How to Assess Investment Needs and Gaps in Relation to National Climate and Energy Policy Targets? A Manual - and a Case Study for Germany

A report by

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Executive Summary

Background and Rationale

The Study "*Assessment of investment needs and gaps in relation to the 2030 climate and energy targets of Germany"* is part of the EUKI project "Climate Investment Capacity: climate finance dynamics & structure to financing the 2030 targets". The EUKI project has three main and interlinked components. First, the design of a climate and energy investment map for Germany (CEIM), which has been provided by IKEM. Second, and based on CEIM results, the development of Energy and Climate Investment Needs and Gap Analyses (INGA) – which is presented in this report. Finally, results from INGA and CEIM will be used to deduct Capital Raising Plans (CRPs) in the third phase of the project.

This report addresses the central question **"How to identify and assess the investment needs and gaps (INGA) for the climate and energy transition?"** by providing a review of existing models and studies. Investment needs assessments are relevant to make long-term investment related decisions, both for the public and private sector. This is particularly the case when market failures and public goods require policy intervention to achieve a socially optimal level and allocation of capital. Investment needs assessments produce insights that can be instrumental in evaluating, legitimizing and motivating respective choices by private and policy decision makers.

This structured review provides a key element for the main purpose of this project, namely the strengthening of the understanding and skills of the project's target group, i.e. decision-makers at ministries, public banks, and operators of public financial support schemes who are responsible for tackling the investment challenge of meeting 2030 energy and climate targets in Czechia (CZ) and Latvia (LV). Our report enables them to develop a better understanding of how to capture the 2030 investment challenge and the related investment needs; how to assess them; and what to pay attention to when interpreting the results of such assessments. While this review of the "German case" by itself enables governments to solve the task of assessing investment needs, it provides an excellent basis for starting discussions and interactions with decision makers, desk officers, analysts, and stakeholders. It also informs more generally about how to tackle this task and how governments (in particular) can be supported in this endeavour.

The introduction (chapter 1) is followed by a discussion of the rational and the analytical framework (chapter 2). In chapter 3, we discuss the range of models that are used to analyse investment needs, their key elements and key factors, assumptions, and choices driving their results and outputs. Then we turn from the general discussion to a presentation of specific insights for Germany, providing an overview of the most recent studies analysing climate investment needs in Germany and discuss the analytical approaches and models used (chapter 4). In chapter 5, we illustrate the analysis in practice and exemplify prototypes for assessing investment needs in two sectors: energy efficiency investments in buildings (section 5.1) and renewable energy investments in the energy sector (section 5.2).

Main conclusions

To make the best use of model outputs representing, in our case, investment needs related figures, it is important to understand their underlying drivers. Across the different studies which model Germany's investment needs to reach climate targets in 2030 or 2050, figures range from EUR 24.9 billion to EUR 58.5 billion annually. The wide range is determined by discrepancies in scenarios, and in underlying models and assumptions. This illustrates the importance of understanding the differing frameworks in investment needs assessment studies.

Estimates of investment needs depend on assumptions that are taken along the course of the modelling-process. Some are more important than others, some are more controversial than others and some may not be obvious in the face of the (necessarily) complex modelling framework required for sophisticated estimates. Examples include price assumptions for fuels, carbon credits, technologies, model boundaries, macroeconomic expectations on economic growth and size of population.

Moreover, it is crucial to understand modelled target scenarios and in particular what is and what is not included in the baseline (i.e., the business as usual or reference case), since investment needs are commonly stated as *additional* costs *on top* of the reference case. When comparing different investment needs figures, one should appreciate the modelled policy scenarios but also take the differing time frames (e.g., 2030 vs. 2050), reference years, metrics (e.g., incremental costs vs. full costs, which is especially important for energy efficiency investments in the buildings sector), and sectoral scopes (e.g., renewable energy investments in the power sector or across all sectors, including heating) into account.

Technical Conclusions from the model review

1. Business-as-usual (BAU) and the choice of scenarios influence the estimated investment needs.

Climate and energy targets are the starting point of INGAs. They are determined politically and defined in national climate and energy transition commitments. They are not necessarily outcomes of assessment studies. Hence, under the same emissions target, different pathways and scenarios are analysed. They can affect in different ways the unfolding of the energy transition resulting in different energy demand, supply, and technologies. Accordingly, investment needs to achieve climate and energy 2030 targets will vary across scenarios.

2. Models differ in their assessment of investment.

Concerning the sector and subsector of interest, it is important paying close attention to the modelling framework. A macroeconomic model, for instance, potentially lacks the required degree of precision on a sectoral level as they mostly just overlook energy markets functioning mechanisms, whereas a specific focus on the energy system is required to provide robust results through taking demand- and supply-side factors into account.

When it comes to technology analyses, substitution cost curves are accurate and easy-to-use instruments that allow users to identify the least costly options to achieve climate and energy targets. Caution is required when the substitution cost curves have a limited emissions abatement scope. Indeed, on the one hand, GHG emissions derive from a wide range of economic activities that are not always accounted for; on the other hand, there are emissions resulting from activities (e.g. agriculture) that are also greenhouse gases but not included in measures such as total final energy consumption (TFEC). Large potential lies in those sectors that are seldom included in investment needs assessments. Accordingly, especially in countries where those economic activities contribute to a large share of GHG emissions (e.g., agriculture in Latvia contributes ca. 4% to GDP but was responsible for 23.6% of total GHG emissions in 2016[1]) investment needs assessments shall have a comprehensive scope.

3. Investment Needs Assessments are Sensitive to the Underlying Assumptions. Assumptions like the price estimates on fuel, technology, interest rates, learning rates, capacity and deployment pathways, and so forth, affect the investment needs projections for the climate and energy transition.

[1] According to Latvia's draft NECP (2019), see: https://ec.europa.eu/energy/sites/ener/files/documents/latvia_draftnecp_en.pdf

Such assumptions can inflate or constrain the estimated investment needs and, in turn, the deployment of the focal technologies. Furthermore, regulatory and policy assumptions also play a relevant role in the deployment of new technologies. Elements such as disruptive technological innovations or extreme climate events are naturally difficult to account for, nevertheless, they might well affect future investments. Therefore, it is important to account for unexpected events and design appropriate risk management strategies.

4. The Two Sector Studies Confirm the Relevance of Scenario Choices and Parameter Assumptions. In the buildings sector, assessing the buildings stock is of primary relevance, and is, combined with renovation and reconstruction rates, the starting point of INGAs. Then different technology options, relative costs and benefits can be assessed for the calculation of the net present value of future investments that would allow to achieve climate and energy targets. Indeed, they have a large effect on investment need estimates. As the result of differing parameter and model framework assumptions, the annual estimated (additional) investment needs of our considered studies vary from 2.1 to 29.3 billion EUR. However, large parts of the discrepancies can easily be explained.

In the case of renewable energy (RE) deployment, short-term demand and supply dynamics are important to have optimal renewable power flexibility and costs and (related) investment decisions. Higher granularity for large temporal resolution and coverage of operational constrains is necessary to model renewable energies deployment. Long-term energy market models are often inadequate to calculate revenue streams for renewable energy projects. As with the building case, different assumptions on costs, technology options, their (relative) costs and benefits have a large effect on investment needs. In line with the studies on the building sector, estimated results differ significantly: three considered studies provide figures ranging from 4.4 to 12.8 billion EUR per year.