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# Infrastructure

## as an Asset Class

*Investment Strategies,  
Project Finance and PPP*

BARBARA WEBER  
HANS WILHELM ALFEN

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## Infrastructure as an Asset Class

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## Preface

All around the world, there has been a significant growth in interest in infrastructure on the part of investors and governments, along with a rising investment volume in this area. Therefore, we have taken the substantially revised second German-language edition of this book *Infrastrukturinvestitionen*<sup>1</sup> and further updated and expanded the text for this international edition. The completion of the English-language edition at the end of 2009 allowed us also to incorporate the first insights and lessons from the financial crisis of 2007/08 and update all the relevant economic data and statistics.

The interface between the world of bureaucracy/politics and investment is one of the largest (communication) problems when developing and implementing Public Private Partnership (PPP) projects. This book forms a connection between the PPP literature, which is mostly written by bureaucrats and politicians and ignores financing aspects, and the traditional finance literature, which is generally compiled by financial experts and tends to mention the subject of PPPs only in passing. To our knowledge, this is the first comprehensive publication to unite the topics of infrastructure investments, project finance and PPPs, and to compile a basis of theoretical information, systematically process and classify this information and illustrate it for practitioners in industry, finance and the various areas of the public sector. In addition, we use a wide range of illustrative examples to make the text as practically relevant as possible. We discuss the differing objectives and expectations of the parties involved in infrastructure investments and the conditions required by public principals and investors to help these groups overcome the 'language problems' they encounter as a result of extreme cultural differences.

In this book, we address the needs of 'advanced' readers, but we also seek to meet the requirements of comparatively inexperienced readers – who may be considering the potential of infrastructure as an interesting investment for them or their institutions – at their current level. We answer burning questions such as:

- How is infrastructure defined?
- Which sectors are classified as infrastructure, how are they categorised and what are the differences between them?
- What are typical country and project specific characteristics?
- Is infrastructure an asset class in its own right? If so, what are its characteristics?
- What are the fundamental options for investing in infrastructure?

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<sup>1</sup> *Infrastrukturfinanzierung – Projektfinanzierung und PPP*, Barbara Weber and Hans Wilhelm Alfen, Bank-Verlag Medien GmbH, 2009.

- What is a good starting point for institutional investors?
- How should infrastructure funds be evaluated?
- How should individual infrastructure investments be categorised and evaluated?
- What are the existing organisational, business and contractual models to implement infrastructure projects financed with private capital?
- What risks do these models entail and how can these risks be identified and assessed?
- How should these models be structured in order to best allocate the risks?

In addition to background knowledge and information on the latest developments in the individual subject areas, particularly with regard to infrastructure as an asset class and the various infrastructure sectors, we provide specific instructions and concrete proposals on the approach to adopt when assessing and making investments in infrastructure assets, whether directly or indirectly (e.g., via investment funds). This includes the analysis, structuring and implementation of project finance, which is at the centre of almost any infrastructure investment.

The contents of this book are not based solely on theoretical knowledge, but instead build upon the wealth of current and complementary practical experience of the authors in the areas concerned.

## Acknowledgements

We would like to thank Andreas Leupold, Dipl.-Ing. M. Sc., Bauhaus-Universität Weimar, who assisted us greatly in editing the contents of this book as he did for the two German editions, and Andrea Frank-Jungbecker, Dipl.-Ing. M. Sc., Bauhaus-Universität Weimar. They both provided extensive support for the substantial revision of the English edition.

We would also like to thank Stefan Maser, the third co-author of the first German edition of this book. Where relevant, we referred to his significant contributions to the material on project finance when preparing the current edition.

Furthermore, we would like to thank our German publisher, Bank Verlag, for its generous support of the English edition. Thanks are also due to our excellent and highly cooperative translator, who was prepared to translate the book 'back to front' in line with the successive revision of the German chapters.

Last but not least, we would like to thank all our 'colleagues' in the industry, from the representatives of pension funds and insurance companies through to placement agents and journalists, who kindly supplied information on their companies and 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.

# Introduction

## **BACKGROUND AND OBJECTIVES**

The quality and volume of infrastructure has a positive effect on the attractiveness, competitiveness and economic growth of countries, cities and municipalities. Infrastructure opens up new business opportunities and promotes trade and the expansion of existing economic activity. It also improves the standard of living of the general public by giving them access to essential resources such as water and electricity, schools, hospitals and markets.

Although we may seem to be stating the obvious, institutions including the World Bank and the Organisation for Economic Co-operation and Development (OECD) often complain that these consequences are rarely appreciated – in highly developed industrialised nations, high-growth emerging economies and developing countries alike. Around the world, 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 – and this fact also applies to industrialised countries. 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 in terms of development and prosperity. Needless to say, this situation is likely to become even more critical following the 2007/08 crisis on the financial markets.

Institutional financial investors with a long-term perspective, such as insurance companies' pension funds, sovereign wealth funds, endowments and foundations, are increasingly considering investing some of their total assets in infrastructure, therewith joining strategic investors such as construction, energy and water corporations who have done so for decades. This is because conservatively structured infrastructure investments can serve to improve the risk-return profile of an investor's overall portfolio on account of their long term and their low level of correlation with traditional asset classes. Some investors, particularly Australian and Canadian pension funds, have been active in this area for a number of years and now invest as much as 20% of their assets in infrastructure. European, US, Middle Eastern and Asian investors have become increasingly involved in recent times. This shows that private investments in infrastructure are already recognised as an important means of helping to close the aforementioned gap for the public sector – as well as constituting a clearly attractive investment opportunity for private investors. As such, the volume of private capital can be expected to increase significantly in future; indeed, up to a certain point, an increase of this nature will be essential to ensure further economic growth.



The market for infrastructure is vast and, contrary to popular belief, the range of potential infrastructure investments is extremely broad, which presents a dilemma for most investors. Although they appreciate the enormous potential of the market and the potentially excellent match between the asset class and their portfolios, particularly in difficult periods on the capital markets, they lack a sufficient overview and insight into the infrastructure market and/or an awareness of the suitable investment opportunities and the risks they entail, making it difficult for them to select the right investments.

The book you are holding offers a way out of this 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.

As a minimum, professional investors must have a sufficient understanding of the infrastructure sectors and the corresponding markets and industries in which they intend to invest along with the relevant legal, institutional and commercial conditions – which can vary significantly from region to region and sector to sector – to allow them to identify the inherent additional project-specific risks and evaluate their prospective risk-return ratios. 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.

Which 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 1.2, but for now it is sufficient to note that 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 the underlying structures, organisations, business models and rules and regulations, which are used to offer certain sector-specific commodities and services (e.g., transport, energy and water supply, waste water and waste disposal) to individual economic entities or the wider public to enable, sustain or enhance social living conditions.*

Typical examples of infrastructure include roads, airports, ports, oil and gas lines and renewable energy plants (e.g., wind and solar plants), as well as public utilities, waterworks, power companies and waste disposal companies. A broader definition of infrastructure also includes the so-called ‘social infrastructure’, also referred to in some countries as public real estate, that is, public facilities such as schools, hospitals, administrative buildings, cultural houses, social housing, sports halls and arenas, public pools and so on, and their sponsors and the corresponding education, healthcare, administrative and cultural services.

One feature shared by a certain subset of infrastructure, which is of particular interest to investors, is that along with real estate or long-term fixed-income securities they can generate comparatively stable and predictable current income with moderate volatility and moderate risk relatively independently of macroeconomic development even in difficult times. Due to their long-term nature, they also allow pension funds and insurance companies to match the maturity structure of their liabilities. Infrastructure with this profile is the driving force behind infrastructure’s reputation as an attractive asset class: an attractive hybrid with similarities to equity, debt 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 embodied by investments in traditional companies. For any potential

investment, these risks must be identified and examined. Accordingly, one of our primary objectives is to make readers aware that an extensive analysis of infrastructure investments, which inevitably requires a significant degree of effort, is always necessary. In addition, we provide a fundamental understanding of infrastructure in general, the differences – in some cases significant – between infrastructure measures within a sector, and the various infrastructure sectors themselves. The systematic procedures and analytical tools we use enable readers to understand and evaluate both infrastructure fund products as well as individual direct infrastructure transactions along with their complex underlying project finance structures, thereby enabling assessment of the risk-return profiles of the respective infrastructure investments.

For this reason, the last three chapters of this book deal solely with the financing of infrastructure assets using project finance. This is an essential component of the implementation of infrastructure measures involving the private sector. Traditionally, governments finance measures of this nature from the public purse, that is, via existing receipts or new debt in the form of government bonds or borrowing. Empty public coffers though mean that more and more private capital is required usually applying the technique of project finance. Project finance has a number of benefits compared with traditional forms of financing; however, it also requires a deeper understanding of financing structures and methods and complex analytical approaches. All in all, a successful project finance depends on the ability to identify, assess and manage all the relevant risks and develop the appropriate contractual structure for the respective sector in terms of organisation, financing and value added, competition/regulation and the possibility of private sector involvement. This structure ultimately determines the risk-return profile of each individual infrastructure investment. Therefore, another explicit goal of this book is to explain the methodology of project finance in detail and establish the key differences compared with other forms of financing. To this end, we guide readers through the various phases of project analysis on a step-by-step basis using practical examples, and provide an introduction to concrete financing instruments and techniques.

This book is aimed at the following target 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, facility managers and so on;
- the 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, railroad companies, etc.

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

## STRUCTURE

Conceptually speaking, we divide this book into three parts.

The first part of the book consists of Chapters 1 and 2. In Chapter 1, we provide an initial overview of the international infrastructure market with a particular focus on demand for infrastructure assets and the expected capital requirements, followed by a definition of the term infrastructure and an overview of the most important infrastructure sectors, the country-, sector-, and project-specific characteristics influencing the performance of the infrastructure

sectors (and hence any respective investments) and a discussion of their general cross-sector characteristics.

We begin Chapter 2 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 its main investment characteristics – stand-alone as well as in comparison with and relation to other asset classes. We conclude that infrastructure appears to be a hybrid between bonds, real estate and (private) equity, which should indeed be considered an asset class on its own. An overview of the different kinds of infrastructure investment opportunities follows, that is, listed as opposed to unlisted and direct as opposed to fund investments. We then focus on unlisted assets, and in particular fund investments, because they represent the entry point to the infrastructure market for most investors due to the complexity of individual infrastructure investments.

The second part of the book begins with Chapter 3, in which we provide potential investors with a particularly helpful investment evaluation system for any infrastructure investment (referred to as the ‘Organisational models of infrastructure implementation’). The aim of this system is to allow all investment opportunities – whatever their underlying organisational model – to be universally classified on the basis of their general, technical, economic, financing and legal/contractual key determining factors, making them internationally comparable in a transparent manner for the first time. The accompanied specification of the respective risk profiles is of particular interest. In order to facilitate this classification, we give a summary of how private investments in infrastructure are seen internationally, presenting the common organisational model types around the world and their specific risks and risk allocation. On a cascading basis, we distinguish between five models: the privatisation, partnership, business, contractual and financing models. In order to better clarify the underlying relationships between these models, some of which are highly complex, we use a number of examples from around the world.

In Chapter 4, we describe the typical characteristics of selected infrastructure sectors and sub-sectors, that is, transport and traffic including road, rail and water transport/ports as well as aviation, fresh/waste water and waste. We break down the discussion of each of these selected sectors into four areas: organisation, financing and value added, competition/regulation and the possibility of private sector involvement. These aspects seem to be – consistently across all sectors – the most relevant for investors when it comes to analysing and conceiving the impact that the particular environment of the respective sector may have on the sustainability of their individual investment. The detailed discussions of the selected sectors seek to raise readers’ awareness and understanding for the general approach of how to identify and assess the sector-specific factors, their interdependence and interaction with country- and project-specific aspects as well as their overall influence on individual investments. The approach can then be transferred easily to any other sector.

In the third part of the book, Chapters 5–7, we continue to deal with direct investments in infrastructure assets and their evaluation, with a particular focus on the financing of such assets using project finance – in its purely private-sector form as well as in PPPs. Chapter 5 contains an introductory presentation of the basic structure of project finance, including the main participants, cash flows and contractual relationships, followed by an extensive discussion of the project finance process broken down into five phases. Within this process, our main focus is on the third phase, risk management: that is, the identification, analysis, evaluation and allocation of risk. An understanding of risk is central to a good analysis and superior investment decisions. The ability to identify risks accurately is the only way to ensure that

appropriate (contractual) structures are implemented that will provide protection. Chapter 6 addresses the various kinds of capital and financing instruments that are used (or that can be used) within project finance, and in Chapter 7 we provide a concrete – if concise – practical explanation of how to determine and prepare the cash flow calculations and sensitivity analyses necessary for such financings. In all cases, the individual steps are reinforced with the help of examples.

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