Heating up Climate Action: Germany's Challenge of Decarbonization and Heat Transition Planning in the Building Sector

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SUMMARY

Decarbonizing the heat supply represents a central challenge for Germany in achieving greenhouse gas neutrality by 2045, as enshrined in the Climate Protection Act. This goal aligns with the UN Sustainable Development Goals (SDGs), particularly Goal 7 (Affordable and Clean Energy) and Goal 13 (Climate Action). The building sector plays a crucial role, accounting for 85% of heat consumption and approximately 30% of energy-related CO_2 emissions. Germany's heat supply still relies heavily on fossil fuels, with natural gas covering around 40% and heating oil approximately 20% of the demand. In contrast, renewable energies contribute only 19%, compared to over 52% in the electricity sector. Although CO_2 emissions in the building sector have been reduced by more than 40% since 1990, progress has recently stagnated. The insufficient annual renovation rate of less than 1% would need to at least double to achieve climate targets.

European directives require each member state to report on the current status of its building stock and its energy efficiency. Key legal frameworks include the 2024 revised Energy Performance of Buildings Directive (EPBD) and the European Energy Efficiency Directive (EED) from 2023. These directives complement each other and form the regulatory backbone of building policy. To date, Germany lacks adequate registers or databases that could comprehensively meet this information need nationwide, unlike other EU member states with nearly complete coverage in a national building registry.

The absence of such statistical data complicates systematic and efficient planning for the heat transition. It is known, for example, that a significant share of the building stock has an energy efficiency rating worse than class E, indicating substantial renovation need - however, exact figures and the identification of specific buildings are lacking. The heat transition requires not only comprehensive political support but also clear strategies, transparent communication, and active

engagement of private property owners to effectively balance social, economic, and environmental objectives. Private property owners, who own over 80% of residential units, are particularly central actors in modernizing the building stock. Their willingness to invest depends largely on whether energy-efficient renovations positively affect property value and whether reliable regulatory and cost planning is ensured. There is thus an urgent need for broader data, more research findings, and generally higher transparency regarding the impact of energy efficiency on property values and cost–benefit analyses of renovations. This, in turn, is likely to significantly increase acceptance of climate protection measures.

Given increasingly complex climate protection regulations and sector-specific decarbonization targets, the government has a growing interest in a comprehensive overview and reliable, precise figures on the status and performance of the building sector. Potential applications are diverse and include identifying needs for policy action in energy monitoring, municipal heat planning, designing, simulating, and evaluating funding programs, fulfilling future regulatory requirements (e.g., identifying the “worst-performing buildings” under the EPBD from 2030 onwards), public building valuation, and more.

This paper examines this complex interplay in detail, with a focus on measures to accelerate decarbonization in the real estate sector and a specific emphasis on the strategic tool of municipal heat planning.