

Wiley Finance Series

Infrastructure

as an

Asset Class

*Investment Strategy, Sustainability,
Project Finance and PPP*

Second Edition

BARBARA WEBER
MIRJAM STAUB-BISANG
HANS WILHELM ALFEN

WILEY

‘Infrastructure is a key prerequisite for economic development and is the backbone of any society, directly impacting the lives of all citizens. Sustainable infrastructure protects our world’s vital natural resources and environment, and promotes a more effective and efficient use of financial resources. This second edition of *Infrastructure as an Asset Class* integrates important sustainability aspects into infrastructure investing, making it an indispensable resource for long-term infrastructure investors and policy makers alike.’

Prof. Klaus Schwab, Chairman, World Economic Forum

‘This updated book has come at a crucial point for institutional investment in infrastructure. Pension funds are maturing in a low return environment and need both the capital growth and cash flows which infrastructure investments can offer. The breadth and depth of practical experience shared by the authors will be invaluable to those assessing the risks and rewards of investing in this asset type.’

Sally Bridgeland, Chair, Local Pensions Partnership Investments Ltd

‘A larger and even more elaborate piece of new and valuable information on infrastructure and a well written must-read for market participants of all kinds.’

Ron Boots, APG, Head of Infrastructure Europe

‘Dr. Weber, Dr. Staub-Bisang and Professor Alfen have produced an excellent update to their important 2009 work on infrastructure investment. This edition succinctly captures the developments of this fast-growing market in light of the close-to-zero interest rates and strained government budgets. The book not only guides and inspires practitioners but should also be mandatory reading for pension fund board members and trustees, so as to gain valuable information about the opportunities and risks in this asset class.’

Torben Møger Pedersen, Pension Danmark, CEO

‘Infrastructure is key to robust and sustainable economic growth and also represents a significant opportunity for investors. Dr. Weber and her co-authors deliver an authoritative guide to this multi-faceted market, addressing both the opportunities in the various sectors and the risks. The book is essential reading for any investment professional as the asset class not only represents an opportunity to diversify a portfolio, but also the chance to benefit from global trends fuelled by renewed government interest and investment in infrastructure. The greater emphasis in this edition on sustainable infrastructure is particularly welcome and of course very topical.’

Chris Knowles, EIB, Head of Climate Finance

‘The authors strike a very good balance between a high-level description of the asset class and a more in-depth and comprehensive coverage of the various sectors and subsectors in the infrastructure investment universe. This book has been written by experienced industry practitioners, which is clearly evidenced by the many real-world examples and case studies covered throughout the book. In a unique way, the book also integrates ESG topics, which are growing in importance in the infrastructure space. All this makes the book a must-read not only for investment professionals, risk managers and pension fund trustees starting to get involved with the asset class, but also for experienced participants in the infrastructure market.’

Christoph Manser, Head of Infrastructure Investments, Swiss Life Asset Managers

‘This book provides readers from the public sectors and investment professionals alike with comprehensive guidance to organisational models, value chain elements and the immense investment needs in the water sector. With “water” having been identified by the WEF not only as a social and political risk, but also as the number 1 business risk, efforts from all sectors of society are necessary to tackle this ardent issue!’

Peter Brabeck, Chair, 2030 Water Resources Group; Chairman, Nestlé SA

‘Long-term and sustainable investments into renewable energy and the maintenance of existing assets are essential for the global energy transition. Not only the energy sector, but all infrastructure areas are facing urgent needs for new investments. In a clear and instructive way, this book provides a comprehensive overview of various infrastructure sectors and is a must-read for all interested in sustainable infrastructure investments.’

Dr. Suzanne Thoma, CEO of the BKW Group

‘Barbara has a wonderful understanding of the infrastructure asset class and all its nuances. This new edition captures the essence of how both investors and the opportunities they are pursuing have evolved over the last 6 years as infrastructure has become an increasingly core long-term asset class.’

Mike Weston, Chief Executive, Pensions Infrastructure Platform (PIP)

‘The first edition was one of those rare books that left the reader wishing that it had been written when they were a novice in the field, while still managing to cover the state of the art; yet the second edition manages to improve upon it. The new stress on sustainability and ESG places it centrally in today’s international marketplace for infrastructure investment.’

Con Ceating, Research Commission European Federation of Financial Analysts Societies

‘For anyone involved in infrastructure PPP – public sector professionals and private investors alike – this book provides critical insights: Not only does it categorize the different organisational models of PPP investment, but it also positions PPP within the broader context of infrastructure investing and project finance and helps consider the increasingly important environmental, social, and governance dimensions involved.’

Gilbert Probst, Co-Founder of the Geneva PPP Center, Chair for Organisational Behaviour and Organisation, University of Geneva, and Member of the Executive Committee, World Economic Forum

‘Sustainable infrastructure and private capital from institutional investors are very important elements in realising the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals. The book *Infrastructure as an Asset Class, Second Edition*, addresses these issues from an investor’s point of view, explaining why it is rational to invest in infrastructure, and even more so if built in a sustainable way. The book is a very important tool for investors, international officials and public servants alike.’

Michael Møller, Director-General, United Nations Office at Geneva

Infrastructure as an Asset Class

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*Investment Strategy, Sustainability,
Project Finance and PPP*

Second Edition

**BARBARA WEBER
MIRJAM STAUB-BISANG
HANS WILHELM ALFEN**

WILEY

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Preface

Investors and governments globally continue to express strong interest in infrastructure, yet for different reasons. Governments have ever-rising, partially urgent needs for new infrastructure and the maintenance of existing assets, which are the backbone of any society and hence strongly determine its quality of living. Investors search for yields in order to meet their long-term liabilities faced with a seemingly continuing low-interest rate environment. Infrastructure investments may be part of the solution.

At the same time, awareness of time-critical sustainability questions in general, and environmental or climate issues in particular, seem to have reached a tipping point. Governments, NGOs and financial institutions as well as institutional investors, such as insurance groups and pension funds, have joined forces internationally to address these major challenges and agree on sustainability goals.

Given the above, governments, societies, and investors alike are particularly interested in (renewable) energy-related and social infrastructure assets. This second edition addresses this interest with new sector sections on renewable energy, energy transmission and storage (electricity, natural gas, district heating), as well as social infrastructure (hospitals, schools, administrative facilities). Sustainability aspects related to infrastructure investments are addressed throughout the book, in all subsectors and in the investment process. Furthermore, it includes a new section on infrastructure benchmarking, which will prove useful to many investors and their advisors.

Last but not least, all relevant economic data and statistics, which have changed since 2010, when the first edition was published,¹ have been updated. In a number of instances, the new data required new interpretations of the overall situation.

The purpose of this book is to comprehensively guide investors who are considering investing, or already invest, in infrastructure through the basic and advanced essential concepts of infrastructure investing. These include an understanding of the market and how closely related sustainability aspects are with the market, as well as any investment decision, benchmarking, possible investment approaches, organisational and contractual models and structures, characteristics of the most important infrastructure sectors and subsectors, general, sector-specific and project-specific risk assessment (including ESG factors), and project finance.

To this end, we unite the pressing topics of infrastructure investments, sustainability, project finance and public–private partnerships (PPPs). For this, we systematically process and classify a compiled basis of theoretical information and illustrate it with examples and case

¹*Infrastructure as an Asset Class*, Barbara Weber and Hans Wilhelm Alfen, John Wiley and Sons, 2010.

studies relevant to practitioners in industry, finance, international organisations and various areas of the public sector. We discuss the differing objectives and expectations of the many parties involved in infrastructure provision and investing. Specific attention is given to risks surrounding infrastructure assets and investments, which is reflected by a new chapter dedicated to risk.

With this book, we predominantly address the needs of advanced readers to deepen their knowledge and to receive up-to-date industry information, while we seek at the same time to meet the expectations of comparatively inexperienced readers who may want to take a closer look at the potential of infrastructure investment for their institutions. The book answers key questions, such as:

- How is infrastructure defined? Which sectors/assets are classified as infrastructure, how are they categorised and what are the differences between them?
- What are the characteristics of infrastructure as an asset class?
- How is a sustainable investing approach to infrastructure assets applied?
- What are suitable infrastructure investment strategies and approaches for different types of investors?
- How are suitable benchmarks for infrastructure investments defined and developed?
- What ESG risk factors need to be considered in new infrastructure projects and operating assets alike? What tools are available for assessing ESG risk factors?
- How are direct and indirect infrastructure investments categorised and evaluated?
- Which organisational structures and business models exist to finance infrastructure projects with private capital?
- Which risks do these structures and models entail and how can the risks be addressed?
- How should assets be structured in order to best allocate the risks in the context of an investment?

In addition to background knowledge and information on the latest developments in the individual subject areas, we provide specific instructions and concrete proposals on the approach to adopt when assessing and making investments in infrastructure assets, whether directly or via investment funds (indirect investments). This includes the analysis, structuring and implementation of project finance, which is at the core of almost any infrastructure investment.

The contents of this book are based on the practical experience and broad theoretical knowledge of the authors. To this end, this second edition benefits greatly from the knowledge of our new co-author Mirjam Staub-Bisang, who helped us address sustainability and environmental, social and governance (ESG) matters. Throughout the book, we illustrate how to incorporate them in every infrastructure investment decision. Hans Wilhelm Alfen, the co-author of the first edition, contributed a new section on social infrastructure to this edition in addition to the revision work completed on a number of key sections.

A Note from the Publisher

The landscape of infrastructure investing has changed profoundly since the publication of the first edition of this book. As a result of these changes the second edition has been fully revised and updated, but also much expanded.

The book's lead author Dr Barbara Weber and Dr Staub-Bisang, who joined the team as a co-author in order to complete this work, have been responsible for the vast majority of the updating and revision throughout this volume. They are responsible for all new content in this volume, with the exceptions noted below.

Prof Dr Hans Wilhelm Alfen, the co-author of the first edition, ably supported the project. He is primarily responsible for Section 1.3, the entirety of Chapter 3, as well as Section 4.1, 4.2, 4.3 and Section 4.7. Section 5.1 and Chapter 6, parts of which are originally based on Prof Dr Alfen's research, have been substantially and substantively revised by Barbara.

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Further, we would like to thank all our colleagues in the industry, from representatives of pension funds and insurance companies, corporate and public investors in infrastructure, through to fund managers, placement agents and journalists, who kindly supplied information on their companies and information about current and historical developments in the infrastructure market. Their contributions have been an important factor in improving the quality of this book and ensuring that it is up to date and state of the art.

About the Authors

Dr. **Barbara Weber** is Founding Partner of B Capital Partners AG, an investment advisory firm focused on building institutional infrastructure portfolios of all shapes – direct and (secondary) fund investments, equity and debt. It offers related strategic and asset allocation services to institutional clients as well. Barbara is also a member of the investment committee of the Swiss pension funds' infrastructure platform IST3. She has over 19 years of direct and fund investment experience in these areas gained with Dresdner Kleinwort Benson, Poly-Technos and, since 2003, B Capital Partners AG. She previously worked for the private-sector development group of the World Bank in Washington, DC on Russia. Barbara wrote her PhD in Economics at Harvard University and University of St. Gallen. She holds an MSc in Business and Operations Research from Warwick University and a postgraduate degree in International Relations from Mannheim University. She continues to lecture at various universities and is the author of several books and articles on infrastructure investing.

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Introduction

BACKGROUND AND OBJECTIVES

The quality and volume of infrastructure has a positive effect on the attractiveness, competitiveness, sustainability and economic growth of countries, cities and municipalities. Infrastructure opens up new business opportunities and promotes trade as well as the expansion of existing economic activity. It also improves the standard of living of the public by giving people access to essential resources, such as water and electricity, schools, hospitals and markets. This is even more true if the development of infrastructure is done in a sustainable way.

Notwithstanding, around the world – in highly developed industrialised nations, high-growth emerging economies and developing countries alike – there is a growing gap between the acute need for new or modernised infrastructure, maintenance and overhaul measures and the actual level of investment and current expenditure, as evidenced by crumbling bridges, broken highways and leaking water pipelines. The public sector, which is traditionally responsible for infrastructure, frequently claims to have a number of other priorities that prevent it from investing the necessary funds in closing this gap, which is so vital for societies in terms of furthering development and prosperity.

Institutional financial investors with a long-term perspective, such as insurance companies, pension funds, sovereign wealth funds, endowments and foundations, are increasingly investing in infrastructure assets, therewith joining strategic investors such as construction, energy and utility companies who have done so for decades. This is because (conservatively structured) infrastructure investments provide attractive returns in a low-interest-rate environment and, additionally, serve to diversify and thus improve the risk-return profile of an investor's overall investment portfolio on account of their low correlation with traditional asset classes.

The volume of private capital in infrastructure is expected to increase significantly in the future and to a certain extent will be essential to help close the aforementioned funding gap for the public sector and ensure further economic growth. This holds in particular for emerging economies.

Going forward, investors in (new) infrastructure assets need to consider rigorously and factor in sustainability and ESG aspects such as environmental risks (e.g. climate change and natural resource scarcity), as well as social and governance risks (mainly) in emerging economies in their investment decisions.

The market for infrastructure is vast and, contrary to popular belief, the range of potential infrastructure investments is extremely broad, which presents challenges and opportunities for most investors. While they appreciate the enormous market potential and the possibly excellent

fit of the asset class with their own investment goals and their existing portfolio, they may lack a sufficient overview of the infrastructure market and/or insight into suitable investment opportunities and their related risks. Furthermore, institutional investors with a sustainable investing mandate may miss clear information and tools for assessing and integrating sustainability considerations in their investment process as well as related risks in their overall risk analysis of infrastructure projects. All of the above make it challenging for investors to take the right investment decisions for their individual strategies and existing portfolios.

This book offers a way out of the dilemma, providing investors with the necessary theoretical knowledge and background information as well as practical examples to help further their understanding of the key aspects of infrastructure investments with a particular focus on appropriate organisational structures, finance, benchmarking and sustainability.

As a minimum, professional investors should have a sufficient understanding of the infrastructure sectors and the corresponding markets and industries along with the relevant legal, contractual, institutional and commercial conditions – which can vary significantly from region to region and sector to sector – to allow them to identify inherent project-specific risks and to determine their prospective risk-return profiles. This is particularly important if the sectors in question have been dominated by the special rules and restrictions of the public sector in the past and are being opened up to the investment conditions required by private investors only on a gradual basis.

This brings us to a basic, yet vital, question: what exactly is infrastructure? We discuss the applicability and validity of various definitions of this term in detail in Section 1.3, but for now it is sufficient to note we use the following common and practical definition throughout this book:

Infrastructure generally describes all physical assets, equipment and facilities of interrelated systems and the necessary service providers, together with its underlying structures, organisations, business models and rules and regulations, offering related sector-specific commodities and services to individual economic entities or the wider public with the aim to enable, sustain or enhance social living conditions.

Typical examples of infrastructure include roads, airports, ports, oil and gas networks, energy generation, including renewable energy (e.g. wind, solar, hydro, biomass), water supply, waste water and waste disposal as well as social infrastructure, which includes public facilities such as schools, hospitals, administrative buildings and social housing.

Many investors are interested in the comparatively stable and predictable current income with moderate volatility and risk relatively independent of macroeconomic conditions, which is generated by a certain subset of infrastructure assets – return features shared by real estate or long-term, fixed-income investments. The long-term nature of infrastructure investments allows pension funds and insurance companies to use them to match the maturity structure of their liabilities. Infrastructure assets with this return profile are the driving force behind infrastructure's reputation as an attractive asset class – a hybrid with characteristics of debt, equity and real estate.

Although infrastructure investments certainly can have this comparatively low-risk profile, it is not necessarily so, and unless structured accordingly such investments can entail significant risks similar to those of investments in traditional companies. For any potential investment, these risks must be identified and assessed carefully.

To this end, we provide a fundamental understanding of infrastructure in general, the differences – in some cases significant – between infrastructure measures and key performance indicators (KPIs) within a sector and the various infrastructure sectors themselves.

A new section on benchmarking allows readers to assess the performance of infrastructure investments against a suitable benchmark. The suitability of a benchmark is determined primarily by the desired risk-return profiles and characteristics.

The systematic procedures and analytical tools we propose, enable readers to understand and evaluate both direct investments in infrastructure assets and indirect (fund) products along with their complex underlying project finance structures. Taken together, they allow the assessment of the risk-return profiles of the respective infrastructure investments.

Given that risk-return analysis, assessment and structuring are at the core of infrastructure investing, the main risks of infrastructure assets are discussed comprehensively in an individual chapter in this new edition. The risk analysis and assessment flows right into, and is among the most important input factors for, structuring the project financing, which itself is a crucial part of the financing of infrastructure assets involving the private sector.

Project finance has a number of benefits compared with traditional forms of financing; however, it also requires a deep understanding of financing structures and complex analytical approaches. All in all, a successful project finance fundamentally depends on the ability to develop the appropriate contractual structure for the respective sector in terms of optimal allocation of risk among the parties involved, financing and value added, competition/regulation and the possibility of private-sector involvement. *It is the contractual structure that predominantly determines the risk-return profile of each individual infrastructure asset.* To this end, the book guides readers step by step through the various phases of project analysis, using practical examples, and provides an introduction to concrete financing instruments and techniques.

This book is aimed at the following groups in particular:

- Financial investors, e.g. insurance companies, pension funds, fund managers and banks;
- Strategic investors, e.g. construction, operation and supply groups, technology suppliers and facility managers;
- Public authorities responsible for infrastructure in the various sectors, in particular ministries of construction and regional building authorities, including their budget departments, as well as ministries of finance and legal supervisory institutions such as audit courts;
- Public and private infrastructure companies, e.g. power suppliers, water supply and disposal companies, airports and railroad companies;
- International organisations, e.g. The World Bank, EIB, OECD, which seek to support and incentivise infrastructure investments on the part of the private sector.

The book's in-depth theoretical basis also makes it suitable as a textbook for students.

STRUCTURE

Conceptually speaking, we have divided this book into three parts. The first part consists of Chapters 1 and 2. In Chapter 1, we provide an overview of the international infrastructure market with a particular focus on demand for infrastructure assets and the expected capital

requirements. This is followed by an introduction to sustainability and the need for sustainable infrastructure. Chapter 1 concludes with an overview of the most important infrastructure sectors, the country-, sector- and project-specific characteristics influencing the risk-return profiles of the infrastructure sectors (and hence any respective investments) and a discussion of their general cross-sector characteristics.

Chapter 2 begins with an overview of some of the most experienced and/or largest global infrastructure investors. We then provide an introduction to infrastructure as an asset class by going through a substantial body of research in this field and discussing the main investment characteristics of the asset class – stand-alone as well as in comparison with and in relation to other asset classes. We conclude that infrastructure comprises a broad variety of assets, and hence appears to be a hybrid between bonds, real estate and (private) equity, which should indeed be considered an asset class on its own.

Given its variety, benchmarking (especially unlisted) infrastructure is challenging. This new edition addresses this problem by guiding investors through the basics of benchmarking and offering them a selection of potentially suitable benchmarks depending on their individual investment strategy.

Chapter 2 continues by making the case for sustainable investing in infrastructure, starting with the history and definition of sustainable investing and how it is framed within the larger investment spectrum. This is followed by an introduction to the ESG factors that are crucial to assessing the sustainability of an infrastructure investment. Chapter 2 concludes with an overview of the different approaches to infrastructure investing, that is via listed as opposed to unlisted assets and direct as opposed to fund investments. It then focuses on unlisted assets, and in particular fund investments, because they represent the entry point to the infrastructure market for most investors.

The second and third parts of the book focus on direct investments only. Accordingly, Chapter 3 provides investors with an investment evaluation framework for direct assets. Referred to as the ‘organisational model’, it gives a structured overview of the various approaches to develop and organise infrastructure delivery with a particular focus on private investments. The aim of our model, which distinguishes between privatisation, partnership, business, contractual and financing sub-models, is to allow investors to analyse and classify individually any infrastructure investment opportunity on the basis of its ordinary components and its general, technical, economic, financing and legal/contractual key determining factors. In order to facilitate this classification, we list the common types of organisational models around the world. This enables investors to better understand and internationally compare, for example, the ownership and/or involvement of the partners and stakeholders and their contractual relationships, the payment mechanisms, incentive structures and resulting flows of funds, as well as the risks and risk allocation. In order to help the reader understand this highly complex model, we make use of examples from around the world.

Chapter 4 describes the typical characteristics of most infrastructure sectors and sub-sectors, that is transport and traffic (including road, rail and water transport/ports as well as air transport), water supply/disposal, solid waste management, renewable energy generation (leaving out traditional energy generation), energy transmission/distribution networks and storage (electricity and gas), as well as social infrastructure. We break down the discussion of each of these sectors into five areas: organisation, financing and value added, competition/regulation, private sector involvement and sustainability considerations. These aspects seem to be – consistently across all sectors – the most relevant for investors when it comes to analysing and conceiving the impact the particular economic and legal environment of the