieeffizient Sanieren*[4]).

Table 1: Other instruments relevant for the context of the EnEV

	Policy type	**Description**
Heating cost ordinance (*Heizkostenverordnung – HeizkostenV*)	Command and control	Regulates the amount of heating costs which has to be paid by own consumption – in general 50-70%, 70% for old buildings.
Condominium Act (*Wohungseigentums-gesetz - WEG*)	Procedural Instrument	Regulates, e.g. how decisions at owners' meetings have to be met. Has been simplified, so that decisions for energetic renovation can be met with 2/3 majority instead of unanimously.
On-Site-Advice (*Vor-Ort-Beratung*)	Funding scheme	Funding scheme of the KfW which supports owners financially to use On-Site-Advice.

3 http://www.kfw-foerderbank.de/EN_Home/Programmes_for_residential_buildings/Energy-Efficient_Construction.jsp

4 http://www.kfw-foerderbank.de/EN_Home/Programmes_for_residential_buildings/Energy-Efficient_Rehabilitation.jsp

Energy taxation Act (*Energiesteuergesetz - EnStG*)	Economic Instrument	During the ecologic tax reform the prize for energy has been increased by taxes. However, heating oil got a lower rate for social reasons.

Author's own

2 Intervention Logic

2.1 The goals of the EnEV

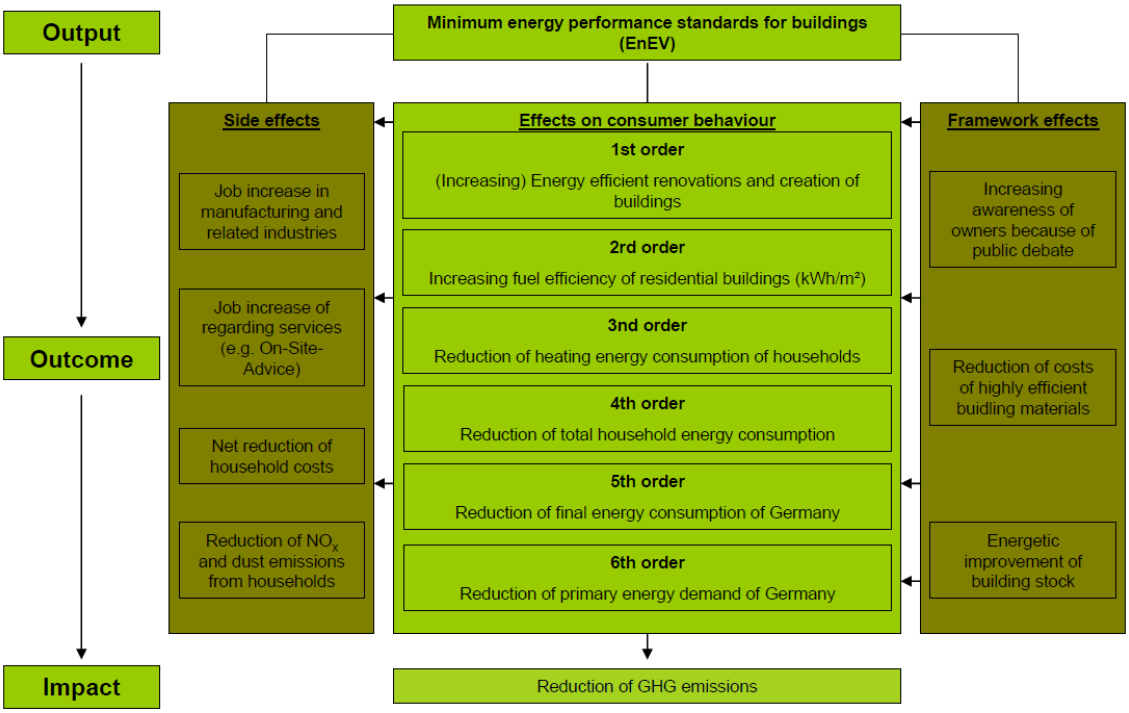
The overall goal of the German government is to reduce GHG emissions. Germany has ratified the Kyoto Protocol and the associated EU burden sharing agreement which means that the Federal Republic has to reduce its GHG emissions by 21% until 2012 (baseline 1990; EU-Effort-Sharing Agreement 2009: Annex II). The national government plans to reach 40% emissions reductions until 2020 (BMU 2007: 1). For the whole sector traffic/household/trade and services, the official goal is to cap emissions at 334 Million tons for 2008-2012 (BMU 2006: 19).

In order to reduce these GHG emissions within different sectors, the target of raising energy efficiency by 3% a year has been set in 2008 (BMU 2008: 18). Again, this target has been translated into targets for different sectors. When looking at the housing sector and especially at heating, the aim is to increase the rate of energetic renovations up to 3% a year. This concrete goal excludes newly built buildings, because the potential for energy efficiency savings is higher within the existing building stock. In Germany, around 64% of the building stock has been created between 1948 and 1990 – these buildings belong to the energetically most inefficient category (Destatis 2008: 216). Additionally, for example, around 50% of single family houses built during this phase have never been renovated to improve their energy performance (DEKRA 2008: 24-28). Per year, new buildings make up only a small ratio of the total building stock (e.g. 0.63% in 2006; 0,53% in 2007; own calculation based on data from: Destatis 2009: 281) and, compared to average buildings, these are rather energy-efficient.

Energy efficiency targets tend to aim at reducing the overall energy consumption which is why the EnEV intends to reduce energy consumption for heating. About 75% of the energy demand of households in Germany goes to heating purposes producing 105 million tCO_2e (Friedrich et al. 2007: 17; UBA 2010). At an individual level, the aim of the EnEV is to encourage building owners to renovate their buildings energy-efficiently or to build energy-efficient buildings right from the start. From an overall perspective, this should improve the average energy performance of the building stock in Germany over time. With regular revisions of the energy performance standards, as happened in 2004, 2007 and 2009, this improvement process is continued and the energetic performance of the building stock should steadily get better. Thus, not the heat requirement, but the heating energy demand to generate that heat is reduced.

Summing up, it can be stated, that the energy performance standards within the EnEV aim at increasing the rate of energetic renovations. The more energetic renovations will be implemented due to the EnEV, the less energy is likely to be consumed for heating. And the less heating energy is consumed, the less GHG emissions will be generated (Figure 1).

Figure 1: Policy Pathway of minimum energy performance standards for buildings



Author's own

2.2 The functioning of the EnEV

The energy performance standards for buildings are an example of a hierarchical command and control instrument. The main idea is to set standards for different parts of buildings which are relevant for all newly constructed buildings and for all renovations of buildings in need for heating or cooling. Whenever someone constructs a new building it will have to stick to these standards. This holds for building renovations as well: whenever someone renovates a building starting from a certain ratio (at least 10% of the regarding part of the building or building element has to be renovated, EnEV 2009 §9 III), it has to meet the standards as set in the EnEV – either for the building element or for the whole building (as compared to the EnEV reference building[5]). The requirements cannot be stated here, but as mentioned before the standards have been increased by 30% in 2009 and shall be raised by the same amount in 2012. In the opinion of several experts this is still not what would be technically and cost-efficiently feasible[6]. Nonetheless sticking to the standards would mean a substantial improvement of average buildings when renovated.

[5] The EnEV reference building is a building similar to the one for which renovation is planned and meets all standards set in the directive.

[6] EUPOPP Project Interview

The “control part” of the ordinance is built by rules stating that any noncompliance against the minimum energy performance standards is seen as misdemeanour. Consistent with the EnEG, misdemeanour can be penalised with fees up to 50.000 Euro, depending on the infringement (EnEG 2009: §5 II and §8).

To sum up, the intervention logic can be formulated as following: **Whenever a building becomes (constructed or) renovated it is supposed to stick to the standards set in the EnEV. If a building does not meet the standards, a fine has to be paid. This leads to increasing rates of energetic renovations.**

Another possible effect may be the increase of the energy performance of the installed building materials (thicker insulation materials etc.), because of the revisions of the EnEV and the increase of minimum standards. Although data for the validation of the installed materials energy efficiency improvement exist (Friedrich et al. 2007: 46-47), this effect cannot be justified by the EnEV so far, as the revision of standards has only been in 2009. Most probably it stems from technological progress, which is why it is not integrated into the intervention logic. The effect of this change could only be researched in the near future.

However, a major drawback of the intervention logic is the almost complete lack of control on compliance with the standards of the EnEV. Except for some cases, building owners in Germany do not need a permit to renovate their buildings complicating control. Nevertheless, one instrument of control has been integrated into the EnEV in 2009: the private confirmation on compliance with the EnEV which has to be issued by building companies and respective services (EnEV 2009: §26a). Still, these confirmations are (and not in every case) only checked, if the owner makes use of the KfW funding schemes, because the KfW wants to make sure that they only spend money for measures with an energy saving effect. Notwithstanding, a general explicit control mechanism by any public authority does not exist. With diffuse addressees and no structured control mechanism, compliance to a high degree cannot be expected. The EnEV also does not affect owners who are unwilling to renovate their buildings at all - and 25% of people in polls answer that they never would renovate their building, irrespective of the cost-effectiveness (Friedrich et al. 2007: 36).

Instead of control mechanisms, there are several activities which can be mentioned as implementing measures, even though they are not explicitly part of the EnEV. There have been some communication and advertisement events (e.g. the *Rote Mützen Tour*, BMVBS 2009) and with the German Energy Agency (*Deutsche Energie Agentur*, Dena [7]) an institution has been created to support interested persons with information and advice. However, these activities can only play a subordinate role. The most important supporting measures are within the above mentioned policy context (see chapter 1.2.2.). Energy performance certificates, for instance, help to create awareness for the energetic condition of buildings and include EnEV reference standards and recommendations to raise awareness for the ordinance. Though, this can

[7] www.dena.de

only work, if a building should be rented or sold, only in these cases a certificate is necessary and there is no automatism to induce renovations because it is still peoples' choice to renovate. Probably the most important context factor which should help to implement the energy performance standards is the KfW funding. Within the KfW programmes, compliance to the EnEV is obligatory and they even go beyond the EnEV: the higher the achieved efficiency level, the higher the possible funding and the lower the interest rates. There have been financial contributions from public funds (which are used to lower interest rates) for these programmes: 1.4 billion € in 2008; in 2009 public payments were extended due to economic stimulus packages to 2.8 billion € for several KfW programmes including those relevant, which seem to have received 2.2 billion €; for 2010, 1.1 billion € are planned to be spent[8] (KfW 2009a; KfW 2009b). If KfW funding schemes are taken as mere supporting measures for the EnEV, the intervention logic could be extended: **With subsidies, low interest rates and long durations, the KfW funding schemes lower investment costs and therefore attract a wide range of owners. This also increases the rate of energetic renovations, because whenever an owner makes use of this incentive, he has to stick at least to the EnEV standards.**

[8] http://www.enbausa.de/daemmung-fassade/aktuelles/artikel/verbaende-fordern-schnelle-freigabe-der-kfw-mittel-863.html

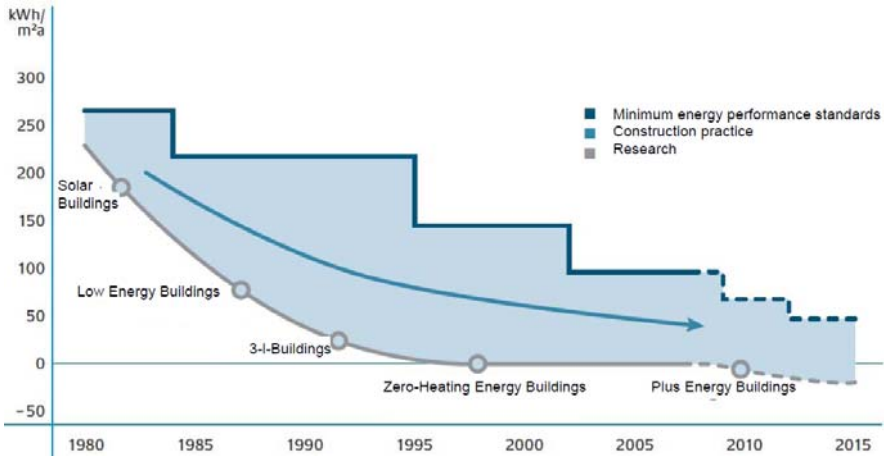
3 Effects & effectiveness

3.1 Outcomes

As indicated in Figure 1, the first consequence of an effective EnEV would be a change in the renovating and constructing behaviour of people – they should not only build or renovate a building, but do this in an energy efficient way, as required by the EnEV. An increase of total renovations could only be a side-effect of KfW funding schemes which might also stipulate people to renovate due to lower investment costs.

As Figure 2 shows, the energetic condition of newly built buildings has improved over time. However, as the curve for constructing practice is always on the left of the curve for building standards on the timeline, this shows that improving constructing practice cannot be an effect of the EnEV. It seems more probable that the building standards are following practice, which in this case would serve as a BAT benchmark. Additionally, the potential influence of newly built residential units on the heating energy consumption is comparatively low, because they regularly make up below 1% of the building stock (0.63% in 2006; 0.53% in 2007). This means that the crucial area is the existing building stock.

Figure 2: Development of minimum energy performance standards relative to the construction practice



Friedrich et al. 2007: 52, translated

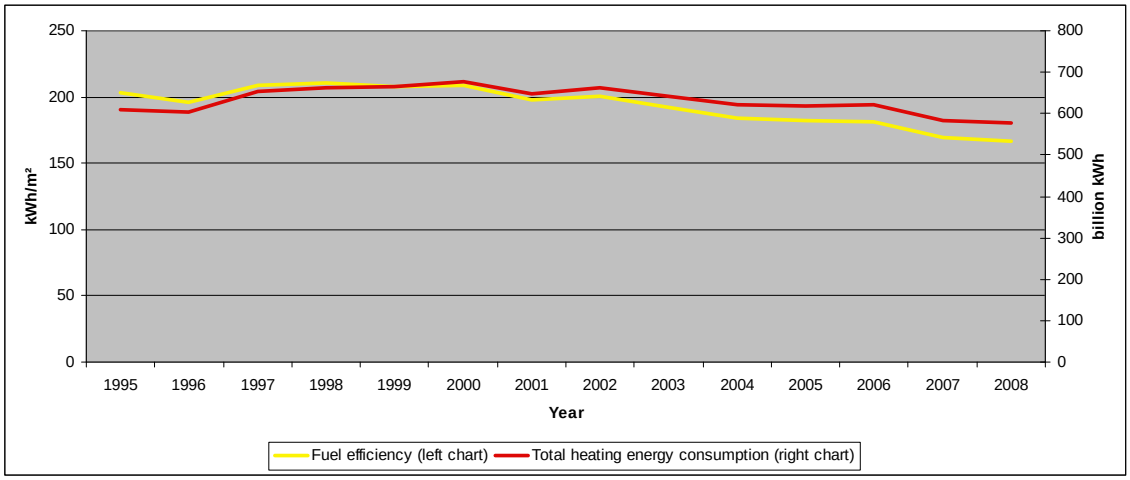
Because of this, **Outcome 1** is the rate of energetic renovations. Different numbers for the rate of energetic building renovations[9] in Germany can be found in the lit-

[9] Please note that this is a statistical number summing up all partly energetic renovations to total energetic renovations (defined as energetic renovations of at least a certain amount of components of a building). So, this does not mean that 0.8% of the building stock has actually been renovated, but all renovations together have an effect as if 0.8% of the building stock would have been renovated.

erature: the highest numbers assume that those renovations increased from 1.6% in 1994 to 2.2% in 2006 (Friedrich et al. 2007: 44). But there are also much lower figures which indicate that the rate of energetic renovations still is only 0.8% (Jochem 2008: 39). The interviews showed that these differences come from uncertainties and problems when asking people about (energetic) renovations conducted in the past. Actually, the numbers can only estimate the amount of energetic renovations. However, all the interviewees agreed that numbers of around 3% might be correct for the total amount of renovations, but are much too high for energetic renovations. Due to the interviews the rate of energetic renovations could be estimated somewhere between 1 – 1.5%. Comparing these numbers also shows that about 50% of renovations are not conducted like it would be required by the EnEV. And in any case the goal of 3% energetic renovations a year has not been reached yet.

Nonetheless it should be expected that an effect of this first order outcome (energetic renovations) would be an increase in **Outcome 2**, the fuel efficiency of households (used kWh/m² for heating). As the growth of total living space in Germany is very small (Annex 1), higher fuel efficiency (caused by energetic renovations) should also lead to reduced total heating energy consumption in households **(Outcome 3)**. The data from Figure 3 confirm this expectation.

Figure 3: Heating data for Households in Germany adjusted to temperature and stock effects



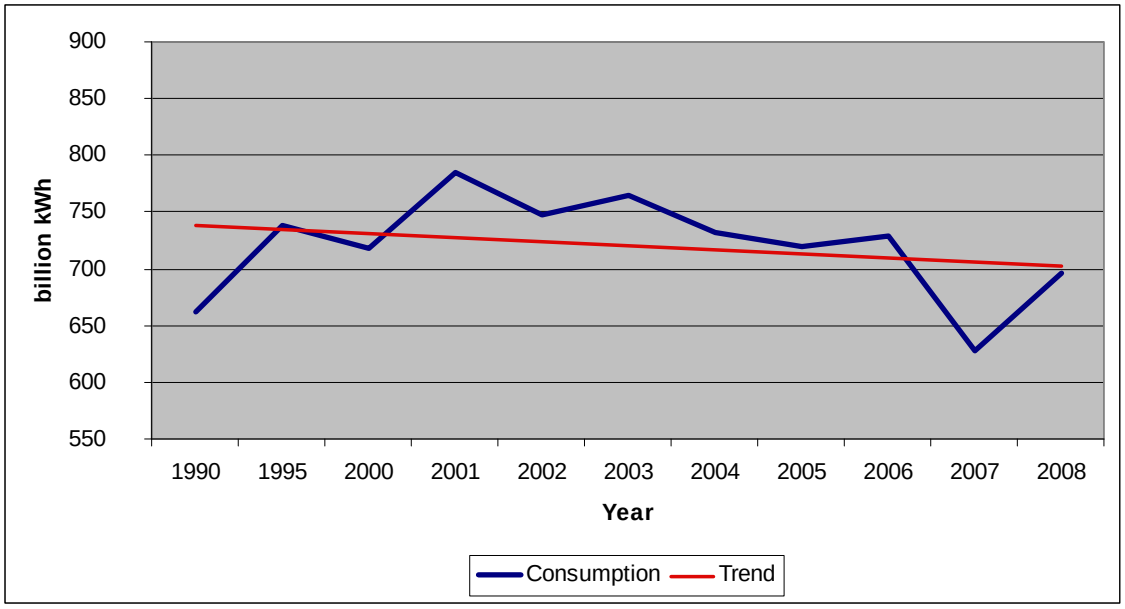
Author's own, data for fuel efficiency from AGEB 2010 : 5.2; heating energy consumption calculated with data from fuel efficiency and total living space in Germany (Destatis 2009: 281).

As can be seen, from the early 2000s on, the tendency is towards higher fuel efficiency and less heating energy consumption: The fuel efficiency has been falling since 2000 by about 50kWh/m², from around 209 kWh/m² to 167 kWh/m² in 2008. Connected to this efficiency increase, the total heating energy consumption (adjusted to temperature effects) has also been falling by about 100 billion, from around 678 billion kWh to around 578 billion kWh (2008). Assuming that an average energetic renovation reduces the energy demand by around 35% and 1.5% of the building stock is

renovated per year, from 2005 – 2007 9.6 billion kWh should have been saved due to these renovations (calculated with average values for living space and energy efficiency for the years 2005 - 2007). Compared to the data used in Figure 3 the actual saving has been about 34 billion kWh. This shows that other measures than only energetic renovations have also led to energy savings related to heating. However, energetic renovations have and will contribute to energy savings and there is great potential to increase this effect.

The next level of outcome **(Outcome 4)** would be a change in total household energy consumption. The less heating energy is used, the less energy should households use in total. And this can be found in the data, too (see Figure 4): until 2001, the energy consumption increased, but from 2001 onwards it has been decreasing continuously. Moreover, when looking at the detailed numbers, it can be seen, that heating oil and gas together are responsible for the whole reduction: The consumption of oil and gas went down from 2001 – 2008 by around 108 billion kWh while the other types of energy in sum increased by around 20 billion kWh, especially electricity and district heating (AGEB 2009). This means that the reduction of heating energy is responsible for the reduction of the overall energy consumption in households. The breach in 2007 is related to temperature effects. This can be seen when comparing temperature and non temperature adjusted data of heating energy used in households. Instead of the more linear development of Figure 3 the data for heating energy not adjusted for temperature show the same break (Annex 2).

Figure 4: Overall final energy consumption in German households

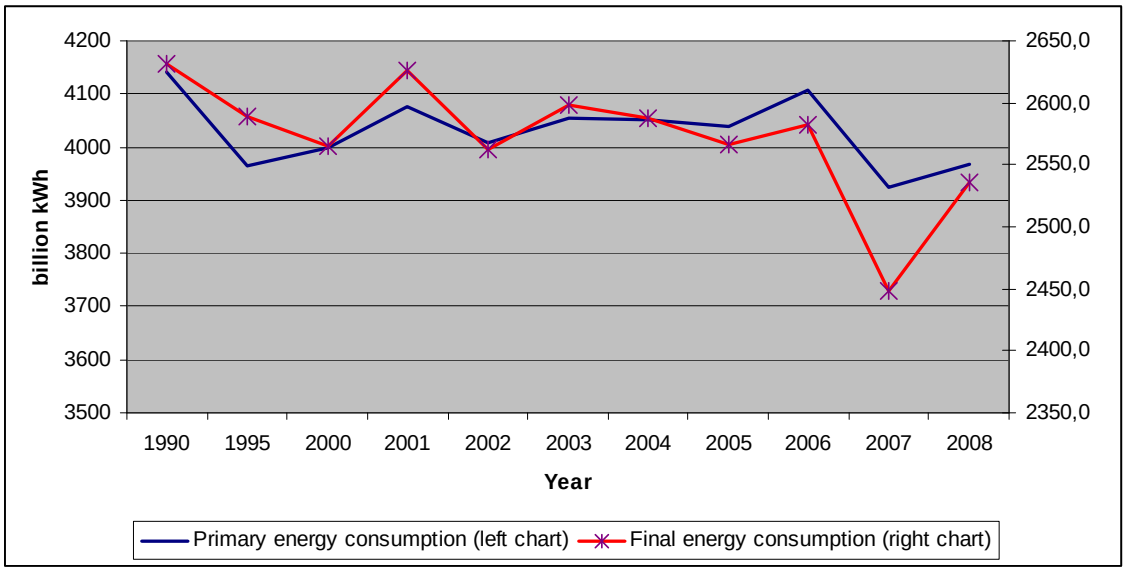


Author's own, data from: AGEB 2009

The results of reductions in the final energy consumption of households should be reductions in the overall final **(Outcome 5)** and primary **(Outcome 6)** energy consumption (and therefore also production) in Germany. As Figure 5 shows, this assump-

tion is correct. The final energy consumption in Germany has been sinking since 2001 by around 90 billion kWh until 2008 – which fits the above mentioned data (Outcome 4) quite well, regarding the timing as well as the amount of changes in kWh. And again, the large reduction and increase between 2006 and 2008 is visible, which indicates that the effect from changes in heating energy usage is quite impressive.

Figure 5: Overall primary and final energy consumption in Germany



Author's own, Data from: AGEB 2009

3.2 Impacts

With regard to the impacts, the most important effect of reducing heating energy consumption in households should be a reduction of GHG-emissions from household combustion plants which should then lead to reductions in the total GHG-emissions for Germany. As can be seen in Annex 3 both assumptions are correct. Another source of saving emissions from household combustion plants is the change of heating systems to renewable energy systems. However, the curve for GHG-emissions from household combustion plants is very similar to the heating energy consumption curves (see strong decline between 2006 and 2008), which means that reducing heating energy demand is the most important driver for the behaviour of these data. At the national level, household heating is only one of several factors influencing GHG-emissions. Nonetheless its share in the total emissions should be considered.

Not only GHG, but all emissions of relevant pollutants can be expected to decrease, if households heat less. Besides GHGs The most important of these pollutants from heating is NO_x. Annex 4 shows that NO_x emissions from German households as well as the total have constantly been declining since 1990. In comparison, though, the curves of household NO_x emissions and of household heating energy consumption

took different developments until 2002 (Annex 5). Not until 2002 the curves converged in their development. The reason might be that other factors influencing NO_x emissions lost their importance and, therefore, by now changes in heating energy consumption more or less directly reflect changes in NO_x emissions. Possible intervening factors which are now less important are increasing standards for heating systems and filter technologies.

Another relevant type of emissions is particulate matter. The less is heated the less particulate matter should be emitted from households. As Annex 6 shows, this is indeed the case. However, as there is a trend to more heating with renewable energies this relation could be weakened in the future: if people more and more use wood for heating (pellet heating), emissions of particulate matter could increase even if less heating energy is used.

Apart from environmental impacts, there are also social and economic effects of reducing heating energy consumption. One basic assumption would be that a reduction of energy consumption, irrespective of the particular field, should lead to reduced additional costs for households. Especially reductions of heating energy should have an effect, because dwelling, energy and dwelling upkeep make up around one third of total consumption expenditures (Destatis 2008: 149). However, while costs for heating steadily increased over the last years (Annex 7), the cost saving effect got reduced. In fact, expenditures for heating more than doubled as costs per m² are around twice as high as in 1991 (Annex 8). Nonetheless, the net effect of reducing heating energy is positive anyway: if heating energy would not have been reduced as it has been the case, the cost increase would have been even more dramatic. The same goes for societal costs. Assuming that energetic renovations are conducted in most cases when they are cost effective, this would mean that the net effect is positive: investing in energetic renovations costs less than paying more of increasing heating energy costs over years. Additionally, energetic renovations safeguard (or perhaps even create) jobs in the field of construction as data for the KfW programmes indicate: for 2009, according to the KfW, measures subsidized by their programmes protected 270,000 jobs (KfW 2009).

3.3 Summary of Effects

After looking at intended (e.g. heating energy reduction, reduction of GHG emissions) and unintended or side effects (e.g. reduction of NO_x emissions, creation of jobs, net reduction of household costs), outcomes and impacts, it seems that the EnEV has had effects on the consumption of heating energy as well as on the total household and final energy consumption in Germany. The timing and size of heating, total household and total final energy consumption changes indicate that these indicators could be closely related.

As calculated above, energetic renovations seem to contribute to these energy reductions. However, there have to be other factors which also lead to a reduction of heating energy. When calculated with an estimated amount of energetic renovations

(1.5%) and an average saving effect (35% less energy consumption for heating), the effect of saving 9.6 billion kWh of heating energy does not correspond to the observed reduction. One possible factor could for example be behavioural change, due to increasing oil and gas prices. Some interviewees even assumed that the EnEV had an effect on public awareness to heating behaviour, mainly because of the energy performance certificates, which could have led to a more sensitive heating behaviour. Another potential factor is the increasing mean annual temperature over the last years caused by climate change (see Annex 9). An increase of mean annual temperatures corresponds to a reduction of heating days and in this manner reduces heating energy demand.

To sum up, as the data indicate there is an effect of the minimum energy performance standards. However, there are not as much energetic renovations as have been aimed for and the observed heating energy reductions caused by energetic renovations are one third at most. Other influencing variables play an important role. Too, according to the data, the effect of the EnEV and related instruments is too small to fully use the great potential of the examined area of household heating energy consumption. Households still use more than 500 billion kWh energy for heating and therefore are producing more than 100 million tons of GHG emissions.

4 Discussion

The look at consumption and emission data in the previous chapter unveils the need for reducing heating energy demand: around a quarter of the final energy consumption in Germany is related to heating in households. Most studies assume energetic renovations to be cost effective at least to a certain extent (e.g. McKinsey&Company 2007: 38). This is closely connected to the high expectations of the residual life expectancy of buildings in Germany, i.e. there is much time for energetic renovations to be cost-effective (DEKRA 2008: 29; Heckler et al. 2003: 3). It should thus be a policy goal to reduce this energy demand as one of several alternatives to reach the IEKP targets (BMU 2007) which intend to increase energy efficiency, and the Kyoto targets to reduce GHG-emissions.

As the analysis also shows, there are two questions left which have to be answered in the analytical part of this paper: Why has the effect not been larger? And do the observed effects indeed originate from energy performance standards, still when looking at it in depth?

4.1 Incomplete intervention logic

As mentioned above, the amount and the timing of energy reductions indicate that there are indications for an effect of the EnEV. As energy performance certificates are rather new and most interviewees agreed that they do not yet play a key role in renting buildings[10], certificates can be excluded as intervening variables, apart from a possible effect of raising the public debate. As changes in the policy context have only been small, the effect can from a pure policy perspective only stem from minimum energy performance standards together with KfW funding[11] - if it is caused by policy instruments altogether.

That the effect is not as large as aimed for can be explained by a closer look at the intervention logic. As stated in chapter two, the basic idea is that building owners have to abide by the standards within the EnEV, when renovating a building to a certain amount. There is no pressure on people who refuse doing anything - with little exemptions. For example, the 25% of survey respondents who answer to be unwilling to renovate irrespective of the circumstances (Friedrich et al. 2007: 36), are not addressed and thus limit the maximum effect.

[10] EUPOPP Project Interviews

[11] In this paper KfW funding is treated, as mentioned above, as part of the policy context of the EnEV – this means the KfW funding supports the implementation of the standards. However, this definition could also be questioned: the KfW funding uses standards which are based on the EnEV but exceed its requirements by far. And it is questionable, whether the KfW funding schemes would not have the same effect without the basis of the EnEV. On the other hand public financial support by the government for energetic renovation programmes would tend to nought were it not for the basis policy EnEV.

Additionally, an energetic renovation rate of 3%[12] would require that almost all the people who renovate have to satisfy the standards, which could not be verified by most of the interviewees[13]; and which is not what the comparison of estimated (energetic) renovation rates shows. The lack of exact data explains this mixture of opinions. Except for the statement of the company conducting the renovation (*Unternehmererklärung*, EnEV §26a) which is itself controlled only seldom, there is no a control mechanism able to produce useful data. Until now it is not possible to judge, whether all renovations meet the standards, but this is most likely not the case. This complicates the identification of possible effects as well as an overall statement about the effect of the EnEV. Despite the fact that the intervention logic is consistent and understandable it is incomplete: the control part of the intervention logic is missing. This has also been reflected by the results of the Focus Groups conducted for EUPOPP: many don't even know the EnEV and its regulations, and the one who do know the EnEV told that they don't have the feeling that it is important to fit to the standards. Not only that they never heard about any sanctioning due to failures to fulfil the EnEV, but at least one of the participants told us that it is easy to find an expert who certifies that it is not possible to fit to the standards due to technical reasons. This means that the lack of control results in people who don't know and those who don't care about the regulation.[14]

The reason for the lack of such probably crucial part of the intervention logic is may be such: the EnEV is an ordinance which can only be adopted by the government in the shape of the responsible ministries. In the case of the EnEV, these are the Ministry of the Environment (*BMU*), the Ministry of Economics (*BMWi*) and the Ministry of Traffic, construction and urban development (*BMVBS*). The responsible committee has a solely advisory function , which is why the government is not obliged to hear or consult it; this is also, but in general true for special interest associations[15]. And, as one interviewee notes, there seem to be only very few experts in the ministerial body on the topic of buildings policy. This might also be a reason why other interviewees claimed that their respective institution was able to influence the decision making process in some points, due to their own expert knowledge. However, according to statements by interviewees, the special interest associations gave no common picture: opinions even within the same branch differed considerably.

But most importantly, the fact that the above mentioned ministries were occupied by different parties (BMU: SPD; BMWi: CSU; BMVBS: SPD) resulted in different plans and targets for the EnEV. Finally, the decision was dominated by the intention not to influence the rights of people massively by increasing standards for existing buildings to an extraordinary level or by effectively controlling implementation. One

[12] Stieß et al. (2010: 66) even assume a rate of 7-8% of people who do anything at walls or heating systems per year

[13] EUPOPP Project Interviews

[14] EUPOPP Project Focus Group Housing

[15] Nonetheless, some special interest associations and the regarding committee have been heard for the EnEV 2009, because the EnEG was also going to be revised. For a law as the EnEG, special interest associations have the right to be heard.

hampering factor for the creation of effective policy instruments and control mechanisms would therefore be a competence overlap between different ministries with different opinions. Moreover vote catching is one major point in this case.[16]

4.2 Specific needs and problems

Another issue when talking about consumption is that effective policies have to take into account the everyday needs and practices of consumers. In this specific case, this appears not to be necessary, however, because a (energetic) renovation, which may cost thousands of Euros, e.g. building insulation, is not a day to day event. Formulating the meaning of "meeting day to day needs and practices" in a slightly other way reveals its importance for this discussion: meeting everyday needs and practices is taking into account specific needs of consumers when using or buying a certain product. In most cases of sustainable consumption these specific needs are day to day habits. If sustainable products do not fit day to day needs and practices, they will not be useful for consumers, because using such products would imply changing practices. In this sense, policies in the field of energy efficiency in the building sector and especially in the case of energetic renovations do not have to fit the day to day needs and practices of consumers. Nevertheless, they have to fit specific problems and needs arousing of them. In this context, three well-known specific problems for building owners when thinking about energetic renovations come to mind:

(1) Knowledge gap

(2) High start up costs

(3) Investor-consumer (or principal-agent) dilemma

None of the three specific problems is currently addressed by the existing policy instruments. When looking at these problems in detail, it becomes clear that this policy gap hampers the effectiveness of the instrument and can create doubts, if the observed effects can be traced back to the EnEV and its minimum energy performance standards for buildings.

4.2.1 The knowledge gap

The term knowledge gap refers to the fact that most building owners do not even know how much energy they use for heating purposes and even if they do they are unable to quantify potential energy use reductions from energetic renovations. Especially this last point is highly underestimated by a wide range of addressees (Friedrich et al. 2007: 31-34; Stieß et al. 2009: 14; Stieß et al. 2010: 67).

But without knowing about the possibilities, it will probably not occur to people to renovate their building to save energy. The standards within the EnEV have no effect on those people because there is no pressure to renovate. Another scenario: perhaps once structural damages are dealt with and the building necessarily has to be reno-

[16] EUPOPP Project Interview

vated. The regulations of the EnEV prescribe that they now have to satisfy the standards. However, there is no control mechanism – especially when people renovate by themselves, noone can control, if the standards are met. From this perspective the EnEV is just a voluntary instrument.

The policy context incorporates some instruments to increase building owners' awareness of the energy they could save by renovating energetically. One of these was the so called "Rote Mützen Tour" (Red Cap Tour) which advertised for insulating buildings and the German Energy Agency (Dena) has been created for information purposes. However, all the existing programmes and initiatives are based on the initiative by the building owner. The problem of people who do not care about renovating is left out by such programmes. This fact limits the effect of any regulation to the small group of people who behave pro-actively. Hence, a large part of potential addressees cannot be reached with the existing programmes. Several interviewees even stated that in their opinion information and advice is the core problem of the existing attempts to increase energetic renovations – even more than debating existing standards and subsidies for renovations or trying to control and sanction misbehaviour. Some assessments by different consumer associations have already been able to show that people react highly sensitively to images from an infrared camera visualizing heating energy loss[17] – the German proverb 'to heat out of the window' instantly gains a much more realistic character for those people. This example shows the potential that could be activated with information and advice.

Secondly, the perspective of craft industries shows the other side of the coin: there is also an information gap, which is complementary to the consumers' knowledge gap (Levine et al. 2007: 419-420), as especially small and medium sized companies cannot afford and are unable to create expertise for the new regulations immediately. As one interviewee stated, the short timeframes in between revisions of the EnEV in the last years (2004, 2007, and 2009, probably 2012) presented an additional problem. This makes it even harder to keep the knowledge up-to-date for manufacturers[18]. However, manufacturers are often the main experts for potential investors (building owners) (Stieß et al. 2010: 67). This shows that the EnEV will not work, if implementation know-how is unknown.

4.2.2 High start up costs

As different studies show, in many cases energetic renovations are cost efficient (see above), at least when performed at the regular turn of renovating a building (because then the so called anyway-costs can be omitted). Life cycle analysis serves as the basis for this calculation:. Assuming that the insulation will be in place for the next x (e.g. 50) years, during those years the costs saved due to the reduced heating energy consumption will be higher than the initial investment costs for the insulation. To put it another way: "it's cheaper to save one kWh energy than to buy it at the energy

[17] EUPOPP Project Interviews

[18] EUPOPP Project Interview

market" (Behle/Enseling 2006: 3). In general, energetic renovations will amortise within something more than ten years (Heckler et al. 2003: 7). However, many people are not bothered by these facts. Of course, cost efficient measures are most favoured, but very often this is not the most important issue. Even if measures are cost efficient, people are unwilling to tie up their money for a fixed amount of years and if they are in favour, the accepted time span is not very long: 47% of the respondents favour a maximum of five years, 18% maximally eight years and only 3% for as much as twelve years (Friedrich et al. 2007: 36). However, the costs of energetically renovating a building can amount to 10% of the building value (Uihlein/Eder 2009: 3-5). Thus, the key issue is not whether a renovation is cost efficient or not. It is more about the absolute amount people will have to pay, because the more they have to pay, the longer the time will be during which they have to pay back the credit and tie up their money – and many are simply unwilling to fix their money for such a time by obtaining a credit (Stieß et al. 2010: 67).

This issue cannot be called a new problem, as it is already well known for years. However, again there is no existing instrument which really tries to solve the issue. High start up costs could even be a very good reason to take advantage of the lack of control within the EnEV and not to fit to the standards which makes renovations much cheaper. The only instrument which is related to start up costs is the funding provided for by the KfW. Low interest rates and subsidies for renovation measures are a tool to minimize the investment costs of a renovation. But the actual problem is not solved: actually, KfW funding schemes work with long durations intended to facilitate the monthly pay-back amount for people. For those people who do not want such financial obligations for ten to twenty years, these programmes do not serve as incentives. And again, this lack of solving a specific problem and addressing a specific need hampers the effect of the existing instruments, altogether. Most of the people will not renovate, because they would have to take a credit and pay it back for more than, e.g., ten years. The same applies for people owning a building who are at the age of 65 or older: as one interviewee stated, this group of people will just not receive a credit to pay the renovation, if they do not own enough money by themselves[19]. Together, both groups discussed in this subchapter substantially reduce the potential target group of the regulations.

Though, as data from one interview show, there is a relationship between the KfW programmes and the rate of energetic renovations. It seems that every time the KfW lowers its interest rates, a new wave of people beginning to renovate their buildings energetically occurs. This shows that it is incorrect to state that KfW funding does not have any impact on renovation behaviour at all. However, the total set of data (KfW data as well as consumption and renovation data above) shows that only a small share of potential investors are being reached. One argument is that many people do not care much about these financial incentives, because it still means to invest money over several years. Hence, only a small group of (higher earning) people can be attracted

[19] EUPOPP Project Interview

with current programmes. Additionally, the results of the conducted focus group analysis show that many people accumulate measures which have to be conducted at the building in case of KfW funding or they conduct better energetic renovations[20]. This again may means that KfW programmes accelerate and improve but not initiate energetic renovations.

4.2.3 The investor – consumer dilemma

The third specific problem is only relevant for a subgroup of building owners – those who lease their buildings. This group should not be underestimated, though, because those owners make up 58% of the total (Destatis 2008: 216).

For this group, it neither matters if the investment is cost efficient, nor does it matter how high the start up costs are and how long it takes to pay back the credit. Direct positive effects will not be visible for this group of building owners, because while they have to pay for the renovations, the effects of reduced heating energy demand and probably reduced heating energy costs will work to the advantage of the consumer – in this case the tenant of the building (Golove/Eto 1996: 9). The only positive effect for building owners letting their buildings is a possible market effect: buildings of better quality may receive higher prices. However, and in this point all interviewees agreed, the energetic condition of a building is not reflected in real estate prices, yet. The most important factors for the market value of a building are still location and size[21].

And again none of the instruments does effectively address this issue[22]. The energy performance certificate can be seen as an instrument with a potential effect on the market value of buildings. However, this potential effect is not realised and even in the creation phase of the EnEV its occurrence has not been expected. The only effect of the energy performance certificates that was intended from the start was the informational aspect. And, related to the fact mentioned above, that the energetic performance of a building does not influence its market value, the certificate is used only infrequently. Actually, many people are unaware of the fact that they even have the right to demand the certificate.

This problem probably is the most complicated one to solve. If a path is chosen with purely positive incentives, innovative financial instruments have to be designed which can close the gap between the consumer of heating energy (the tenant) and the investor (the person who owns the building). As the acceptance of negative incentives

[20] EUPOPP Project Focus Group Housing

[21] EUPOPP Project Interviews

[22] The possibility of transferring 11% of the modernisation costs to the rent per year (BGB §559 ff.) has not been mentioned yet, but is only a small attempt to tackle the issue which does not change the overall presumption. Additionally, financial sources from public funds are not allowed to be transferred – which is the case for KfW funding.

(e.g. higher property taxes according to the energetic condition of a building) is rather low, which has already been mentioned in relation to the lack of effective control mechanisms, no solution for this issue is in sight in the short run. This also obstructs the effect of the regulations, because renovation in the absence of immediate financial benefit will not be an option for many of the 58% of building owners who lease their buildings.

The analysis of these three problems, not related to everyday needs and practices but to specific needs and practices of consumers, shows that existing instruments reach building owners only to a limited extent. This is one possible explanation for why the observed effect of the minimum energy performance standards in conjunction with the KfW does not correspond with the expectations. Moreover, it is questionable, whether the observed effects have been caused by the EnEV at all. As mentioned above, the average temperatures rose and the heating prices did so, too. Both factors should have had and should still have an effect on the heating energy demand and consumption and the question is how much of the reduction can be attributed to the EnEV if those two are accounted for? Another question is how much of the estimated 1.5% of energetic renovations are actually caused by the EnEV? This is, because people could not only change their heating behaviour with regard to increasing costs, but they could also renovate their buildings for these reasons. Furthermore, some people will always renovate their buildings energetically irrespective of the existence of policy instruments, because they can afford it and they want their building to be equipped with the best available techniques (Stieß et al. 2010: 51). In some cases, owners will not have a choice: if the heating system breaks down and, for example, the boiler has to be exchanged, the result will be an energetic renovation – as similar systems as have been installed at the last renovation are not available anymore. As a matter of fact, only a small part of the 1.5% energetic renovations will have really been caused by the EnEV, even if KfW effects are taken into account (small target group size and limited budget).

4.3 The Framework conditions

An indirect way of reaching a goal is to change the framework conditions. The advantage of this kind of policy influence is that it may not create heavy opposition due to its indirect character – it will be difficult for people to discern changes, because of a certain instrument.

In the context of the energy performance of buildings and regarding standards, the probably most important framework condition is: what building materials are available on the market? A potential effect of minimum energy performance standards for buildings may be that companies will produce more environmentally sound materials and stop producing materials which are incompatible with these standards, because

people have to buy the appropriate materials anyway. Indeed, some interviewees confirm that this development is ongoing[23].

Of course, there might be cases in which this assumption is correct. One interviewee stated an example of windows: today, triple-glazing windows are not much more expensive than double-glazing windows. This may lead to a phase-out of double-glazing windows in the near future, because it will no longer be cost-effective for companies to produce them[24]. However, in general there are some important objections to this argument. It has to be assumed that building materials which do not fit the standards will not vanish completely, because standards are not the same for all kinds of buildings and there are still types of buildings for which it is not mandatory to comply with any standards at all. And there might be other applications for regarding materials than the ones listed in the EnEV. Another, and even more important objection is that the effect outlined above might not lead to higher energetic renovation rates, because the decision of energetically renovating or not is the same as before - and this is more or less a voluntary decision. It has been mentioned above that the renovations which are conducted, steadily use better materials and this could also be an effect of the increased production of better materials. However, even if this could be related to shifting framework conditions, it is not that which generates an effect as large as it has to be to reach the policy goals. The crucial issue in the context of buildings is to get people to energetically renovate their buildings in the first place. In most cases they will choose better materials by themselves, because they are most cost-effective, even if cheaper but less effective materials are available.

Hence, contrary to other assumptions, it cannot be assumed that the framework conditions, which might have been changed a little, could have led to greater rates of energetic renovations or could have accounted much for heating energy reductions.

4.4 The Policy context

The policy context is a very important issue for the EnEV. As the EnEV only sets minimum performance standards which have to be fulfilled when renovating, it is dependent on context instruments to reach the desired effect of increasing the rate of energetic renovations. A common assumption of almost all interviewees has been that the EnEV is merely the core or basis for surrounding regulations[25]. Besides, even if more effective control mechanisms would have been introduced, no government wants or can afford to use command and control alone to create an effect. Additional policy instruments have been described above; the most important are the KfW programmes.

As has already been mentioned, all these context instruments are intended to support the effect of the EnEV and they aim in the same direction. However, the (scale of the) effect of these instruments has to be doubted. A major argument can be found

[23] EUPOPP Project Interview
[24] EUPOPP Project Interview
[25] EUPOPP Project Interviews

in the specific problems mentioned above. Although these problems hampering the effect of the whole package are crucial issues for investors, no instrument really tries to solve them.

Furthermore, there are several problems for individual context instruments themselves. The most important examples seem to be: according to all interviewees the energy performance certificate is still only little used, because the most important characteristic of buildings are location and size; KfW programmes are used quite well (e.g. in 2007 they had to be added and they are bailed out every year (KfW 2009a: 63)), but it has to be examined what net effect KfW programmes have, because it can be assumed that they mainly access people who are financially able and willing to renovate their building with or without KfW support; as stated before, none of the instruments tries to solve the three specific problems in the area of building efficiency. What becomes clear from this short summary is that it is not enough for several instruments or instrument packages to aim in the same direction. They have to be harmonized with each other – that means: in their total they have to solve the specific problems; they have to address different aspects of the consumption process (financial aspects, knowledge etc.); they have to use a mix of policy approaches (command and control, financial incentives, information providing). If these aspects are not completely covered, it happens as has been asserted: the instruments have no or only a small effect and the planned aim will not be reached.

5 Conclusions

After looking at these data, the result is twofold. On the one hand, there have obviously been changes in the Outcome and Impact levels. Starting with the rate of energetic renovations, the energy efficiency of the German building stock has been improving over time. This is also represented in decreasing heating energy and total energy consumption of German households and decreasing final and primary energy usage for Germany. Parallel to the Outcomes the Impacts also developed positively: GHG as well as NO_x-Emissions have been decreasing over time. Similarities in several energy consumption curves (household heating, total household etc.) point to a connection between them, which means that heating energy reduction might be a crucial issue for all the following Outcomes and Impacts. Calculations demonstrated that energetic renovations of buildings cannot be the only relevant factor, but they seem to contribute up to one third of heating energy savings.

On the other hand, the aimed-at goal of considerably increasing energetic renovations has not been reached. Still, the rate of energetic renovations is estimated at around 1-1.5% of the building stock per year – great potential remains unrealised. And - for this paper serving as a policy analysis highly problematic - it is not clear to which extent the analysed instrument (the minimum energy performance standards for buildings in Germany included in the EnEV) caused those 1.5% of energetic renovations. The reasons for these doubts lie within specific problems, which can be compared to everyday needs and practices in other areas of consumption. Building owners are confronted with:

(1) A knowledge gap

(2) High start up costs

(3) The investor-consumer (or principal-agent) dilemma

Existing policy programmes do not offensively try to solve these problems: (1) There are no campaign-like information offers. Most of the information and advice available is based on individual initiative by the interested building owner. People who are not interested in renovating energetically or do not know how much they could save in terms of energy and money, cannot be reached. The energy performance certificate is only relevant for owners who let their buildings on a lease and it is still only used in rare cases. On-site-advice is based on individual initiative, just as all Dena offers are. (2) Investment costs, which can amount to up to 10% of the building value, are a barrier for many owners to renovate their buildings energetically. However, only KfW funding schemes partly try to solve the problem. Costs with KfW funding are less than with regular credit programmes (due to longer durations and lower interest rates or subsidies). However, total costs remain high and many people do not want to take out a loan because this would mean that they bind their money for several years. (3) The problem of building owners who lease their buildings (58% of total building owners) is, that they do not profit from energetic renovations at all. Energy savings remain with the renter and the market value hardly changes because still location and size of an object are the crucial issues. According to the law, owners can transfer parts of the cost to the yearly rent. However, as for KfW programmes, this also produces only a small incentive, because costs remain high.

As there is neither an effective control mechanism which could ensure the implementation of the EnEV against the backdrop of unsolved specific problems (which would anyway mean a very strict instrument of command and control which should have great problems with its acceptance), these new questions on the effectiveness of policies are coming up:

- As estimated, 1.5% of the buildings are renovated energetically every year; how much of those renovations happen because of the EnEV?
- KfW programmes are used quite well. However, how many energetic renovations are originally caused by KfW programmes?
- To what extent did intervening factors (energy prices, rising annual mean temperature etc.) influence the renovation behaviour and thus cause part of the 1.5% of energetic renovations?

As these questions can hardly be answered together with the previously mentioned problems, it has to be assumed that some but not all of the energetic renovations are caused by the EnEV and related policies (e.g. KfW programmes). Regarding the missing control mechanisms and the unsolved specific problems, it has to be expected that only small parts of the 1.5% are actually caused by policy instruments. Probably one of the most important influencing factors is the rising energy price.

Regarding policy recommendations there are several results. At first, it is not enough to have an intervention logic which is consistent. It also has to be implemented stringently and at all stages. In the analysed case, there is a command and control policy and theoretically there are “commands” (minimum energy performance standards) and there are “controls” (possible sanctioning of misbehaviour). However, there is no effective control mechanism covering these necessities. For the EnEV this would mean to implement an effective control mechanism, e.g. via registering energy performance certificates. Within 30-40 years (which means 3-4 certificates) it could be checked if and how renovations have been conducted.

Another important point is, that it is not enough to have a policy package which aims in the same direction. In the analysis it became clear that there are several policies which aim in the same direction: it is a mix of EnEV (performance standards), KfW programmes, EnEV (energy performance certificates), information and advice offers, other regulatory instruments etc. However, the specific problems of building owners could not be solved. The crucial issue is that all policies within a policy package have to be harmonized with each other. Additionally they should not only aim somehow into the same direction but try to address different aspects of the consumption process (financial aspects, knowledge etc.) and to solve relevant problems. The last point also requires that different types of policy instruments are used. For energetic renovations this would mean to conduct informational campaigns which also reach people who do not care about renovating their buildings (energetically) at the moment. Most of the interviewees stated that information is a highly underestimated aspect of policies. Instead of better and more effective control mechanisms most of the interviewees suggested to improve the information offers. Another issue is to create and implement innovative financial incentives (positive and negative) to solve the investor-user-dilemma as well as to lower investment costs. This also means that substantial investments need to be undertaken when seriously trying to achieve an effect.

Nonetheless, the basic aim of the EnEV and related policies is a good one, because the potential of energy and GHG emissions savings is quite large in the building stock. This holds not only for Germany but for entire Europe and even for the rest of the world. Moreover, this is also one more argument for policy makers to seriously try to solve hampering factors and barriers and to use all the reduction potential which exists in this area. With some improvements and stricter implementing measures, the German approach might overcome its problems and it can serve as a reference point for other countries.

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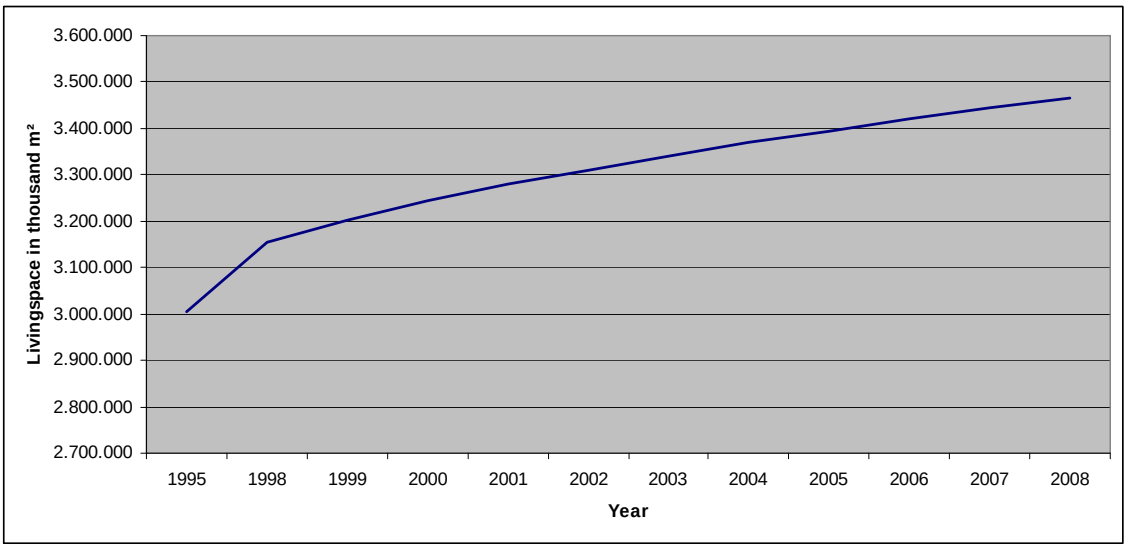
derung des Zugewinnausgleichs- und Vormundschaftsrechts“, of 07. July 2009, BGBl. I, 1696.

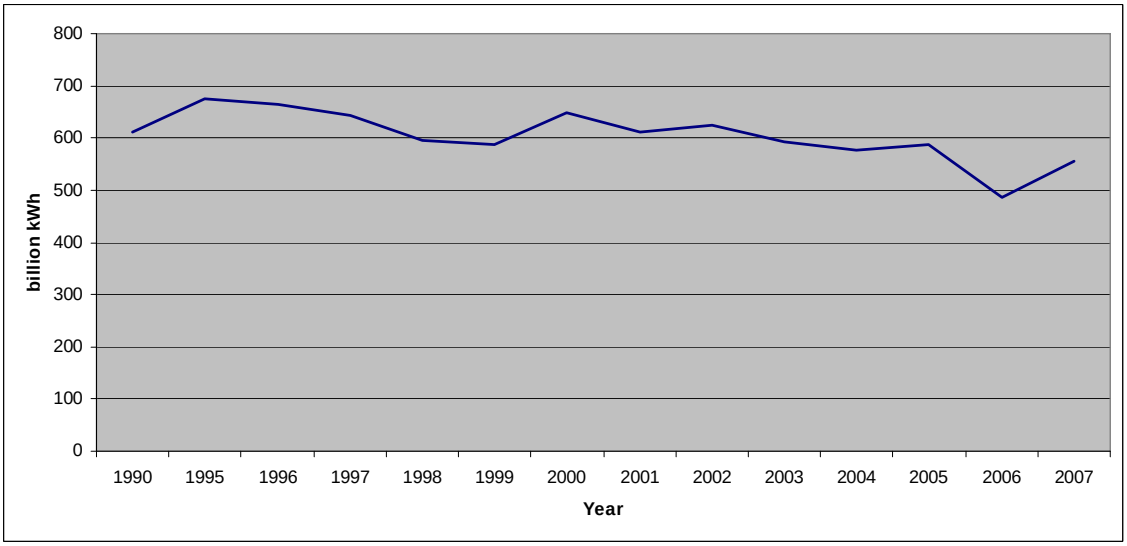
7 Annex

Annex 1: Development of total living space in Germany 1995 – 2007



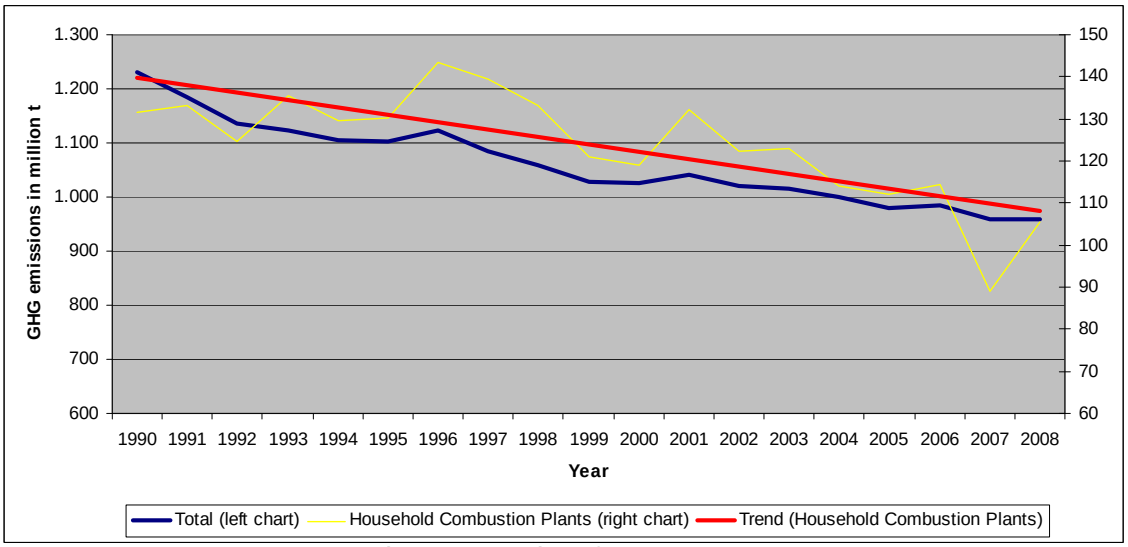
Author's own, data from Destatis 2009: 281

Annex 2: Total household heating energy consumption (not adjusted to temperature and stock effects)



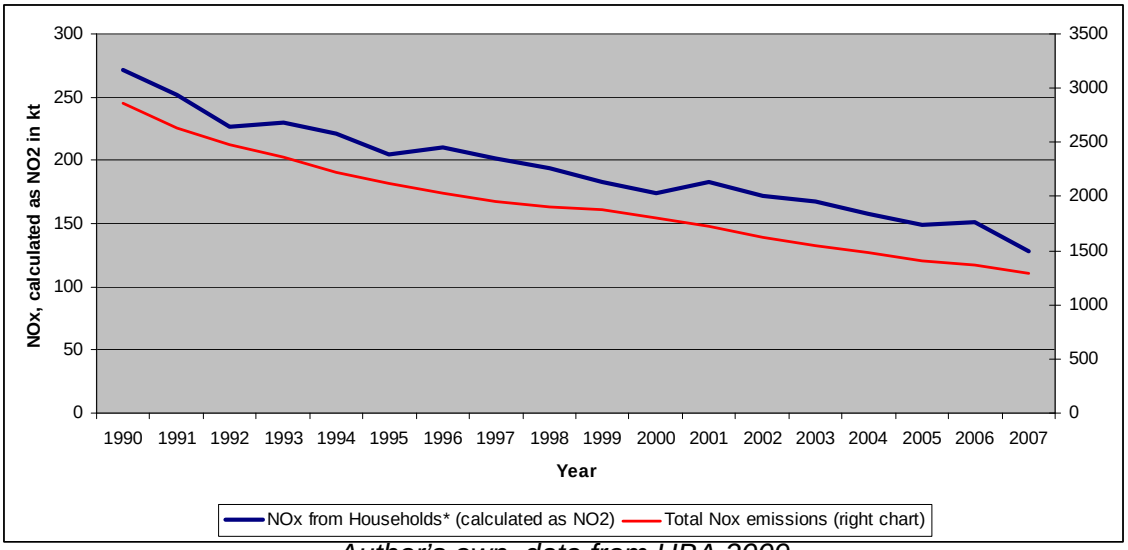
Author's own, data from AGEB 2010 : 5.1

Annex 3: GHG emissions for Germany in equivalents 1990 – 2008



Author's own, data from UBA 2010

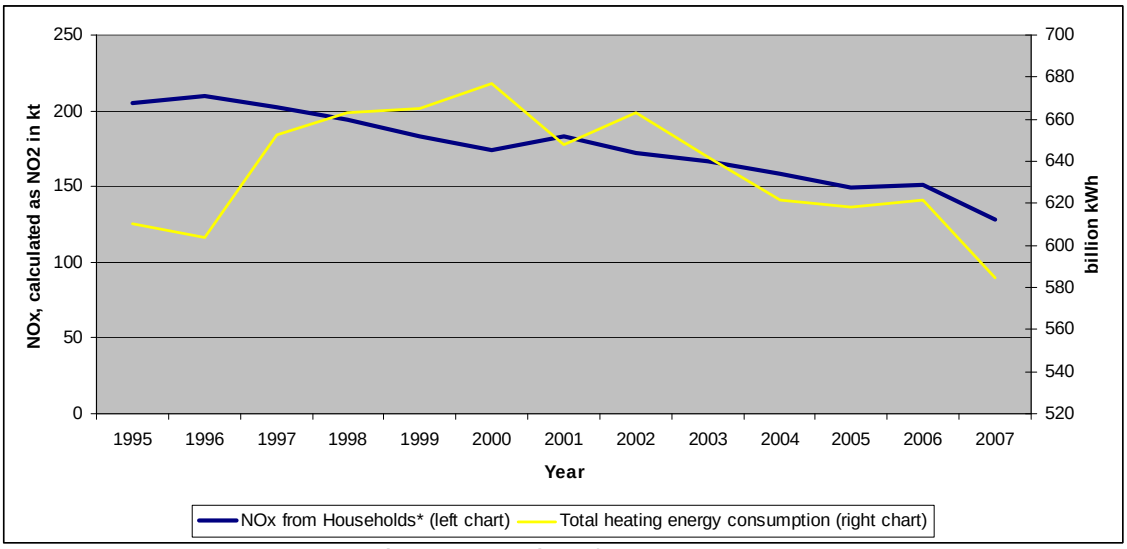
Annex 4: NO_x emissions from households[26] and total in Germany, calculated as NO_2 1990 – 2008



Author's own, data from UBA 2009

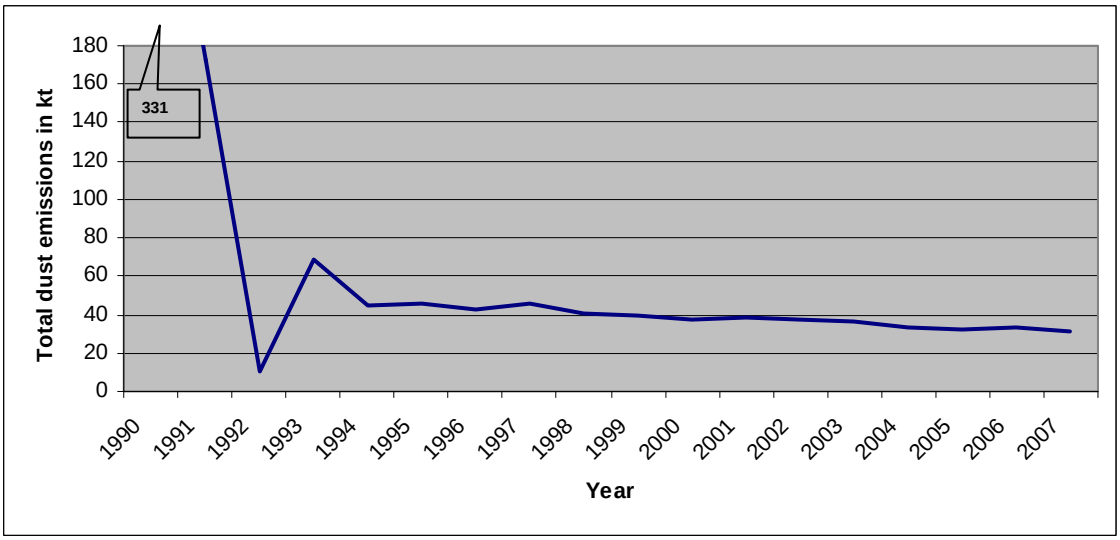
[26] Incl. Military, agricultural and forestry traffic

Annex 5: NO_x emissions from German households in relation to heating energy consumption from households 1995 – 2007



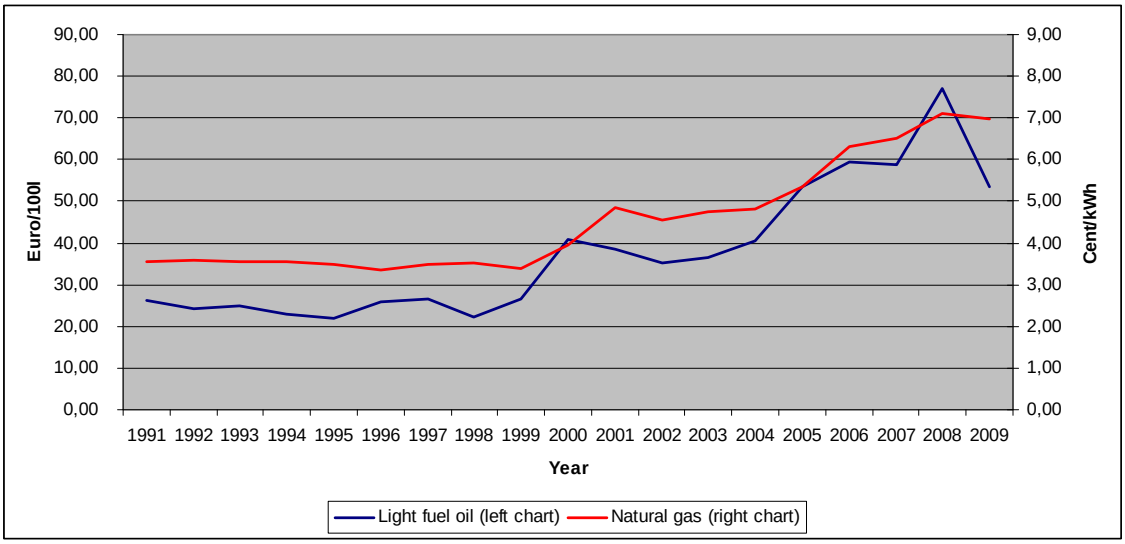
Author's own, data from UBA 2009

Annex 6: Total dust emissions from German households 1990 - 2007



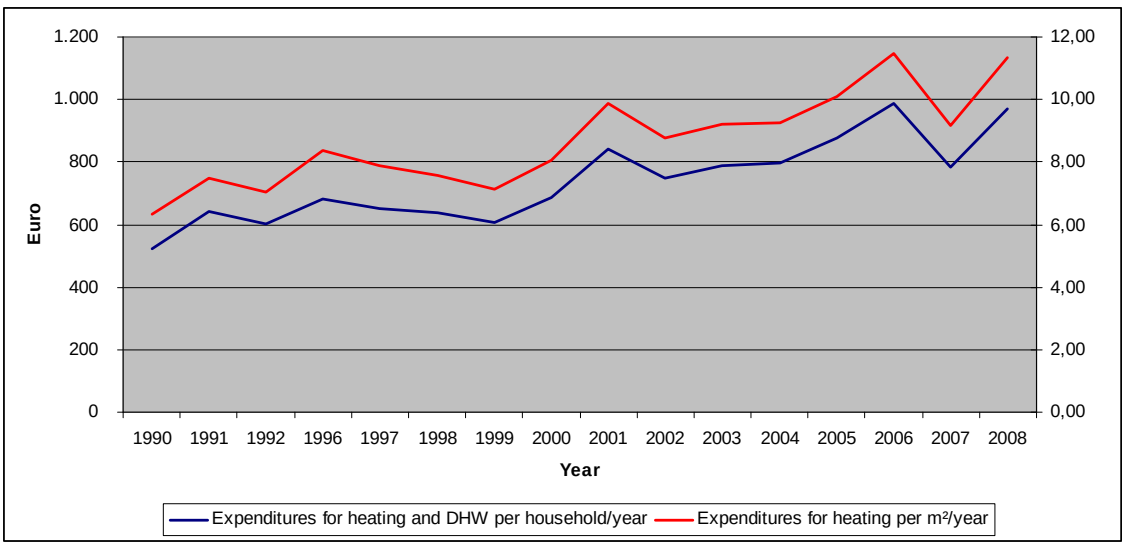
Author's own, data from UBA 2009

Annex 7: Development of light fuel oil and gas prices in Germany 1991 – 2009



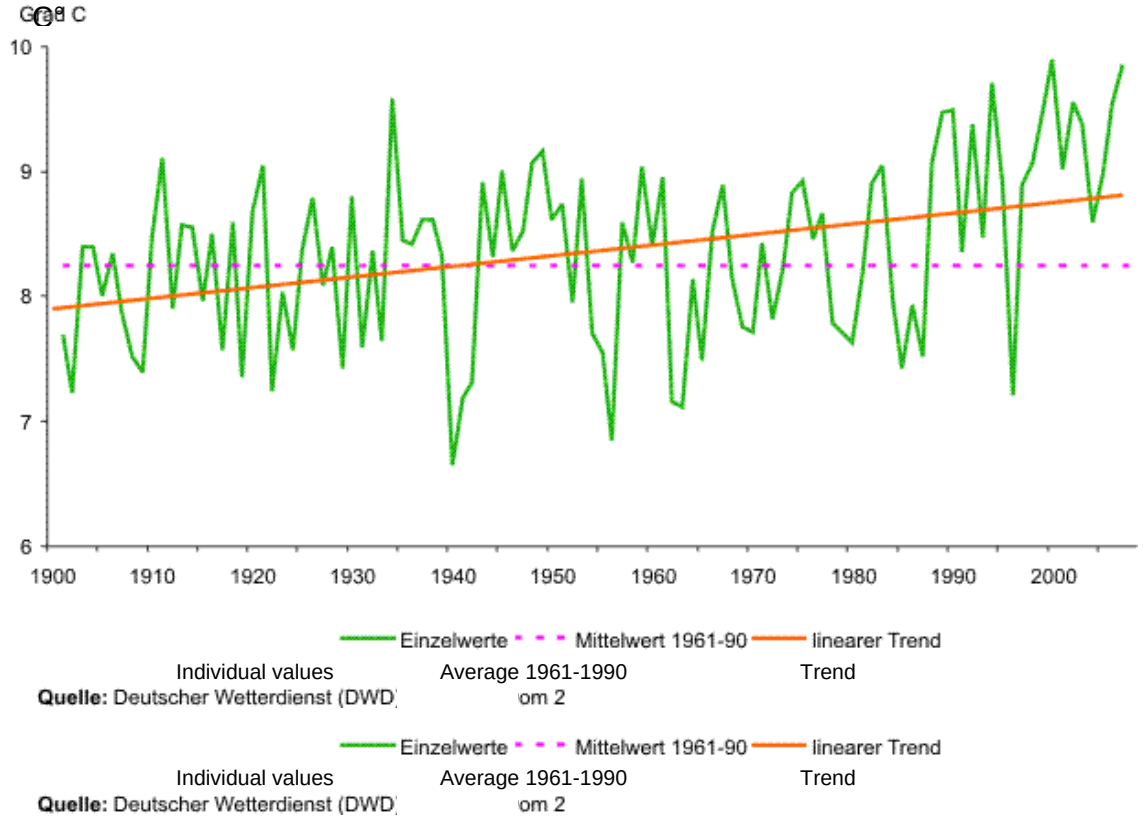
Author's own, data from BMWi 2010

Annex 8: Development of heating expenditures of German households 1990 – 2008



Author's own, data from BMWi 2009

Annex 9: Mean yearly mean daytime temperature for Germany 1901 – 2009



UBA 2009a