



Challenges of our time – discussing solutions for future energy and sustainable homes

Erwartungshorizont – Worksheets 1–3

WORKSHEET 1 – Do our homes contribute to climate change?

Part A – Where does our energy go?

Individuelle Lösungen; Erwartet werden plausible Beispiele für alltägliche Aktivitäten, den jeweiligen Energiebedarf und mögliche Energiequellen.

- heating a room → heat → natural gas / electricity / district heating / renewable heat
- taking a hot shower → hot water → gas / electricity / heat pump / solar thermal
- cooking → heat → electricity / gas
- heating and hot water generally require more energy than small devices such as phone chargers

Part B – How much energy do buildings use?

- a) Around 30% of global energy demand is connected with buildings.

Around 70% of energy demand in buildings comes from the residential sector.

Space heating and water heating dominate household energy demand in advanced economies; together they account for around 70%.

Approximately 21 of 100 global energy units are used by residential buildings: $30 \times 0.70 = 21$.

- b) The figures show that homes are highly relevant to global energy demand. Residential buildings alone account for roughly one fifth of total global energy demand, so changes in homes can make an important contribution to the energy transition.

Homes are highly relevant to global energy demand; changes in residential buildings can support the energy transition.

- c) For chimney sweepers, heating systems and hot-water systems are particularly relevant because their type, age, condition and energy source can be observed in individual homes.

Part C – Germany and the UK: How do they compare?

1. Analyse and compare

- a) Germany: 59.0% renewable electricity

United Kingdom: 50.4% renewable electricity

Difference: 8.6 percentage points.

- b) Similarity: renewable electricity supplies around half or more of electricity generation in both countries.

Similarity: wind power is an important renewable source in both countries.

- c) Difference: Germany is led by onshore wind; the UK is led by offshore wind.

2. Think beyond numbers

- a) National statistics cannot show whether one particular home is energy efficient. National data describe the wider energy system; an assessment of an individual building requires building-specific information.

- b) Relevant building-specific information: age and condition, insulation, windows, heat demand, heating system, energy source, hot-water system, energy consumption and household use patterns.

Part D – Renewable or non-renewable: why does it matter?

1. Build the distinction

- Renewable energy comes from sources replenished faster than they are used, for example wind, solar, hydropower and biomass.



- Non-renewable energy comes from finite resources that cannot be replenished on a human timescale, for example coal, oil and natural gas.
- Advantages of renewable energies:
 - lower greenhouse-gas emissions / contribution to climate protection
 - less dependence on imported fossil fuels and greater energy security
 - potentially lower costs as renewable technologies become more affordable
 - cleaner air and health benefits
 - new jobs and economic opportunities
- Problems connected with fossil fuels:
 - Fossil fuels are finite and cannot be replenished on a human timescale. Renewables use naturally replenished sources.
 - Burning fossil fuels causes greenhouse-gas emissions and contributes to climate change. Switching to renewables can reduce emissions.
 - Dependence on imported fossil fuels can create energy-security risks. Domestic renewable energy can reduce this dependence.
 - Fossil-fuel use can contribute to air pollution. Renewable energy can help improve air quality.

2. Energy change

- a) Switching to renewables can reduce emissions, fossil-fuel dependence and air pollution.
- b) Changing the energy system is important because renewables can reduce emissions, improve energy security and create other benefits. However, the transition is not simple because new infrastructure and investment are needed and existing systems cannot be replaced immediately.

Part E – From statistics to real buildings: a home visit

1. From data to professional observations

Drei plausible Beobachtungen sind gefordert. Beispiele:

- An old gas or oil heating system → uses a non-renewable energy source and may contribute to greenhouse-gas emissions.
- An older or inefficient heating system → heating is a major part of household energy demand, so inefficient equipment can increase energy use.
- A heat pump or another renewable/low-carbon heating solution → can reduce dependence on fossil fuels, depending on the building and energy supply.
- Signs of poor insulation or high heat loss → more energy may be required for space heating.
- A heating system that is well maintained and appropriately adjusted → building-level observations can reveal information that national statistics cannot provide.

Andere fachlich plausible Beobachtungen sind zu akzeptieren. Wichtig ist jeweils eine nachvollziehbare Verbindung zu mindestens einem Material.

2. Explain your observations

- a) and b) During a home visit, a chimney sweeper might observe an old gas heating system. This connects to Material C because natural gas is a non-renewable fossil fuel. Its use matters for the energy transition because burning fossil fuels produces greenhouse-gas emissions and continued dependence on gas can slow the shift towards renewable energy. During a home visit, a chimney sweeper might notice poor insulation or signs of heat loss, for example cold surfaces or an inefficiently heated building. This connects to Material A because space and water heating account for around 70% of household energy use in advanced economies. Improving the insulation could reduce heat demand and energy consumption. This matters for the energy transition because less energy would be needed for heating, especially if the building still uses fossil fuels.
- c) Expected connection: observation → relevant material fact → significance for the energy transition.



Part F – Reflection

Yes, our homes contribute to climate change, although the impact differs from building to building. Material A shows that buildings account for around 30% of global energy demand and that residential buildings make up about 70% of building energy use. Heating and hot water are especially important. Material B also shows that Germany and the UK already generate a large share of their electricity from renewable sources. However, Material C makes clear that fossil fuels such as gas, oil and coal still cause greenhouse-gas emissions. From a chimney sweeper's perspective, the condition and energy source of an individual heating system are therefore important. Overall, making homes more efficient and using cleaner energy can support the energy transition.

Bewertungshinweise für den Kommentar

- clear answer to the guiding question
- evidence from at least three of the required areas/materials
- specific and accurate use of figures or factual information
- logical connection between evidence and conclusion
- appropriate use of the chimney sweeper's professional perspective
- coherent English and approximately 100–120 words



WORKSHEET 2 – Changing buildings creates conflicts

Part A – From climate goals to political decisions

1. Looking back

Changing a building can be difficult because of high upfront costs, technical limits, lack of information, political rules and unequal financial opportunities.

Die Auswahl der zwei wichtigsten Schwierigkeiten ist offen. Die Lernenden sollen ihre Priorisierung nachvollziehbar begründen.

2. Who should take responsibility?

Individuelle Rangfolgen. Es gibt keine verbindliche Reihenfolge. Entscheidend ist eine plausible Begründung.

Possible position: Governments should have a high level of responsibility because they set climate targets, create rules and can provide funding.

Alternative: Homeowners should carry substantial responsibility because they make decisions about their own buildings and energy use.

Landlords, energy companies and society as a whole can likewise be placed high in the ranking if the reasoning is coherent.

Kernidee: Making buildings sustainable is a shared responsibility; different actors have different possibilities to influence change.

Part B – How do governments support change?

1. Compare the policy approaches

United Kingdom – Material A: Warm Homes Plan

- **Main aim:** to make homes warmer, cheaper to run and cleaner and to upgrade millions of homes.
- **Measures supported:** home energy-efficiency improvements, solar panels, batteries and heat pumps; the plan also addresses energy performance in rented homes.
- **Who receives support?:** households, including specific support for low-income households; private and social rented homes are also addressed.
- **Type of financial support:** direct support, grants and low- or zero-interest finance.
- **What remains unclear?:** the exact amount an individual household would receive, detailed eligibility, the best measure for a specific building and the final cost to the homeowner.

Germany – Material B: Funding sustainable heating

- **Main aim:** to reduce the financial barrier to replacing fossil-fuel heating with more climate-friendly heating.
- **Measures supported:** heat pumps, solar thermal systems, biomass heating and connections to heating networks.
- **Who receives support?:** eligible private homeowners; additional support/bonuses may depend on the household and the heating system being replaced.
- **Type of financial support:** a 30% basic grant, with possible additional bonuses; total support can reach up to 80% of eligible costs in qualifying cases. For a single-family home, up to €28,000 of eligible costs are taken into account in the material.
- **What remains unclear?:** whether a particular household qualifies for all bonuses, the actual installation cost, which technology fits the building and what technical work may be required.

Similarity:

- both governments use policy and financial support to encourage more sustainable homes.

Difference:

- the UK plan covers several technologies and household groups
- the German material focuses specifically on sustainable heating



2. From policy to real decision

Useful advice requires policy information plus information about the individual building and household. An adviser would need information about the building's age, insulation and condition; the existing heating system and energy source; heat demand and hot-water needs; available space and technical infrastructure; household size and usage patterns; the family's budget; and current eligibility for funding.

Part C – The Miller family needs a new heating system

- Relevant building features: detached house built in 1985; poor insulation; old gas heating system; roof suitable for solar; existing building rather than new construction.
- The decision is urgent because the old gas heating system needs to be replaced soon.
- The family cannot implement every sustainable measure because their maximum budget is £25,000 and several improvements could require substantial investment.
- Possible top three factors: technical suitability of the new heating system, available budget/funding, and the building's insulation/energy demand. Other well-justified priorities such as running costs, climate impact or reliability are acceptable.

Part D – Who wants what?

1. Identify the interests

Homeowner

- Main aim:** a reliable and affordable solution
- Main concern:** limited budget and manageable monthly costs
- Possible conflict:** climate-friendly options may require higher upfront investment

1. Climate activist

- Main aim:** reduce emissions and move away from fossil fuels quickly
- Main concern:** avoiding long-term fossil-fuel lock-in
- Possible conflict:** rapid change may exceed the family's financial or technical possibilities

Government representative

- Main aim:** reduce emissions while making the transition realistic for households
- Main concern:** balancing climate targets with affordability and implementation
- Possible conflict:** public goals or rules may limit individual choice or require public spending

2. Find the clashes

Mögliche Übereinstimmungen:

- All three perspectives can agree that the old heating system needs a solution and that a sustainable, reliable long-term outcome is desirable.
- All can recognise that costs matter, even if they give affordability different weight.

Mögliche Konflikte:

- Climate protection vs. affordability: the fastest low-carbon option may require an investment the family cannot afford.
- Long-term savings vs. upfront costs: a measure may reduce future energy bills but still be too expensive initially.
- Individual choice vs. political goals: homeowners may prefer the cheapest immediate option while public policy encourages lower-emission technologies.
- Fast change vs. realistic implementation: climate goals favour rapid action, but building condition, installers, funding and household finances can slow implementation.

Warum erschwert dies die Beratung?

- A professional adviser has to balance competing priorities instead of simply maximising one objective.



Part E – The chimney sweeper as energy adviser

1. Before you recommend anything...

- b) Funding can make a technology affordable that would otherwise exceed the household's budget. It can change the comparison between upfront investment and long-term benefits. The adviser must therefore consider both technical suitability and the current funding conditions before recommending a final option.

2. Give your advice

Offene Beratungsaufgabe. Da Worksheet 2 noch nicht alle Technologien aus Worksheet 3 systematisch untersucht, wird keine einzige technische Lösung als verbindlich erwartet. Die Empfehlung muss vor allem realistisch, materialgestützt und als vorläufige Beratung gekennzeichnet sein.

Beispielantwort:

I would first arrange a detailed assessment of the Miller family's existing heating system and the energy performance of the house. Because the gas system needs replacement soon, the family should then compare climate-friendly heating options that are technically suitable for the building and check the available funding before making a final decision. A complete renovation could wait because the family has a maximum budget of £25,000. This balances the homeowner's need for affordability with the climate goal of moving away from fossil fuels. Material B shows that Germany provides grants for eligible sustainable heating systems, which could reduce the upfront cost. Before recommending a specific technology, an adviser would still need to check heat demand, insulation, radiators, installation requirements and exact funding eligibility.

Erwartete Bestandteile der Empfehlung

- what should happen first
- what could wait
- explicit consideration of the £25,000 budget
- at least two conflicting interests
- reference to Material B or another policy source from the worksheet
- clear statement of what still needs to be checked before a final technical decision

Part F – Reflection: what makes the energy transition fair?

Individuelle Gruppenpositionen. Erwartet wird eine Abwägung.

Mögliche Argumente:

- Homeowners benefit directly from lower energy use, improved comfort and potentially lower running costs, so they should contribute financially where possible.
- Governments benefit from progress towards public climate goals and can reduce inequality through targeted funding, so they should share responsibility.
- Lower-income households may be unable to finance large upfront investments even if measures save money in the long term.
- Landlords, energy companies and society can also have responsibilities because the benefits and costs of the transition are distributed across different groups.



WORKSHEET 3 – Buildings can be part of the solution

Part A – What makes a home sustainable?

Individuelle Lösungen. Erwartet werden drei plausible Merkmale eines nachhaltigen Hauses. Mögliche Beispiele:

- a heat pump or another low-carbon heating system
- solar panels or another renewable electricity source
- good roof, wall and/or floor insulation
- efficient windows and reduced unwanted air leakage
- smart heating controls
- a green roof
- energy storage / battery systems
- energy-efficient appliances and lighting

Die Aufgabe dient der Aktivierung des Vorwissens; eine vollständige technische Bewertung wird noch nicht erwartet.

Part B – Become an expert

60-second expert briefing

Jede Expertengruppe sollte erklären, wie die Maßnahme funktioniert, einen klaren Nutzen, mindestens eine Grenze und die wichtigsten Prüfpunkte vor einer Empfehlung nennen.

Part C – Compare the solutions

1. Build your own comparison grid

Solution	How it works	Main benefit	Limitation	Adviser should check
Solar panels	Convert sunlight into electricity for direct use, storage or export	Renewable electricity can reduce the amount of electricity drawn from the grid and contribute to lower operational emissions	Generation varies with sunlight; electricity is not produced continuously and the house may still need grid electricity	Roof orientation, space, shading and roof condition
Heat pump	Transfers heat from air, ground or water into the building rather than generating all heat directly	High efficiency; according to the material, a typical household heat pump can deliver around four units of heat for one unit of electricity used	Installation costs and performance depend on the heating system and energy performance of the building	Heat demand, insulation, radiators/underfloor heating and flow temperature
Insulation	Slows heat transfer through roof, walls and floors and reduces unwanted heat loss	Lower heating demand and improved comfort; it can also reduce the amount of heat a new heating system has to provide	Retrofit can be technically difficult or expensive	Where heat is being lost, the existing construction and the condition of the building envelope



Solution	How it works	Main benefit	Limitation	Adviser should check
Smart heating controls	Regulate when and where heating is used; may learn routines or adjust automatically	Reduced unnecessary heating and potentially improved comfort	Benefit depends on compatibility, settings and user behaviour	Existing system and controls, compatibility and heating habits

2. Make a first assessment

Keine verbindliche 1–5-Rangfolge. Entscheidend ist, dass sie aus den Expertenmaterialien begründet werden.

Eine mögliche vorläufige Einschätzung für ein unspezifiziertes älteres Einfamilienhaus könnte sein:

- **Insulation:** relatively promising because older homes may lose substantial heat and insulation can reduce heating demand ,e.g. 4/5
- **Heat pump:** promising but uncertain because suitability depends strongly on heat demand, insulation, radiators and flow temperature, e.g. 3/5
- **Solar panels:** potentially promising if the roof is suitable, but roof orientation and shading are unknown, e.g. 3/5
- **Smart heating controls:** potentially useful and comparatively easy to implement, but the scale of savings depends on the existing system and user behaviour, e.g. 3/5

Part D – Return to the Miller family

1. Prepare your consultation

Die Beratung soll nicht als starre Technikempfehlung verstanden werden. Erwartet wird eine nachvollziehbare, gebäudespezifische Priorisierung mit Quellenbezug und professionellen Vorbehalten.

Possible consultation plan:

1. First priority:

I would first assess the house's poor insulation and identify the main areas of heat loss. Reducing heat demand should come first because it can lower energy consumption and improve the conditions for a new heating system.

2. Second priority:

I would investigate whether a heat pump is technically suitable. The old gas heating system needs replacing, and the IEA material explains that heat-pump performance depends on heat demand, insulation, radiators and flow temperature.

3. Measure that can wait:

Solar panels could be considered later. The roof is suitable, but replacing the heating system and reducing heat loss are more urgent within the limited budget.

4. Two on-site checks:

I would check the building's heat demand and insulation. I would also check the existing radiators and required flow temperature.

5. Cost or funding issue.

The family should clarify whether the recommended measures can be financed within the £25,000 budget and which grants are available.

2. The consultation

Beispiel für eine mögliche Beratung:

Based on the condition of your house, I would first focus on reducing heat loss and assessing whether a heat pump is technically suitable. Your house was built in 1985 and is poorly insulated, so targeted insulation could reduce the amount of energy needed for heating. At the same time, your old gas system needs replacement. According to the IEA material, heat pumps can be highly efficient, but their performance depends on the building's heat demand, insulation, radiators and required flow temperature. These two measures could therefore work together: better insulation can reduce heating demand and improve the conditions for a heat



pump. However, your £25,000 budget means that we first need detailed cost estimates and available funding. Before making a final recommendation, I would calculate the heating load and check the existing radiators and flow temperature.

Erwartete Bestandteile:

- TWO priorities are clearly named.
- The recommendation is linked to the Miller house: 1985, poor insulation, old gas heating, solar-suitable roof and £25,000 budget.
- The interaction between the two measures is explained.
- Evidence from at least TWO authentic sources/materials is used.
- At least one limitation or cost issue is addressed.
- At least one other measure is explicitly not prioritised now and the decision is justified.
- At least one on-site check is identified before a final technical recommendation.

Die Gesprächsführung wird qualitativ bewertet. Erwartet werden eine verständliche Empfehlung und mindestens zwei sinnvolle Rückfragen des 'homeowner'.

Mögliche Rückfragen:

- Would a heat pump work with our existing radiators?
- Can we afford both measures within our £25,000 budget?
- Would solar panels be worth adding later?
- Which improvement should be completed before the heating system is replaced?
- What funding could be available?
- Der Adviser sollte nicht spekulieren, sondern bei fehlenden Daten auf notwendige Prüfungen verweisen.

3. *Client feedback*

Individuelle Rückmeldungen. Gute Rückmeldungen beziehen sich konkret auf:

- clarity of the recommendation
- realism for the building and budget
- balanced explanation of benefits and limitations
- strength and relevance of the evidence used

Part E – Reflection

Beispielantwort:

There is no single best combination for every building. The right solution depends on the building's condition, heating system, energy demand, roof and the household's budget. Measures should be considered as a system: insulation can reduce heat demand, while a suitable heat pump can provide efficient heating. Solar panels can add renewable electricity if the roof is appropriate. Therefore, advisers must assess the building and household before making a recommendation. Professional energy advice combines technical information, on-site checks, costs and household needs. This helps families choose a realistic solution instead of simply selecting the most fashionable technology.

Bewertungshinweise für die Reflexion:

- answers the guiding question rather than merely listing technologies
- explains why there is no universal best solution
- recognises that measures can interact as a system
- explains why building and household assessment must come first
- describes the role of professional energy advice
- uses coherent, accurate English and approximately 80-100 words