

# Obstacles and opportunities for the ramp-up of heat pumps in apartment buildings

## Results of a stakeholder survey

## Contents

<b>Key Messages .....</b>	<b>3</b>
<b>1. Introduction .....</b>	<b>5</b>
<b>2. Approach.....</b>	<b>5</b>
<b>3. Technical feasibility of heat pumps in apartment buildings .....</b>	<b>6</b>
<b>3.1. Role of the energy performance of buildings.....</b>	<b>6</b>
<b>3.2. Heating apartment buildings with heat pumps .....</b>	<b>7</b>
3.2.1. Hybrid solutions .....	9
3.2.2. Monovalent heating.....	10
<b>3.3. Warm water treatment.....</b>	<b>10</b>
<b>4. Monitoring of heat pumps .....</b>	<b>11</b>
<b>5. Integration of heat pumps into the power grid .....</b>	<b>11</b>
<b>6. Economic conditions .....</b>	<b>12</b>
<b>6.1 The CO<sub>2</sub> price .....</b>	<b>13</b>
6.1.1. State funding .....	13
6.1.2. Modernisation allocation .....	15
<b>7. Political/legal framework.....</b>	<b>15</b>
<b>7.1 Act on the Ownership of Apartments and the Permanent Residential Right     (Wohnungseigentumsgesetz).....</b>	<b>16</b>
<b>7.2. The 65 per cent criterion .....</b>	<b>17</b>
<b>8. Consumer acceptance .....</b>	<b>18</b>
<b>9. Decision-making and planning process towards the heat pump .....</b>	<b>19</b>
<b>10. Professionals: planners, craftspeople, energy consultants .....</b>	<b>20</b>
<b>11. Conclusion and outlook.....</b>	<b>22</b>

## Key Messages

- A building envelope with good energy performance is essential for the efficient and affordable use of the heat pump. Nevertheless, a heat pump can also be operated efficiently and economically in an apartment building that has not been completely renovated. Ideally, the building should be renovated to such an extent that monovalent use of the heat pump is possible.
- When planning a heat pump in an apartment building, it is crucial to ensure that the capacity of the heat pump is matched precisely to the heating load of the building. The capacity can either be provided by a single larger heat pump or by several heat pumps with lower capacity interconnected in a cascade.
- There are several technical options available for hot water preparation in apartment buildings. These include instantaneous water heaters and decentralised fresh water stations, whereby the former provide hot water independently of the heat pump. When choosing between these options, consumers do not necessarily opt for the technically most efficient solution; practical issues such as renovation and maintenance costs also play a role.
- The monitoring of heat pumps in apartment buildings is crucial for their efficient operation. However, data protection issues still pose an obstacle to mandatory monitoring.
- So far, the integration of heat pumps into the electricity grid does not pose a threat to the latter's stability. Due to a lack of financial incentives, heat pump-related flexibility schemes are not attractive for consumers yet.
- The ratio of electricity prices to gas prices should continue to change in favour of electricity: A ratio of 2.5:1 would be beneficial to render heat pumps more economically attractive.
- While the CO<sub>2</sub> price has played an insignificant role for most stakeholders in their profitability calculations so far, it will become increasingly important as prices continue to rise in the future.
- Due to their heterogeneous composition, it is difficult for Community of Apartment Owners (CAOs) to finance replacing their heating system. The availability of state subsidies is a fundamental factor in consumers' decision-making regarding the installation of a heat pump. While the modernisation allocation is equally important for some stakeholders, others call for a reform of this instrument.
- The inherently lengthy planning and decision-making processes of CAOs, as well as the dependence of their project implementation on building managers, should be taken into account in the provision of state subsidies, for example by providing constant fixed subsidy pots.
- For many housing companies, the modernisation allocation is central to the economic financing of a heating system change. In order to gain tenants' acceptance for the installation of a heat pump, the allocation should be lowered and reformed so that maintenance and modernisation costs are better separated.
- Legal adjustments are needed in, among other things, the Heating Costs Ordinance (as this is not geared to the use of heat pumps) and the Heat Supply Ordinance (as this requires cost neutrality when switching to a local and district heating network).
- It would be advisable for the heating transition to make the installation of a heat pump a privileged measure under the Act on the Ownership of Apartments and the Permanent Residential Right (Wohnungseigentumsgesetz).
- Due to a lack of information on the part of the federal government, there is still a lot of uncertainty about the 65 per cent renewable energy criterion. The requirement can only be implemented well with the preparation of a heating system replacement plan by the stakeholders.

- In order to ensure the necessary acceptance among consumers, the provision of comprehensive and comprehensible information about energy performance-related renovation measures and heat pump technology is essential.
- The decision-making and planning process for a heating system change is a particular issue for CAOs - primarily due to its lengthiness and the lack of knowledge of the stakeholders involved. Accordingly, information should be bundled and made available comprehensively, and best practices should be communicated more widely.
- Both heat pump installers and energy consultants need their own job description to ensure adequate training that is widely available. In addition, the training and working conditions of craftspeople must be fundamentally reformed, the exchange of knowledge among planners must be furthered, and the government should remove hurdles for energy consultants in practising their profession and in further training.

## 1. Introduction

To achieve a climate-neutral building sector by 2045, greenhouse gas emissions must be significantly reduced through greater energy efficiency and, above all, a switch to heat pumps (operating with natural refrigerants). Given that 22.2 million of the 42.8 million residential units in Germany are in apartment buildings, the switch to heat pumps gradually happening in single-family and two-family houses must also extend to apartment buildings. However, so far, there are hardly any practical examples of heat pumps being used to supply heat for apartment buildings in Germany. The few examples that do exist are only communicated to a very limited extent, and very little information is available on the subject in general.

To close this gap and get a better picture of heat pumps in apartment buildings, different groups of stakeholders were interviewed in order to shed light on their experience. The interviews focused on the following two questions:

1. What are the possibilities for heat pumps in existing apartment buildings and why is the heating technology hardly used in these buildings so far?
2. What are the hurdles and what framework must be set for a ramp-up of heat pumps in apartment buildings?

The interviews were conducted as part of the project “Schlüsseltechnologie für Klimaschutz in Gebäuden: Die Wärmepumpe im Mehrfamilienhaus in der Praxis” (“A key technology for climate protection in buildings: the heat pump in apartment buildings in practice”). The results reflect the views of the interviewees. This is therefore not a purely objective description of the situation, but rather a presentation of the most important obstacles and possibilities from the perspective of the stakeholders.

## 2. Approach

We interviewed the following stakeholders online:

- Bundesverband Wärmepumpe e.V. (German heat pump association) to get the perspective of heat pump manufacturers on the technical feasibility of ramping up heat pumps in apartment buildings
- Fraunhofer ISE (institute for solar energy systems) as an independent research institute on the feasibility of ramping up heat pumps in apartment buildings, as it already supervises projects on heat pumps in apartment houses.
- Housing companies with different ownerships, as they are building owners who make the (investment) decision to install a heat pump:
  - Church-funded: Rheinwohnungsbau GmbH
  - Private: Vonovia SE
  - Municipal: HOWOGE Wärme GmbH
- Tenant associations, as 53.5% of flats in Germany are occupied by tenants and the latter are therefore the ones who use the heating and are affected by the heating costs.
  - Deutscher Mieterbund e.V.
  - Berliner Mieterverein e.V.

- Apartment owner associations, as they are the ones who make the (investment) decision to install a heat pump and also occupy 46.5% of the flats in Germany
  - Wohnen im Eigentum e.V.
  - Bauherren-Schutzbund e.V.
- Energy consultant associations, as they (partly) accompany and influence the decision-making process on heat pumps and know the obstacles in practice:
  - Deutsches Energieberater Netzwerk e.V.
  - Gebäudeenergieberater Ingenieure Handwerker - Bundesverband e.V. (GTT Die Energieeffizienz Profis GmbH)
- Verbraucherzentrale Bundesverband e.V. (federation of consumer associations), as this organization may also be aware of obstacles faced by tenants and owners when installing a heat pump in apartment buildings.
- Distribution system operators, since the installation of heat pumps with higher capacities in apartment buildings requires thinking about the building's connection capacity to the electricity grid.
  - Netze BW GmbH
  - MVV Netze GmbH

The following topics were discussed in the interviews:

- The technical feasibility of heat pumps in apartment buildings,
- The monitoring of the heating system
- The integration of heat pumps into the electricity grid,
- Economic framework conditions,
- Political and legal framework conditions,
- Consumer acceptance,
- Decision-making and planning processes towards the heat pump,
- The availability and level of knowledge of specialists.

The interviews lasted about 45 minutes each. A questionnaire with open questions was prepared for each stakeholder group.

### 3. Technical feasibility of heat pumps in apartment buildings

#### 3.1. Role of the energy performance of buildings

According to several stakeholders, one challenge for the market ramp-up of heat pumps in apartment buildings is poor energy performance. **An efficient building envelope** is crucial for the efficient and affordable operation of the heat pump. In order for a heat pump to operate efficiently, **a correctly calculated heating load is paramount**, according to the energy consultants' associations. To ensure this, it is important to first draw up an overall balance sheet for the building. If this is not available, there is a risk that the heating load will be calculated incorrectly. The heating load can be used to estimate whether the heat pump can be installed as the sole heating system without further energy-related renovation

measures or whether it should be operated as a hybrid system for the time being. This could mean, for example, that the heat pump covers the base load, while a gas boiler provides the peak load on particularly cold days. Monovalent heating, on the other hand, only uses one heating system, in this case the heat pump. Planning a heat pump differs greatly from planning a gas boiler, as the heating load needs to be determined very precisely in the former case, whereas a rough heating load determination based on the year of construction of the building is sufficient in the case of gas boilers.

One stakeholder strongly recommended commissioning **an individual renovation roadmap** before installing a heat pump to accurately determine the possibilities of using this heating technology in an apartment building, especially with a view to future energy renovations.

The housing companies surveyed, which are already implementing or planning heat pump projects, stated that the buildings concerned had at least already been energetically upgraded in the past. One stakeholder stated that heat pumps are only used in apartment buildings that have an annual heat demand of less than 80 kilowatt hours per square meter. Where the heating demand is higher, using a heat pump is not economical and therefore not planned. The stakeholder stated that, in addition to the energy-efficient renovation of the buildings, in three to 25 percent of the cases it was necessary to **replace individual radiators** that were not designed for low flow temperatures and were therefore incompatible with a heat pump.

Another housing company stated that an Efficiency House 55-standard was not necessary for efficient operation of the heat pump and that a lower standard was sufficient. In general, however, the company strives for the highest possible Efficiency House-standard, taking into account the existing substance, the structural conditions and what is financially feasible for both the tenants and the company.

In the context of energy renovation, **serial renovation** is considered a possible vehicle for a higher renovation rate. This type of renovation aims at attaching prefabricated façade or roof elements including an integrated system technology to existing buildings. Due to the installation of prefabricated elements, the time required on site is significantly reduced. However, the housing companies surveyed do not see serial renovation as a door opener for heat pumps in apartment buildings, since this type of renovation is thus far neither widely available on the market nor cheaper than conventional renovation.

#### Interim conclusion:

**An efficient building envelope is essential for the efficient and affordable operation of heat pumps. Nevertheless, a heat pump can also be operated efficiently and economically in an apartment building without prior full renovation. If possible, the building should be renovated to the extent that monovalent use of the heat pump is possible.**

## 3.2. Heating apartment buildings with heat pumps

Heat pumps can be used in various ways for heating in apartment buildings. One stakeholder explained that the only difference between using heat pumps in single-family and two-family houses and using them in apartment buildings is the heating load that the heat pump has to cover. Besides operating heat pumps with a high capacity, another technical possibility to cover the heating load is to **connect several heat**

**pumps with lower performance in cascades.** In the latter case, one or more heat pumps within the cascade are only used to cover the peak load. This approach differs from the approach concerning gas boilers in apartment buildings, where it is common to opt for a larger boiler so that it can also cover the peak load. In the case of heat pumps, **the installed capacity should be precisely matched to the heating load** in order to avoid inefficient operation and thus high costs.

The technical challenges in the market ramp-up of heat pumps in apartment buildings are, according to the interviewed stakeholders, in particular **the question of how to deal with the existing pipe system (i.e. the system for heat distribution) and how or which heat sources can be tapped.** Concerning the piping system, the central question is how extensively it has to be changed in the course of the change to a heat pump. Consumers often do not want to get a completely new pipe system. Therefore, they often opt for a system which may mean less efficient operation of the heat pump while avoiding too many changes to their pipe system.

Accessing heat sources for apartment buildings can be difficult, especially in densely populated urban areas, because either there is no space for ground probes or ground collectors or the installation of several air-heat pumps is difficult due to space or noise issues. However, interviewees suggested solutions to this problem. In the case of air-heating pumps, it is possible to **install the heat pump(s) on the roof.** Furthermore, the **combination of two heat sources was considered worthwhile** under certain circumstances. The combination of air and ground heat sources is recommended, for example, if the heat demand cannot be completely covered by the heat collectors in the ground, if there are noise emission problems at night with air-heat pumps and/or if the ground probes should be spared or the load on the ground should be minimised. No difficulties with the interaction of two heat pump types to cover the heating demand are known, but combined source systems are not yet represented on the market.

In addition to the aforementioned heat sources (air and geothermal), the possibility of **photovoltaic thermal collectors (PVT collectors)** was mentioned by several of the interviewed stakeholders. This technology can be integrated into the building envelope - which is particularly interesting when it is difficult to tap other heat sources. With regard to the availability of PVT collectors as a heat source for heat pumps, however, it must be noted that market development is still in its infancy and that technical experience must first be gathered so that they can become a standard solution. Specialist companies with expertise in this area are still lacking. Another hurdle for the combination of a heat pump with this heat source are, according to two stakeholders, the investment costs, which are higher than for air-heat pumps. One stakeholder mentioned the challenge that the roof load can be too high due to the installation of PVT collectors.

During the interviews, the differences between central and decentralised heat pump systems were also addressed. While **central heat pumps supply the entire building**, decentralised heat pumps heat individual flats. In principle, both air and ground source heat pumps can be considered as central heat pumps. It is also possible to **supplement a central heat pump with decentralised heat pumps in individual flats or rooms.** The advantage of this option is the minimization of efficiency losses via the pipes. The disadvantage is that there are line losses at transitions between the central source network and the individual flats.

In this context, the **challenge of gas floor heating systems** was also addressed, for which (especially in the context of the announced 65 percent renewable energy-criterion [see chapter 7.2.]) a replacement concept must be developed. One technical solution is to first centralize the heating system and then connect the individual floors in the building. However, this is difficult due to the necessary integration of fresh



water stations.<sup>1</sup> Another possible solution is to equip the individual flats with decentralised heat pumps. Here, however, the availability of heat sources can be challenging.

In addition to this topic, the integration of heat pumps into cold local heating networks was also discussed. This concept implies that the energy transmission within the heating network takes place at a low temperature level of about 0°C to 20°C and the energy in the buildings is provided by heat pumps in a decentralized manner. One interviewee pointed out, however, that cold local heating networks are only relevant for the development of new neighbourhoods. However, there is no consensus on this among experts and the establishment of cold local heating networks is also being discussed for existing buildings.

Notably, the housing companies interviewed are currently building up or have already built up expertise on the topic of heat pumps in apartment buildings and are already in the planning or implementation process. A few projects already exist at one housing company. They are mainly implementing **projects with air-heat pumps**. This is consistent with the market data, which show a strong dominance of this type of heat pump.

#### Interim conclusion:

When planning a heat pump in an apartment building, it is important to ensure that the capacity of the heat pump is precisely matched to the heating load of the building. The capacity can either be provided by a larger heat pump or by a cascade connection of several heat pumps with lower capacity.

### 3.2.1. Hybrid solutions

**In principle, heat pumps can be used to cover the base load** in apartment buildings - this was confirmed by an association of energy consultants. In practice, however, not all apartment buildings can be efficiently supplied in monovalent mode. The predominant reasons cited by energy consultants were an insufficiently good energy status and the difficulty of tapping heat sources to cover the entire heating load. In these cases, a hybrid solution is necessary. Regarding the energetic condition, one interview **pleaded for the energetic renovation of existing apartment buildings, if possible, before switching to a heat pump, so that the heat pump can be used in a monovalent way.**

In one interview, the advantages and disadvantages of a hybrid solution were also discussed. The advantage lies in the temporal decoupling of the energy renovation of the building envelope from the heating system replacement. This means that buildings can also be energetically upgraded after the installation of the heat pump, in order to be completely supplied by the heat pump in the long term. **The major disadvantage of a hybrid solution lies in the difficulties of control technology:** it is complicated to con-

---

<sup>1</sup> A fresh water station produces hot water with the help of an external heat generator, for example the heat pump. For this purpose, the heating water flows through a heat exchanger when hot water is required and thus heats the drinking water without coming into contact with it.

nect a heat pump with an existing gas boiler in such a way that the bivalent heating system can be operated in a CO<sub>2</sub>-optimised way. For this, monitoring would have to be integrated into the system. In addition, this type of system requires more maintenance.

### 3.2.2. Monovalent heating

During the interviews with the **housing companies**, it became clear that they **prefer monovalent operation** of the heat pumps they are planning. They do not believe that bivalent operation is necessary to cover the peak load. Even on cold days, a short-term reduction of power<sup>2</sup> by the grid operators to stabilise the electricity grid is justifiable. Large buffer storage tanks are available for hot water, which is why a short-term failure is not a problem. Another housing company reported that for the initial operating phase of the heat pump, the existing gas boiler would remain in place in case of peak load problems. However, it is planned to remove the gas boilers after the test phase - especially against the background that otherwise a double maintenance is necessary and the basement rooms are often too small for two heating systems and therefore basement compartments have to be used by tenants.

## 3.3. Warm water treatment

Warm water treatment was not seen as a central challenge for the widespread use of heat pumps in apartment buildings. Of the stakeholders who have already supported heat pumps in apartment buildings, direct electric water heating - i.e. using an **instantaneous water heater** - **was the most frequently mentioned method**.

One participant pointed out that the hot water supply in apartment buildings with heat pumps and the associated guarantee of hygiene requirements is about clarifying **systemic questions**: how can a high level of efficiency be ensured? The common solution for apartment buildings with heat pumps is to limit the water temperatures of the pipes on the individual floors to a moderate level of 50°C to 55°C and then to supply the individual flats with a hot water temperature of 55°C **decentrally via heat exchangers**. With the help of this decentralised hot water preparation, there are usually no problems with legionella in the pipes.

Another stakeholder pointed out that so far there is no meaningful conclusion from available data which model of water heating is most recommendable for apartment buildings. In the case of direct electric heating and thus not using the heat pump, distribution losses in the pipes are avoided, but a high electricity consumption may be accepted. In view of these energy loads, it must be clarified whether the house grid connection is designed for this. Another disadvantage of direct electric heating is that it is more inefficient than using a heat pump. A **decentralised fresh water station**<sup>3</sup>, which is connected to a heat pump via a buffer tank, is a better alternative than direct electric heating due to its higher efficiency. A disadvantage is the high installation and maintenance costs. An additional possibility for reducing the amount of electricity used is the combination with PVT collectors.

---

<sup>2</sup> For example, a period of two hours was mentioned in the interview.

<sup>3</sup> See explanation footnote 1.

#### Interim conclusion:

There are several technical options available for hot water production in apartment buildings. These include instantaneous water heaters and decentralized fresh water stations, whereby the former provide hot water independently of the heat pump. The choice of water heating does not necessarily fall on the technical solution with the highest efficiency, but also depends on practical issues such as renovation and maintenance costs.

## 4. Monitoring of heat pumps

While politicians are pushing for a rapid roll-out of heat pumps no questions asked, energy consultants are urging for quality over quantity. This includes not only considering the overall balance of buildings in order to be able to design the heat pump for the most efficient operation, but also monitoring its operation. **The majority of the interviewed stakeholders consider the monitoring of heat pumps in apartment buildings critical for efficient operation**, and some are calling for it to become mandatory. However, **data protection issues** stand in the way of this, as the operating patterns of the heat pump could possibly lead to conclusions about the usage behaviour of the consumers. On the other hand, **incorrect settings** on the heat pump that go **unnoticed** can cost users a lot of money and lead to a bad image of heat pumps. Therefore, one stakeholder also recommended the owners to be able to understand and adjust their system. Monitoring is particularly important for hybrid/bivalent heating systems, as they require more control and maintenance than monovalent heat pumps and have to be operated in a CO<sub>2</sub>-optimised way. To ensure the latter, monitoring must be integrated into the system.

#### Interim conclusion:

The monitoring of heat pumps in apartment buildings is critical for efficient operation. However, data protection issues are still an obstacle for a mandatory monitoring.

## 5. Integration of heat pumps into the power grid

In the interviews, the surveyed grid operators stated that the integration of heat pumps into the electricity grid has so far been **harmless** and that the greater challenge for grid stability lies with electric mobility. Nevertheless, grid operators have to carry out **grid compatibility tests** for heat pumps with higher power (from 20kW + additional heating) - which are mostly used for apartment buildings. Here, care is taken to ensure that the permissible voltage band<sup>4</sup> is adhered to and that the start-up currents<sup>5</sup> of the heat pump do not cause any problems.

<sup>4</sup> The permissible voltage band specifies an upper and lower limit of the voltage of an electricity grid that must be adhered to by grid operators in order to ensure grid stability.

<sup>5</sup> Start-up or inrush current is the current that flows when a unit is switched on and can be many times higher at this point than during normal operation.

Grid operators must approve the connection of heat pumps within two months. However, one operator interviewed explained that this period is very rarely fully utilised. Sometimes it is necessary to reinforce the **house connection** to the grid in order to operate the heat pump(s). **The costs for the reinforcement have to be paid by the customers, i.e. owners or housing companies, to the grid operators.** The amount of these costs depends on two points: the house connection costs (these include the actual costs of the construction work) and the construction cost subsidy (this subsidy is partly passed on to the customers by the network operator and depends on the output of the heat pump). One housing company mentioned the costs for the reinforcement as a relevant financial barrier, as they amounted to 3,000 to 111,000 euros per building in their case. The sometimes long approval periods for the connection to the electricity grid - due to an apparent lack of a uniform strategy and lack of expertise - was named as a further obstacle by this company.

In addition, the topic of **flexibility options** for the heat pump to stabilise the electricity grid was raised. When there is a surplus of electricity in the grid, for example, the electricity could be used to heat buffer storage tanks with the help of the heat pump or to heat living spaces to higher temperatures. At the same time, the output of the heat pump could be reduced for a certain time in the event of supply bottlenecks. For this, heat pumps must be **controllable** for the grid operators. Therefore, the grid operators welcome the fact that such a legal requirement is planned in §14a of the Energy Economy Act from 2024.

Theoretically, it would also be possible for consumers to voluntarily provide flexibility by reducing the output of the heat pump within certain time windows. However, there is hardly any financial incentive for this, as the **output of the heat pump(s) is usually too low** to make a cheaper electricity tariff worthwhile. This is because the reduced electricity tariff incurs additional costs for another electricity meter.

#### Interim conclusion:

So far, the integration of heat pumps into the electricity grid is not a problem with regard to its stability. The flexibility options of heat pumps are not very attractive for consumers due to the lack of financial incentives.

## 6. Economic conditions

Before the Russian aggression, gas-heating systems were much cheaper to operate than heat pumps, so that stakeholders have only become more interested in heat pump technology in the last one to two years due to the increase in gas prices. A housing company that had already installed heat pumps in buildings several years ago reported that inefficient operation of these heat pumps, in addition to the unfavourable economic conditions at the time, made them uneconomical. Therefore, the heat pumps were dismantled and replaced by another heating technology.

Another company stated that the installation of a heat pump was already worthwhile depending on the annual work figure - thanks to the modernisation allocation. Nevertheless, electricity is still too expensive compared to other European countries, which is why several stakeholders demanded price reductions for electricity. Lower electricity prices were also mentioned by one stakeholder as an important incentive for

those who initially rely on the bivalent operation of heat pumps in order to eventually switch to monovalent operation. Specifically, a **target ratio between electricity and gas prices of 2.5:1** was mentioned.<sup>6</sup> The bivalent operation of heat pumps is already economical in apartment buildings, since the heat pump can work efficiently during peak loads by supporting the second heating system. While the price ratio between electricity and gas is slowly changing for the better, a new obstacle to **investment** has developed due to **higher interest rates**.

#### Interim conclusion:

The ratio of electricity prices to gas prices should continue to change in favor of electricity: A ratio of 2.5:1 would be beneficial.

## 6.1 The CO<sub>2</sub> price

The housing companies interviewed attributed **different degrees of importance** to the CO<sub>2</sub> price. For one actor, the CO<sub>2</sub> price has played a subordinate role in the profitability calculation so far, as the installation of heat pumps is already worthwhile without including it, but with rising CO<sub>2</sub> prices this factor will also play a greater role. Another housing company stated that the CO<sub>2</sub> price is already included in the investment calculations. For the third company, the CO<sub>2</sub> price and its impact on the business model has been a strong focus from the beginning - a view that is not widely held. Instead of letting liquid money flow away, funds should be put into the energetic renovation, including the replacement of heating systems in existing buildings. For this reason, the company was also in favour of the phased model for the distribution of the CO<sub>2</sub> price<sup>7</sup> instead of a half-share. In this way, companies that have already invested a lot in a better CO<sub>2</sub> balance of their buildings would be rewarded (and vice versa). In conclusion, it can be said that state subsidies and modernisation allocations play a much greater role in the financial planning of a heat pump project than the CO<sub>2</sub> price.

#### Interim conclusion:

While the CO<sub>2</sub> price has so far played a subordinate role for most stakeholders in their profitability calculations, it can be attributed increasing importance due to further price increases in the future.

### 6.1.1. State funding

While the majority of the **housing companies** surveyed rely primarily on the modernisation allocation and **only use the state funding as a support** to mitigate rent increases, the federal subsidy for efficient buildings (BEG) is **indispensable for many stakeholders** to install a heat pump in their apartment build-

<sup>6</sup> Currently (as of March 2023), the ratio is about 1:3.

<sup>7</sup> The phased model should work as follows: The worse the energy condition of a building, the higher the share of the CO<sub>2</sub> price borne by the owner. The better the condition, the higher the share borne by the tenant.

ing. In this sense, one stakeholder emphasised that the funding landscape and conditions **must be reliable and permanent**. A sudden stop of subsidies like in 2022 is unacceptable. With regard to the **social security of tenants**, another actor also emphasised that the **incentive** for all landlords - i.e. also housing companies - **to make use of the funding** must be sufficient, as the latter is only used in 5-10% of cases in the rental housing sector.<sup>8</sup>

One stakeholder noted that with the 65% criterion, owners have little choice but to install a heat pump to meet the target, so the **funding is less decisive than before**. The higher gas prices and thus earlier amortisation of heat pumps also contribute to this. However, in the case of Community of Apartment Owners (COA) it also depends on their structure. Often, **CAOs do not have sufficient reserves**, so that a loan has to be taken out. In some cases, owners who have just retired can no longer get a loan, even if they are interested in a heat pump or energy-efficient renovation. Even shortly before retirement, it is often no longer desirable for owners to take out a loan. In such cases, the BEG is helpful in reducing the initial investment.

In view of the **poor energy condition** of many buildings, one actor called for an increase in the subsidy rates for the implementation of individual measures on the building envelope. This should **correct the imbalance between the promotion of measures on the building envelope and heating technology**. Separate funding for **combinations of measures** (such as external wall insulation in combination with the installation of a heat pump) or funding per tonne of CO<sub>2</sub> saved is also recommended. Although there is no direct financial subsidy for saved CO<sub>2</sub>, consumers still benefit financially from CO<sub>2</sub> savings through a lower CO<sub>2</sub> price.

**For CAOs**, there are **further obstacles** to claiming subsidies. This is due to the fact that the owners usually only have a **meeting once a year** at which they can decide on a project and the corresponding claim with legal certainty. This means that all the relevant information, tenders and offers must be obtained in advance, which in turn **requires a lot of preparation - i.e. a lot of commitment on the part of the owners and/or managers**. If the decision-making process is only continued and completed after one year, the **funding pot may already be empty**. More than one meeting per year would mean more administration costs and would also require more initiative on the part of the WEG. Therefore, one actor suggested that CAOs should have the possibility to use two meetings for decision-making, so that in the first meeting discussions can take place, then the manager can ask for offers and in the second meeting a decision can be taken. Other possibilities would be separate funding programmes for CAOs or a specific contingent that is held back for the CAOs. Another actor pointed out that CAOs would have an advantage in the funding because the number of flats means that the eligible sum is higher. In addition, there is already a special subsidy for the explanation of individual renovation plans (German: iSFPs) for CAOs.

For the **managers of CAOs**, applying for funding means **extra work** anyway, for which they sometimes charge a fee of 5 percent of the costs. However, this does not seem to be the case across the board, as one actor also demanded remuneration for the fact that managers approach the projects more stringently. Better support from the funding structure would also be helpful here. However, the additional effort differs from one federal state to the next, as in some states there is a state guarantee for KfW loans (a German state-owned investment and development bank) for CAOs, while CAOs in other federal states cannot access KfW loans as a unit, so that the management has to apply individually for all owners.

---

<sup>8</sup> The actor referred to the Heat and Housing Panel 2021, Berliner Mieterverein 2017. This would be due to the fact that funding that has been used, must be deducted from the costs that can be counted towards the allocation.

#### Interim conclusion:

The inherently lengthy planning and decision-making processes of WEGs as well as the dependence of project implementation on the building managers should be taken into account in the provision of state funding, for example by constantly making fixed funding pots available.

### 6.1.2. Modernisation allocation

For housing companies, the switch to heat pumps must be economically worthwhile. Even before the big price increase, the investments were often worthwhile, and after the developments of the last year, the switch is even more profitable, subject to the calculated annual performance factor. In order to be able to write off the investment costs, the modernisation allocation is **central for the housing companies**. To ensure that this is not so high in view of the impact on tenants, **BAFA (Federal Office for Economic Affairs and Export Control (Bundesamt für Wirtschaft und Ausfuhrkontrolle, short BAFA) or KfW fundings** are also used.

However, according to several stakeholders, the allocation **for tenants is still too high**. For social housing companies, the full levy of eight per cent of the costs for major modernisation is not possible, as they have the requirement that no one has to give up their flat because of a renovation. Nevertheless, renovations and the installation of heat pumps must also be economically viable for a social housing company, so that one participant pleaded for the funding landscape not to deteriorate further in order not to have to burden tenants more. However, it was also pointed out by one party that **the installation of a heat pump alone does not lead to a rent increase**, since energy cost savings cannot be clearly proven. Consequently, housing companies cannot allocate the costs. Here, another actor pointed out that this statement would not be true if a heating system replacement was obligatory (for example after 30 years), as circumstances for which the landlord was not responsible were chargeable on the allocation. Another reason for the high cost burden on tenants is that the **separation of maintenance and modernisation costs** does not work adequately in practice. One actor called for a reduction of the modernisation allocation to four per cent, a better separation of maintenance costs from the modernisation allocation and a mandatory use of the BEG.

#### Interim conclusion:

For many housing companies, the modernisation allocation is central to the economic financing of a heating system change. In order to gain tenants' acceptance for the installation of a heat pump, the levy should be lowered and reformed so that maintenance and modernisation costs are better separated.

## 7. Political/legal framework

In order to support the market ramp-up of heat pumps in apartment buildings, two experts advocated adjusting the **design internal temperatures** in DIN 12831-1 (heating load). One suggestion was to lower the prescribed minimum temperatures in buildings at extreme outdoor temperatures - for example, so



that the heating load at an outdoor temperature of  $-10^{\circ}\text{C}$  would only have to be designed for a room temperature of  $18^{\circ}\text{C}$ , since such low outdoor temperatures rarely occur. Another weak point in the above-mentioned standard is the significantly higher design internal temperature for bathrooms at  $24^{\circ}\text{C}$  compared to the  $20^{\circ}\text{C}$  otherwise applicable. It is costly to separate the heating circuit of the bathroom from that of the rest of the flat, so that in practice the entire flat is usually designed for a possible internal temperature of  $24^{\circ}\text{C}$ . Alternatively, one housing company suggested that the room temperature that must be provided should be regulated by law. In case housing companies do this on their own, they risk a legal dispute.

In the context of environmental considerations, a **higher sound limit** for urban areas was proposed within the Federal Immission Control Act (German: Bundes-Immissionsschutzgesetz; BImSchG), as it is louder there anyway. Of course, this is a question of acceptance.

In addition, one of the participants explained that the **Heating Costs Ordinance** in its current form is not geared towards the use of heat pumps. According to the ordinance, the heating costs of buildings that are predominantly (i.e. more than 50 per cent) heated by a heat pump do not necessarily have to be billed according to the Heating Costs Ordinance and thus do not depend on consumption. Thus, consumers are hardly rewarded for energy-saving behaviour and the high efficiency of the heat pump compared to gas boilers is not reflected in the heating cost bill.

Another obstacle to the **integration of heat pumps into local and district heating networks** or heat supply via contracting is the prescribed cost neutrality in the Heat Supply Ordinance.

This requires that a future heat network supply must not exceed the costs of the previous (fossil) supply. Here, it was suggested as a solution that all costs chargeable on the allocation according to §7 para. 2 of the Heating Costs Ordinance will be included in the comparison, so that the comparison between depreciated old and new systems is somewhat fairer. With regard to the 65 percent criterion, it could also make sense to define the heat pump as the benchmark technology for the cost comparison. Another possibility would be to consider the property side of the benchmark by looking at what would be the cheapest available technology in a reference building that meets the renewable energy requirement.

#### Interim conclusion:

Legal adjustments are needed in, among other things, the Heating Costs Ordinance (as this is not geared towards the use of heat pumps) and the Heat Supply Ordinance (as this requires cost neutrality when switching to a local and district heating network).

## 7.1 Act on the Ownership of Apartments and the Permanent Residential Right (*Wohnungseigentumsgesetz*)

Under the Act on the Ownership of Apartments, a distinction is made between separate and joint ownership of property in the residential buildings. Since heat pumps normally serve to supply heat to the entire house, they affect the jointly owned property. While owners decide on their own (separately owned) property, nothing can be changed in the jointly owned property without a majority vote. However, since the reform of the Act on the Ownership of Apartments of 1 December 2020, there are so-called **privileged measures**, which entail that individual owners have a right to have a measure carried out even without a majority in favor. These include measures for protection against burglary protection, e-mobility, fast internet and accessibility. In order to achieve the energy transition, renewable heat supply should be included in the catalogue of privileged measures, according to one of the stakeholders.



Once a decision has been made, people against it have one month to challenge it. Otherwise, it becomes effective and must be observed by all. One obstacle for owners who wish to install a heat pump in an apartment building are the costs, as these are to be borne by the members who voted in favor of the decision. To avoid this, there are two ways to ensure that the costs are borne by all owners:

1. If there is a double-qualified majority, i.e. more than 2/3 of the owners who jointly hold more than half of the co-ownership shares in the apartment building vote in favor of the change.
2. If there is a simple majority and a reliable prognosis (which can also be challenged) shows that the heat pump will pay for itself within ten years.

Achieving the necessary majorities for passing decisions is particularly relevant if owners are to give up a piece of their separate property (e.g. basement or garden area) in favor of the placement of the heat pump, as unanimity is rarely achieved here. For this reason, one participant advocated for giving administrators more leeway under the Act on the Ownership of Apartments in order to reach legally binding decisions more quickly. However, another actor spoke out against this, as owners should continue to be able to make decisions about their property themselves and as it was primarily a matter of convincing the owners of the plans. Since there tends to be scepticism as to whether managers obtain the best possible offers for the CAO, **transparency** is also very important.

If a CAO wants to operate its heat pump with its own solar power and decides to build a **PV system** on the roof, there are still many bureaucratic and fiscal hurdles in this regard. This is because the electricity is generated by the legal entity of the community, but consumed by the individual owners in the building. In legal terms, this therefore constitutes a supply of electricity, so that the CAO becomes a micro-electricity supply company and is therefore subject to information and notification obligations with the Federal Network Agency. Consequently, contracts for the supply of electricity must be concluded, and sales and income tax obligations apply above a certain level of output.<sup>9</sup> For the CAO, this means that tax returns have to be filed. Most CAOs and their managers are not familiar with this multitude of legal requirements, so they tend to stay away from such projects.

Even if managers always have to buy the expertise for heat pump installations and renovation measures, it is important that they, as managers of the buildings, accompany the decision-making process of the WEG. One stakeholder referred to a study that showed that façade renovations **can only be successfully implemented if owners, advisory boards and managers are actively involved in the process**. This is at least as relevant for heating system changes.

#### Interim conclusion:

It would be advisable for the heat transition to make the installation of a heat pump a privileged measure under the Act on the Ownership of Apartments.

## 7.2. The 65 per cent criterion

The announced legal anchoring in the Building Energy Act (GEG) that heating systems must be operated with at least 65 percent renewable energies from 2024 was assessed differently by the stakeholders. For

<sup>9</sup> There has been minimal legal progress in this area so far. The Annual Tax Act has exempted PV systems with an installed capacity of 15kWp to 600kWp from tax liability. However, the information and notification obligations still apply.

the majority, **it does not play a major role** – for different reasons. Some mentioned that it does not change the work of the advisory associations, as the basic questions of their advice remain the same. In some housing companies there is already a roadmap for emission reduction/heating change. On the other hand, doubts were expressed as to whether heating systems fired by at least 65% renewable energy would be possible everywhere and how this criterion could be implemented without any bonus malus system. One actor also **feared chaos**, as no one knew when their heating system would break down and how the 65 percent criterion could be implemented ad hoc. Most owners do not think about this in advance. In this sense, two stakeholders remarked that **it could only be implemented well by preparing an exchange scenario**. Another point of criticism was that there is still no information on how to deal with gas floor heating systems that fail individually - do all the heating systems in a building have to be replaced in accordance with the specifications? Furthermore, the criterion for the operation of bivalent systems is not strictly speaking fulfilled if one takes into account that electricity is not 100 percent renewable.

#### Interim conclusion:

Due to a lack of information on the part of the federal government, there is still a lot of uncertainty about the 65 percent renewable energy criterion. The requirement can only be implemented well with the preparation of an exchange scenario by the actors.

## 8. Consumer acceptance

The lack of acceptance by owners in condominiums for renovation measures including the exchange of heating systems for heat pumps was named by several stakeholders as a relevant obstacle to the market ramp-up of this heating technology. In particular, several stakeholders see the **convincing of older people** as a challenge. Three reasons were given for this assumption:

1. The amortisation of the planned measures within the lifetime is doubted by the group of people.
2. There is scepticism about the hitherto unknown technology of the heat pump.
3. There is a lack of financial resources.

In addition, the stakeholder pointed out that older people have a stronger influence on votes at WEG meetings, as they tend to be present more regularly than younger people and are therefore more strongly represented in the voting picture.

Further challenges in creating acceptance in CAOs lie in the **different interests of owner-occupiers and capital investors**, as well as in the fact that a heating system change to a heat pump can be associated with a **reorganisation of ownership**. This is the case, for example, if the installation of the heat pump requires space in the cellar or in the garden.

According to several stakeholders, in order to ensure acceptance within a WEG, it is necessary to **involve all owners in the planning process at an early stage** and to offer the WEG **independent and neutral advice on the heating system replacement and other renovation measures**.

One party noted that many tenants fear energy-efficient renovations, including heating system replacement, because they are often associated with rising housing costs. These costs could be reduced by reforming the modernisation allocation, noted another stakeholder. With regard to tenants, two points were described that need to be improved in the **communication of energetic renovation measures** in order to increase acceptance among this target group. Firstly, not enough information is communicated

about upcoming energy renovations, although **transparent information** about all relevant aspects is necessary. This transparent approach, according to one of the experts, can even contribute to the fact that higher costs are accepted to a certain extent. Secondly, the information provided is difficult to understand, as it is mainly energy-related key figures that are communicated, which are not comprehensible to most people. Consequently, **transparent and easily understandable educational work** is needed. In principle, it is assumed that tenants are interested in heat pump concepts for their own buildings, even though the housing companies surveyed have not yet received any concrete enquiries from tenants about heating systems. The lack of reference to the technology due to few points of contact was named as a challenge for this. Another challenge is the **sensitisation of the residents for the lower flow temperatures** and the associated less hot radiators (if these are used). It is necessary to communicate this, otherwise residents assume that there is a defect in the heating system.

Regarding the change of the heating system to the heat pump itself, one stakeholder noted that the **conversion measure itself is not a big burden** because the project can be completed in one day and usually takes place in summer. Finally, stakeholders also mentioned the economic framework conditions as an influencing factor for acceptance by owners and tenants.

#### Interim conclusion:

**In order to ensure the necessary acceptance among consumers, comprehensive and comprehensible information on energy-related renovation measures and heat pump technology is needed.**

## 9. Decision-making and planning process towards the heat pump

The fact that condominium owners' associations usually meet only once a year makes the decision-making and planning process for a heating system change and any necessary renovation measures difficult. In addition, there is the multitude of stakeholders involved: Owners with different opinions and financial possibilities as well as administrators with different motivations. If there is scepticism in a condominium association about replacing the heating system, this can have a catalysing effect on the **group dynamics** and increase the scepticism. If inspection orders are then requested, the process is delayed. In this context, several participants emphasised that there is a **lack of knowledge or half-knowledge** about the heating technology. In order to address this problem, it was suggested that **the BMWK create an information page especially for condominium owners' associations**, where all relevant information - **both technical, legal and economic** - would be bundled, since up to now single-family and two-family houses have been the focus of the heating system change to heat pumps. Often, owners are put off if they have to find all the information themselves. Energy consultants only cover technical questions and funding possibilities, but the "how", i.e. the implementation planning, remains open. In addition, long waiting times for energy advice were also mentioned. Here, one actor pleaded for more holistic and detailed advice on technical possibilities, funding opportunities and project duration. Another stakeholder recommended the creation of an **individual renovation roadmap** before the heating system is replaced, so that it can be calculated when a heat pump will pay for itself, so that offers can be obtained for a price comparison. In addition, an individual renovation roadmap can avoid problems such as incoherent heating load calculations by energy consultants on the one hand and heating engineers on the other.

The **integration of heat pumps in neighbourhood approaches** was only briefly mentioned by the stakeholders. One stakeholder explained that thinking in terms of neighbourhoods makes sense in general and

is **promoted by municipal heating planning**. However, the frequent heterogeneity in ownership and the large number of stakeholders involved is a challenge, as in this case all owners have to be convinced of a common solution. One stakeholder therefore does not see the use of heat pumps in apartment buildings in quarters.

In summary, several stakeholders concluded that positive examples are also **necessary for decision-making and planning processes**. Not only lighthouse projects, but also "normal projects" should be communicated. A solution that already exists in part is the exchange in networks or forums, such as the Wohnen 2050<sup>10</sup> Initiative. Increased data collection to learn from the experiences of others, on the other hand, would be seen as an additional burden. Stronger communication of positive examples and within networks is also essential to combat the shortage of skilled workers.

#### Interim conclusion:

The decision-making and planning process for a heating system change is a particular obstacle for Communities of Apartment Owners - primarily due to its tediousness and the lack of knowledge of the actors involved. Accordingly, knowledge should be bundled and made comprehensively available, and best practice examples should be increasingly communicated.

## 10. Professionals: planners, craftspeople, energy consultants

For the ramp-up of heat pumps in apartment buildings, **planners and craftspeople with the necessary expertise are needed**, which is still lacking across the board. According to one stakeholder, this includes, for example, that all planners should be able to carry out a heating load calculation. This is not yet a matter of course. In addition, one participant explained that there are so few planners with the appropriate know-how that those who know how to do it no longer do it themselves, but only instruct and instruct other planners because their knowledge is so valuable.

**The exchange between professionals is essential in order to spread the knowledge.** In this regard, one housing company emphasised that it is necessary to spread the knowledge among manufacturers and technical building equipment planners that many buildings can be converted to heat pumps relatively easily if certain conditions are met. One housing company explained that an Efficiency House 100 standard and readjustment of the supply temperatures are sufficient. According to the company's experience, the heating load could be reduced by up to 40 percent by lowering the flow temperatures. Up to now, the heating capacity has often been set too high.

Certificates for the planning of heat pump systems in apartment buildings do not exist yet. The idea of introducing this was not suggested by the stakeholders. It is simply hoped that planning offices will approach more demanding projects with increasing experience.

One of the obstacles for craftspeople is the heterogeneity of the projects. This is due to the fact that different heat pumps are repeatedly combined with different storage units and used in different buildings. **Due to this complexity, craftspeople often lack the knowledge** of how to combine the system elements

<sup>10</sup> The initiative is an association of housing companies for a climate-neutral future.

with each other. In addition, problems often arise during monitoring and maintenance if the commissioning was carried out by the manufacturing company itself or, as a result of a tender, by a craftspeople's company that is located far away from the installation site. In such cases, the craftspeople do not have the capacity to visit several times in a row for inspection or maintenance. Nearby craftspeople often have no incentive to deal with the equipment because they had nothing to do with the installation.

One actor also complained that housing companies assume that manual workers need the same amount of time to install a heat pump as they do for a gas heating system. However, this is not possible due to the necessary fine-tuning of the heat pump. The installation of heat pumps should therefore be possible in a more modular way in order to reduce time and costs.

Another actor recognised the shortage of skilled craftspeople in 2018 and, together with the VDI, developed a training concept and materials for craftspeople. The training lasts three to four days and ends with an examination. In principle, the work involved in installing heat pumps in apartment buildings does not differ significantly from installing them in single-family or two-family houses. However, the training is designed for simpler buildings, because it is designed for the further training of as many craftspeople as possible.

Furthermore, it was pointed out that there is still no standardised job description for heat pump installers, as this combines the knowledge of electricians and heating engineers. Therefore, the vocational training has to be adapted. One actor also emphasised that **the professional conditions must be fundamentally modernised** - this includes, among other things, better salaries, but above all the possibility of working part-time and fewer overtime hours. Occupational health and safety also has many weak points, especially when it comes to carrying heavy loads.

In order to achieve the market ramp-up of heat pumps in apartment buildings, challenges regarding energy consultants were mentioned in addition to the lack of planners and craftspeople. For this group of stakeholders, too, there is **no standardised job description**. This should be introduced. Furthermore, one stakeholder criticised that the **government had deliberately created hurdles** by only allowing qualified energy advisors to advise on non-residential buildings, even if the corresponding knowledge is available in the case of advisors trained in the trades. In general, the **stakeholders are not concerned about the level of knowledge of the energy advisors**. According to one association, the sufficient level of knowledge is also due to the fact that the heating system is not the first priority in energy counselling. Instead, the energy consumption and losses are always considered first during the consultation. Then it is analysed with how much effort which losses can be covered.

Both associations interviewed also stated that sufficient further training courses for energy advisors were available, which were also constantly being developed further. Due to the lack of training opportunities on the market, one association founded its own academy in 2005, where members can always acquire new knowledge. In this regard, the association cooperates with universities, practitioners and manufacturers. In order to make use of the further training offers, a further training premium was pleaded for. In addition, one actor demanded a VAT exemption for energy consulting services, as the state currently earns more from its subsidised services than it spends on them. In addition, the costs for DENA's energy efficiency expert list should be covered by the federal government, since the energy consultants have to pay a lot for it, even though they are the ones who provide the subsidised services. The federal government saves costs anyway by placing the responsibility for certain parts of the implementation of the funding programmes with the energy consultants. One example of this is that energy advisors take on the task of informing end customers.

## Interim conclusion:

Both heat pump installers and energy consultants need their own job description to ensure appropriate and broad-based training. In addition, the training and working conditions of craftspeople need to be fundamentally reformed, the exchange of knowledge among planners needs to be strengthened, and the government should remove obstacles to the practice of the profession and further training for energy consultants.

## 11. Conclusion and outlook

The interviews conducted for this inventory offered different perspectives, but they all pointed to similar or identical barriers to the increased use of heat pumps in apartment buildings. A key barrier mentioned by almost all stakeholders is the lack of knowledge about the use of heat pumps in apartment buildings among consumers, property managers, planners and craftspeople. This problem is exacerbated by the fact that hardly any practical examples - apart from individual lighthouse projects - are known, which the stakeholders can use as orientation in their planning/decision-making processes. In addition, attention was drawn to several weak points in various laws that could be changed to simplify and accelerate the ramp-up of heat pumps in apartment buildings. The project "Key Technology for Climate Protection in Buildings: The Heat Pump in Apartment Buildings in Practice" addresses these obstacles by launching a digital information campaign via short publications and the creation of a roadmap, and finally by elaborating demands on political stakeholders.



### Deutsche Umwelthilfe e.V.

Bundesgeschäftsstelle Radolfzell  
Fritz-Reichle-Ring 4  
78315 Radolfzell  
Tel.: 077 32 9995 -0

Bundesgeschäftsstelle Berlin  
Hackescher Markt 4  
Eingang: Neue Promenade 3  
10178 Berlin  
Tel.: 030 2400867-0

### Contact

Jessica Appelman  
Referentin Energie und Klimaschutz  
Tel.: +49 30 2400867-929  
E-Mail: appelman@duh.de

Paula Brandmeyer  
Stellvertretende Bereichsleiterin  
Energie und Klimaschutz  
Tel.: +49 160 3201434  
E-Mail: brandmeyer@duh.de

[www.duh.de](http://www.duh.de) [info@duh.de](mailto:info@duh.de) [@](#) [f](#) [i](#) [n](#) [u](#) [m](#) [w](#) [e](#) [l](#) [h](#) [i](#) [l](#) [f](#) [e](#)

Wir halten Sie auf dem Laufenden: [www.duh.de/newsletter-abo](http://www.duh.de/newsletter-abo)

Die Deutsche Umwelthilfe e.V. ist als gemeinnützige Umwelt- und Verbraucherschutzorganisation anerkannt. Wir sind unabhängig, klageberechtigt und kämpfen seit über 40 Jahren für den Erhalt von Natur und Artenvielfalt. Bitte unterstützen Sie unsere Arbeit mit Ihrer Spende: [www.duh.de/spenden](http://www.duh.de/spenden)

Transparent gemäß der Initiative Transparente Zivilgesellschaft. Ausgezeichnet mit dem DZI Spenden-Siegel für seriöse Spendenorganisationen.



Initiative  
Transparente  
Zivilgesellschaft

