Abstract [en]

This thesis investigates the structural and environmental impacts of the European energy crisis and COVID-19 on Germany's energy system between 2020 and 2024. A mixed-method approach combining quantitative energy data from AG Energiebilanzen (AGEB), BDEW, BMWK, and Eurostat, combined with qualitative analysis was applied to analyse and evaluate disrupted Russian fossil-fuel imports (In 2021, the Russian share of the total import was 53.6% of the natural gas, 49.9% of the hard coal, and 34.1% of the crude oil), emergency policy responses, the impact of market conditions on primary energy consumption, import dependency, and progression of Germany's renewable energy development and transition. Results show that total primary energy consumption declined continuously, falling by about 1.1 % in 2024 compared with 2023, and by 8.8% in 2023 compared to 2022. This reached one of the lowest levels in decades. This reduction was largely driven by high energy prices, milder winters, weak industrial performance, and stored energy reserves from the previous year rather than efficiency improvements, technological advances, or rapid renewable growth. The ratio of domestic production to total consumption remained between 28.21 % in 2019 and 32.07 % in 2024 reflecting continued structural dependence on imports. Renewables expanded gradually reaching 20.04 % of total primary energy consumption in 2024 compared to 14.9% in 2019. On the other hand, production reached 63.43 % in 2024 compared to 53.16 % in 2019. Greenhouse-gas (GHG) emissions declined in parallel with energy demand, but mainly for cyclical reasons rather than structural decarbonisation. Results show that Germany's energy system from 2020 to 2024 revealed a complicated relationship between short-term crisis-driven adaptation and long-term sustainability goals. However, the energy system changed in the following Pattern: Consumption declined due to the crisis, not efficiency. Structural import dependency stayed the same where Russia was replaced by other suppliers. Although renewable energy made steady progress, it wasn't fast enough to meet the goals for 2030 and 2045. Finally, Germany's crisis response—LNG expansion, supplier diversification, and temporary coal use—ensured short-term energy stability but achieved limited environmental progress. Long-term sustainability will depend on faster renewable integration, grid modernisation, and higher efficiency adoption.

Keywords [en]

Germany, energy crisis, primary energy consumption, renewable energy, energy transition, import dependency, Russian war, Ukrainian war, climate, economy.