



# How Public Investment Banks Drive Germany's Renewable Energy Transition

Paola D'Orazio, Chair of Economics, Chemnitz University of Technology, Thüringer Weg, 7, Chemnitz 09126, Germany. E-mail: [paola.dorazio@wiwi.tu-chemnitz.de](mailto:paola.dorazio@wiwi.tu-chemnitz.de)

## Resumen

Este artículo examina el papel de los bancos públicos de inversión en la movilización de inversiones en energías renovables en Alemania, con un enfoque en instituciones como KfW, LR y L-Bank. Estos bancos ofrecen préstamos concesionales, garantías y financiación de proyectos clave para impulsar la transición energética del país. A pesar de sus importantes aportaciones, existe una brecha de financiación respecto a los niveles necesarios para alcanzar las metas climáticas de Alemania. El análisis destaca la importancia de las alianzas público-privadas y de mecanismos financieros innovadores, como los bonos verdes, para cerrar esta brecha y cumplir los objetivos climáticos a largo plazo.

Clasificación JEL: Q42, G23, H8

## Abstract

This paper explores the role of public investment banks in mobilizing renewable energy investments in Germany, focusing on institutions like KfW, LR, and L-Bank. These banks provide critical concessional loans, guarantees, and project financing to support the country's energy transition. Despite significant contributions, a financing gap remains between current investments and the levels needed to meet Germany's climate targets. The paper highlights the importance of public-private partnerships and innovative financial mechanisms, such as green bonds, to bridge this gap and ensure the country stays on track to achieve its long-term climate goals.

JEL Classification: Q42, G23, H8

- 01 Introduction**
- 02 The German Context: Renewable Energy and Public Investment Banks**
- 03 Financing Needs for Renewable Energy**
- 04 The Role of State-Owned Banks**
- 05 Public-Private Partnerships and Financing Models**
- 06 Challenges and the Future of Renewable Energy Financing**
- 07 Conclusion**

## 1. Introduction

Germany is internationally recognized for its ambitious *Energiewende* policy, which aims to transition from fossil fuels and nuclear energy to renewable energy (RE) as the dominant source of electricity. This transition is critical for achieving the country's climate targets under the Paris Agreement and leading the way in global climate change mitigation efforts. Renewable energy investments are essential to reducing greenhouse gas (GHG) emissions but require substantial financial resources and support from both public and private sectors.

Public investment banks, especially in Germany, are crucial in bridging the financing gap for renewable energy projects. Institutions such as Kreditanstalt für Wiederaufbau (KfW), Landwirtschaftliche Rentenbank (LR), and Landeskreditbank Baden-Württemberg (L-Bank) have been instrumental in driving renewable energy financing. These banks provide concessional loans, guarantees, and project financing, helping to de-risk investments and mobilize private capital for renewable energy projects. This text explores the role of these public banks in Germany's energy transition, challenges in maintaining investment levels, and the evolving dynamics of public-private partnerships in climate finance.

## 2. The German Context: Renewable Energy and Public Investment Banks

Germany's energy sector has historically been one of the largest contributors to its GHG emissions, making the transition to renewable energy vital for achieving the country's climate goals (Matthes, 2017). Germany's *Energiewende* policy has been in place since the early 2000s, and it focuses on reducing the

country's reliance on nuclear and coal energy while promoting the use of renewable sources like wind, solar, and biomass. According to the International Energy Agency (IEA), the energy sector accounts for about 85% of Germany's total GHG emissions, underscoring the importance of accelerating the energy transition.

Public investment banks have been key players in Germany's financial ecosystem for renewable energy, leveraging public capital to mobilize private investments. KfW, LR, and L-Bank are three of the most prominent public financial institutions contributing to renewable energy projects. Together, they account for approximately 75% of the total balance sheets of promotional banks in Germany (D'Orazio & Löwenstein, 2022). KfW, the largest public bank, has been particularly active in financing renewable energy through concessional loans, providing on average 4.7 billion euros per year between 2010 and 2018. However, despite this significant contribution, Germany faces challenges in maintaining the required level of investment to meet its ambitious emissions reduction targets (IRENA, 2015).

### 3. Financing Needs for Renewable Energy

One of the key challenges in the global transition to renewable energy is the substantial investment required to develop and implement clean energy technologies. According to the International Renewable Energy Agency (IRENA, 2017), Germany needs to invest approximately 14 billion euros annually in renewable energy to meet its climate goals by 2030. The current level of investment, however, falls short of this target, with a noticeable decline in new renewable energy investments since 2012. The financial gap is further exacerbated by the high upfront costs and long payback periods associated with renewable energy projects, which often deter private investors (Egli et al., 2018).

Public investment banks in Germany have filled a crucial role in addressing this financing gap by providing concessional loans and guarantees that reduce the cost of capital for renewable energy projects. KfW, for instance, has provided

financing for renewable energy through programs such as the Renewable Energies Standard and Renewable Energies Premium programs. These programs have offered favorable financing terms, including low-interest loans and long repayment periods, which have made renewable energy projects more attractive to private investors.

However, D'Orazio and Löwenstein (2022) note a decline in KfW's new commitments for renewable energy financing since 2012, with the bank's annual contribution decreasing from 8.9 billion euros in 2010 to 905 million euros in 2018. This decline reflects broader trends in Germany's renewable energy sector, where feed-in tariffs and other policy incentives that previously spurred investment have been scaled back in favor of market-based mechanisms like auctions (Frondel et al., 2010).

Although smaller than KfW, LR and L-Bank have also made important contributions to renewable energy financing. For example, LR's Energie vom Land program focuses on supporting renewable energy projects in rural areas, particularly in the agricultural and forestry sectors. This program has provided between 1.5 and 2.5 billion euros annually for renewable energy projects, playing a key role in promoting bioenergy and wind power in less urbanized regions (Rentenbank, 2019). L-Bank, meanwhile, has contributed to renewable energy financing on a smaller scale, with an average annual financing of 89 million euros between 2010 and 2018.

### 4. The Role of State-Owned Banks

State-owned banks like KfW, LR, and L-Bank are significant sources of direct financing and act as catalysts for private investment by reducing risks through guarantees and concessional loans. These banks follow a dual model of first-tier and second-tier lending. First-tier lending involves direct financing of renewable energy projects, while second-tier lending entails collaboration with private banks, which assess loan applications and pass them on to public investment banks for financing. This approach leverages private banks' customer relationships

and local expertise while maintaining the favorable financing conditions of public investment banks (Boitan, 2016).

Public investment banks have also proven to be less pro-cyclical than commercial banks, maintaining their lending activity even during economic downturns. This characteristic has been particularly important in the context of the global financial crisis and the COVID-19 pandemic, during which private banks have been more reluctant to finance high-risk and long-term investments like renewable energy projects (Micco & Panizza, 2006). As a result, public banks have been able to sustain renewable energy investments even when private capital flows have dried up.

Despite the crucial role of public banks, Germany faces a growing gap between the investments needed to meet its renewable energy goals and the available financial resources. According to D'Orazio and Löwenstein (2022), while public investment banks have made significant contributions to renewable energy financing, their resources alone are insufficient to meet the country's long-term energy transition needs. This has led to calls for greater private sector involvement in renewable energy financing, with a particular focus on innovative financial instruments like green bonds and sustainability-linked loans, which can attract institutional investors seeking environmentally sustainable assets (Mazzucato & Penna, 2016).

## 5. Public-Private Partnerships and Financing Models

Germany's financial system, particularly its "three-pillar" structure, allows for a unique blend of public and private sector cooperation in renewable energy financing. Public investment banks often work in conjunction with private banks, insurance companies, and institutional investors to mobilize capital for renewable energy projects. This partnership is facilitated by the second-tier lending model, in which public banks provide the capital while private banks

handle the risk assessment and loan management.

One example of successful public-private collaboration is the offshore wind sector, where KfW has partnered with private banks and energy companies to finance large-scale wind farms in the North Sea and the Baltic Sea. Offshore wind projects are capital-intensive, requiring billions of euros in upfront investments, but they offer significant long-term returns in clean, renewable energy. KfW has helped de-risk these projects by providing concessional loans and guarantees, making them more attractive to private investors (Morris & Jungjohann, 2016).

Moreover, public investment banks have been instrumental in developing innovative financing mechanisms such as green bonds. KfW has been a pioneer in issuing green bonds, raising billions of euros for renewable energy projects through the bond markets. These bonds provide an additional source of capital for renewable energy projects, allowing institutional investors like pension funds and insurance companies to invest in low-carbon assets (Migendt et al., 2017). Green bonds have become a popular tool for financing climate-friendly investments worldwide, and Germany's public investment banks have been at the forefront of this trend.

## 6. Challenges and the Future of Renewable Energy Financing

Despite the positive contributions of public investment banks, Germany faces significant challenges in meeting its renewable energy and emissions reduction targets. The country has made progress in reducing GHG emissions, with a 27.5% reduction between 1990 and 2017 (UBA, 2019). However, this reduction falls short of the targets set under the Paris Agreement, and the pace of emissions reductions has slowed in recent years. The decline in renewable energy investments, particularly since 2012, is a major factor in this slowdown.

The reduction in feed-in tariffs, which were instrumental in driving early investments in renewable energy, has made it more difficult for public banks to attract private capital. In response, Germany has shifted to an auction-based system for renewable energy projects, where developers bid for contracts to supply renewable energy at the lowest possible cost. While this system has successfully driven down the cost of renewable energy, it has also introduced greater uncertainty for investors, particularly smaller developers who may struggle to compete with larger, more established companies (Hoppmann et al., 2014).

Germany will need to scale up its renewable energy investments significantly to meet its climate goals. The IEA estimates that Germany must increase its renewable energy capacity by 50% by 2030 to meet its targets. To achieve this, the country will need to mobilize additional private capital through innovative financing mechanisms such as green bonds, sustainability-linked loans, and public-private partnerships.

## 7. Conclusion

Germany's energy transition requires the combined efforts of the public and private sectors. Public investment banks like KfW, LR, and L-Bank have been instrumental in financing renewable energy projects, but their resources alone are not enough to meet the country's long-term goals.

To bridge the growing investment gap, Germany must continue to innovate in climate finance, expanding the use of green bonds and public-private partnerships while maintaining policy support for renewable energy projects.

The success of Germany's *Energiewende* will depend on the ability of public and private institutions to work together to mobilize the necessary financial resources. Public investment banks will continue to play a critical role in de-risking renewable energy investments, but the private sector must also step up to provide the scale of investment needed to achieve a low-carbon economy. With the right mix of public and private financing, Germany can lead the way in the global energy transition and meet its long-term climate targets.

## References

Boitan, I. A. (2016). Examining the Role of National Promotional Banks in the European Economy: Emerging Research and Opportunities: Emerging Research and Opportunities. Hershey, USA: IGI Global.

D'Orazio, P., & Löwenstein, P. (2022). Mobilising investments in renewable energy in Germany: which role for public investment banks? *Journal of Sustainable Finance & Investment*, 12(2), 451-474.

Egli, F., Steffen, B., & Schmidt, T. S. (2018). A dynamic analysis of financing conditions for renewable energy technologies. *Nature Energy*, 3(12), 1084.

Fronzel, M., Ritter, N., Schmidt, C. M., & Vance, C. (2010). Economic impacts from the promotion of renewable energy technologies: The German experience. *Energy Policy*, 38(8), 4048-4056.

Hoppmann, J., J. Huenteler, and B. Girod. 2014. "Compulsive Policy-Making. the Evolution of the German Feed-in Tariff System for Solar Photovoltaic Power." *Research Policy* 43 (8): 1422-1441.

International Renewable Energy Agency (IRENA). (2017). *Insights Series 2017 – Perspectives for the Energy Transition: Investment Needs for a Low-Carbon Energy System*, 1-204.

International Renewable Energy Agency (IRENA). (2015). *Renewable Energy Prospects: Germany, Remap 2030 Analysis*, 1-133. Abu Dhabi.

Matthes, F. C. (2017). Energy transition in Germany: A case study on a policy-driven structural change of the energy system. *Evolutionary and Institutional Economics Review*, 14(1), 141-169.

Mazzucato, M., & Penna, C. C. (2016). Beyond market failures: The market-creating and shaping roles of state investment banks. *Journal of Economic Policy Reform*, 19(4), 305-326.

Micco, A., and U. Panizza. 2006. "Bank Ownership and Lending Behavior." *Economics Letters* 93 (2): 248-254.

Migendt, M., Polzin, F., Schock, F., Täube, F. A., & von Flotow, P. (2017). Beyond venture capital: An exploratory study of the finance-innovation-policy nexus in cleantech. *Industrial and Corporate Change*, 26(6), 973-996.

Morris, C., & Jungjohann, A. (2016). *Energy Democracy*. Berlin: Germany's Energiewende to Renewables.

Rentenbank, L. March 2019. *Geschaäftsbericht 2018*, 1-144.

UBA (Umweltbundesamt). (2019). *National Trend Tables for the German Atmospheric Emission Reporting 1990-2017*.

## Biography

Paola D'Orazio is a Junior Professor of Economics at Technische Universität Chemnitz. Her research focuses on the complex relationship between climate-related financial policies and the stability and transformation of financial systems towards a sustainable, low-carbon economy. Her diverse but interconnected research interests include Macroeconomics, International Economics, Central Banking, Financial Instability, and Climate and Environmental Risks.