Chapter 7

Financing and Burden Sharing Mechanism of the Vientiane–Hanoi Expressway

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Chapter 7
Financing and Burden Sharing Mechanism of the Vientiane–Hanoi Expressway

Narong Pomlaktong

1. Introduction

This chapter examines methods for setting up pragmatic models for investment in cross-border surface transport infrastructure. The focus is on the route connecting three major cities – Bangkok, Vientiane, and Hanoi – of neighbouring countries. The development transcends national borders and is regional in character. A strategic and operational framework for supplying international public goods and mobilising financial resources is thus crucial for successful cooperative development. This is because the costs and benefits of cross-border projects may be perceived as unequally distributed amongst the countries concerned, making the financial arrangements difficult to negotiate. This is especially true for transport infrastructure development projects, which are not always financially sustainable and often need government support. The challenge is, therefore, to agree on how to share the costs and benefits amongst the participating countries. Ultimately, taxpayers are better off if the project can be conditioned to be financially viable for private investment.

2. Goals of Transport Infrastructure Provisions

Transport infrastructure has a positive effect on the attractiveness, competitiveness, and economic growth of countries. Apart from opening up new business opportunities, it improves people's standard of living by facilitating access to essential resources such as schools, hospitals, and markets. There is, however, a growing gap between the need and actual level of investment in new transport infrastructure or the modernisation, operation, and maintenance of existing transport infrastructure. This is particularly true for developing countries.

Available funding from traditional sources falls short of investment needs. As a consequence, governments in both developed and developing countries around the world have been looking for alternative models to procure public services. One common aim is to find better ways to deliver services of the desired quality with the lowest burden possible on the public budget. The provision of public services involves performing a number of tasks. These include:

(i) defining the project objectives,

(ii) designing the infrastructure,

(iii) financing the project,

(iv) constructing the infrastructure,

(v) maintaining the infrastructure,

(vi) operating the facilities to provide the services, and

(vii) paying for the services.

This does not imply that the government must carry out all these tasks. Some of the tasks are 'sovereign' in that they are fundamentally the government's responsibility, and the government's role typically involves high-level decision-making regarding the use of public funds as well as the overall monitoring and regulation of outcomes. This is in contrast to 'operational' tasks, which need not be directly executed by the government. Traffic management, toll collection, and construction and maintenance services are examples. Whatever infrastructure tasks the government delegates to the private sector, providing infrastructure services with the available resources at the cheapest delivery cost is important.

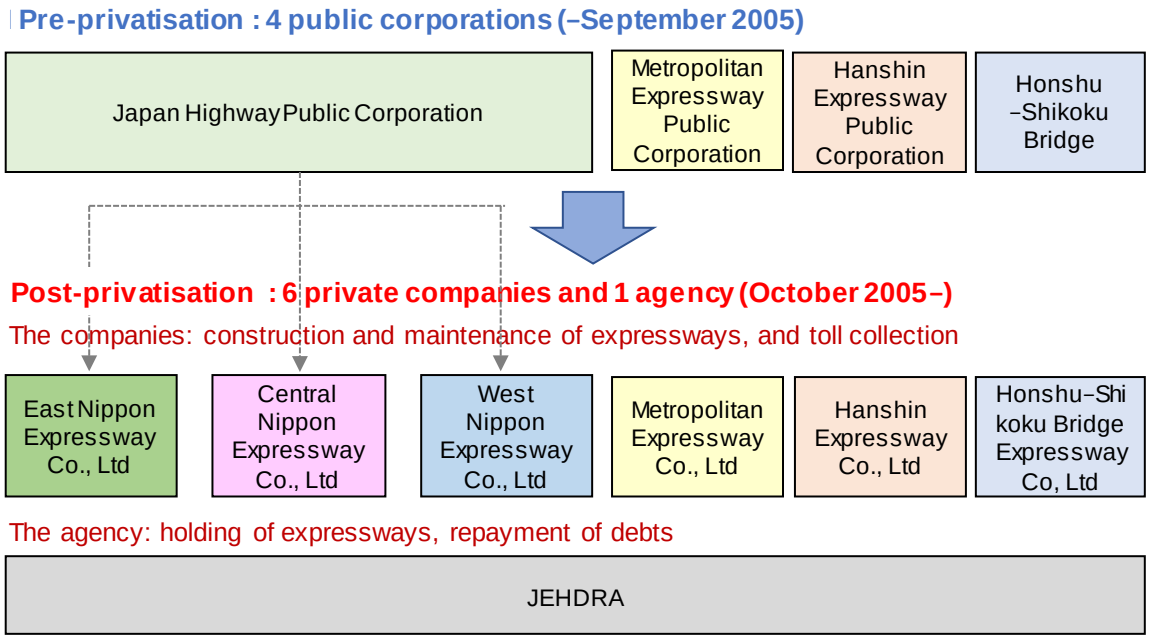
The following equation shows a possible mixed objective of enterprises that provide infrastructure. It assumes that private shareholders of the enterprise maximise profits while the public authority pursues welfare maximisation. The two groups of representatives arrive at a compromise, which is a mixed objective function where both profit and social welfare carry the %age weight of their respective supporters. The amount of x%age shareholding reflects the bargaining power in favour of welfare maximising, whereas the 1-x represents maximisation of profits.

$$\theta = x(CS + PS) + (1 - x)\pi$$

where CS = consumer surplus, PS = producer surplus, π = infrastructure operating firm's profit, x =%age representative of the government's proposed welfare maximising, and $1 - x$ =%age representative of the profit maximising of the firm operating the infrastructure.

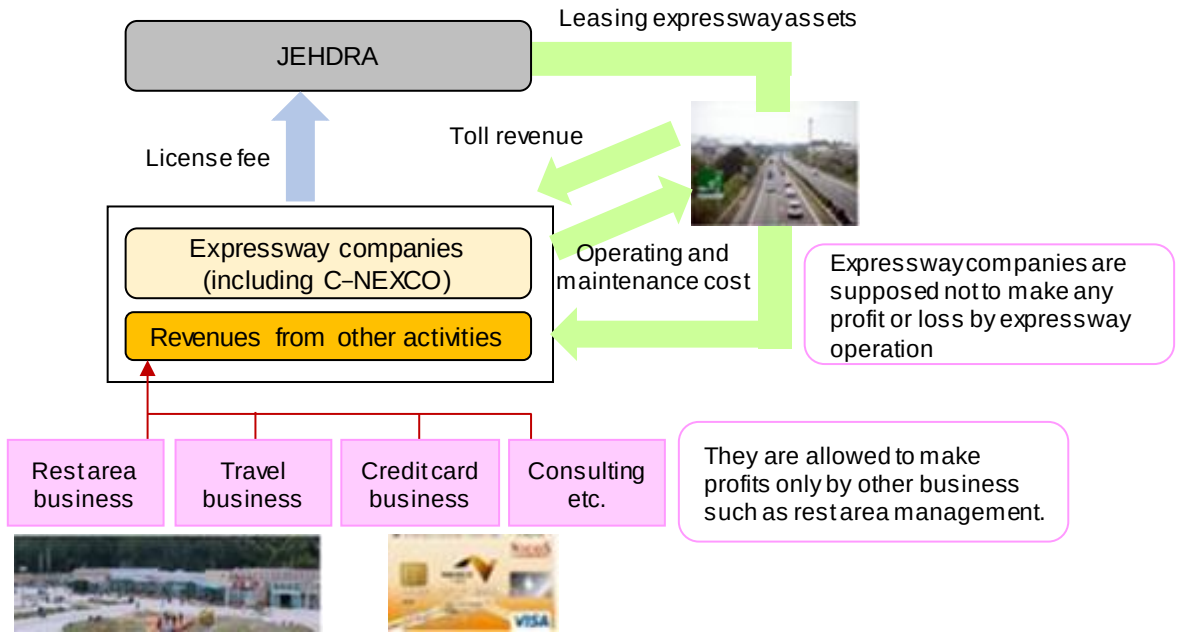
With good contract design, the mixed enterprise may opt to pursue welfare maximising regardless of the percentage share of the public. Japan offers a good example of how to pursue welfare maximising under the mixed enterprise arrangement. According to Morisugi (2006), Japan's motorway network has been developed by four main public corporations since the 1950s. Given their rising debts, at $350 billion, six private motorway companies were established in 2005. A holding company, Japan Expressway Holding and Debt Repayment Agency (JEHDRA), was also established as an independent administrative agency renting assets to the six private companies that are responsible for constructing and managing expressways and toll collection (Figure 7.1). The goal of JEHDRA is to repay debts over a 45-year period, then transfer the expressways back to the government and dissolve. The mission is to allow for a toll- and debt-free national expressway system. All six companies are allowed to make profits from related businesses but not from the expressway operations (Figure 7.2). This emphasises the importance of good contract design in successful infrastructure provision, including public–private partnerships (PPPs).

Figure 7.1: Institutional Arrangement of JEHDRA



Co., Ltd = company limited, JEHDRA = Japan Expressway Holding and Debt Repayment Agency
Source: Oi. (2012).

Figure 7.2: Framework of JEHDRA's Operations



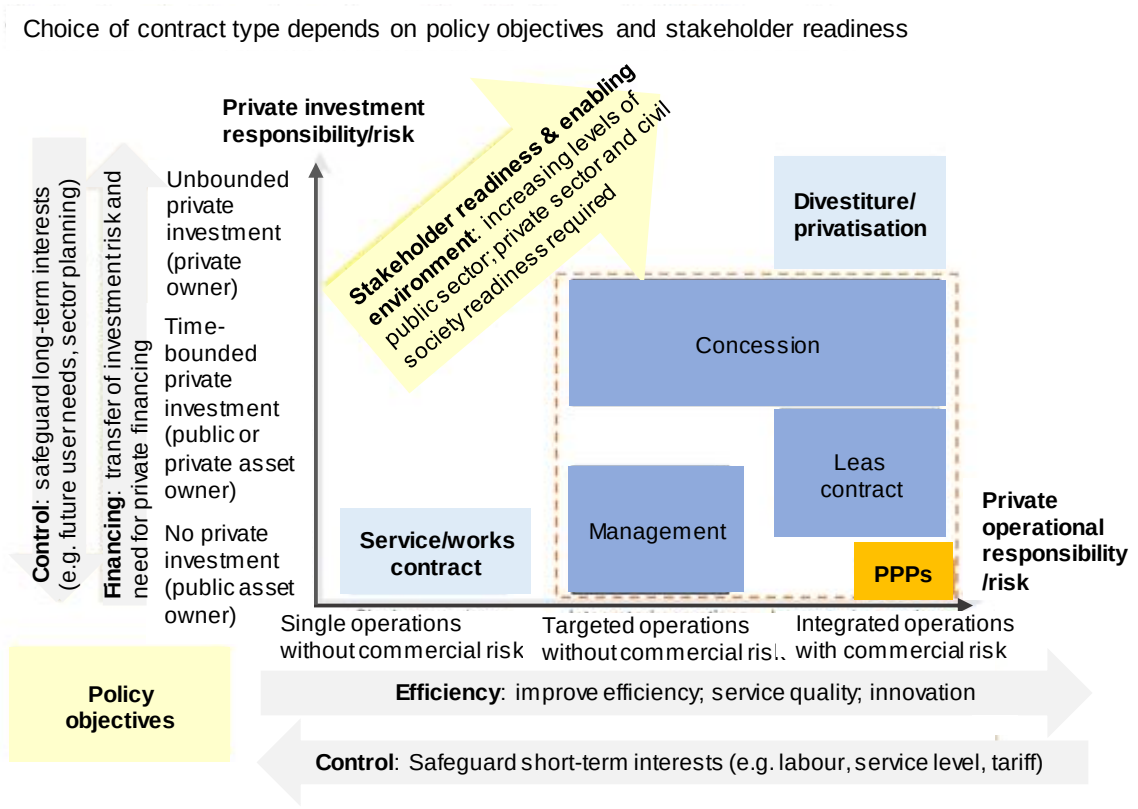
JEHDRA = Japan Expressway Holding and Debt Repayment Agency.
Source: Oi (2012).

3. Risks and Financing Options over the Project Life Cycle

Distinguishing between the two roles (sovereign and operation) has opened up various options for the provision of infrastructure. This depends on the extent to which the execution of operational tasks remains under direct political control. The highest degree of political control is observed when all the above-mentioned tasks are carried out by the government ministry using its own resources. Reducing government control can be done in two ways: outsourcing and devolution.

With outsourcing, the government is responsible for infrastructure provision but delegates the responsibility of some specified operational activities to private companies for a limited period based on contractual arrangements, while devolution refers to the transfer of responsibility for the provision of infrastructure to organisations that are not directly under the control of government officials. Outsourcing comes in many levels: contracting out, design–build arrangements, and PPPs. With varying degrees of independence, these include government state-owned enterprises, mixed companies, and private owner–operators. The choice of contract type depends on the policy objectives and degree of stakeholder readiness, as shown in Figure 7.3.

Figure 7.3: Choice of Contract Type



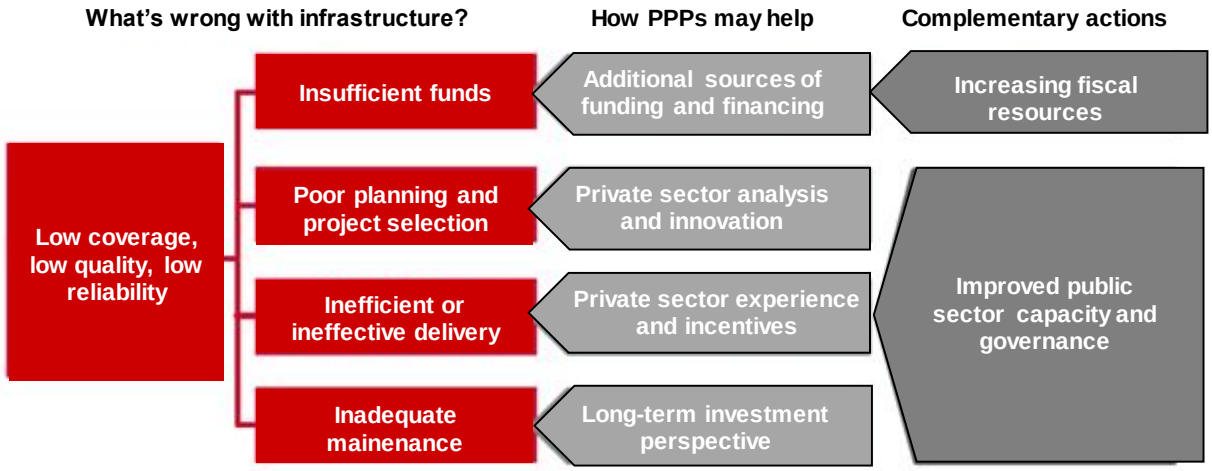
PPP = public–private partnership.
Source: World Economic Forum (2013).

The combination of outsourcing and devolution being employed to supply infrastructure becomes more complicated when the design and implementation involve more than one country. The decision on how to finance infrastructure is sovereign to the host country. The governments involved must decide on the level of public sector resources to be dedicated to transport infrastructure, compared with other prioritised socio-economic national agenda items. As far as feasible, infrastructure should be paid for by its users or ultimately by taxpayers if demand falls short. This kind of practice is common because transport infrastructure is a public good. However, for cross-border infrastructure, the means and amounts of resources to be channelled become crucial. According to Ray (2015), financing cross-border infrastructure involves countries with diverse financial capabilities and fiscal constraints. The level of public debt is critical to the country credit rating. Government debt in excess of a critical threshold impacts on the cost of all government borrowings. This increases the marginal cost of public funds for other sectors seeking investment. For these reasons, the option of PPP for infrastructure development can be useful.

Figure 7.4 shows various reasons why the private sector may be more efficient in carrying out operational activities than the government – resulting in successful PPP outcomes. These include:

- the private sector is more experienced in optimising the use of assets and their revenues;
- the focus on profit maximisation and shareholder value results in better financial discipline and accountability (Arndt, 1999); and
- innovative design and better construction materials and methods, combined with efficient operation and maintenance (O&M), result in lowering the overall project life cycle costs (Harris, 2004).

Figure 7.4: How PPPs Can Help



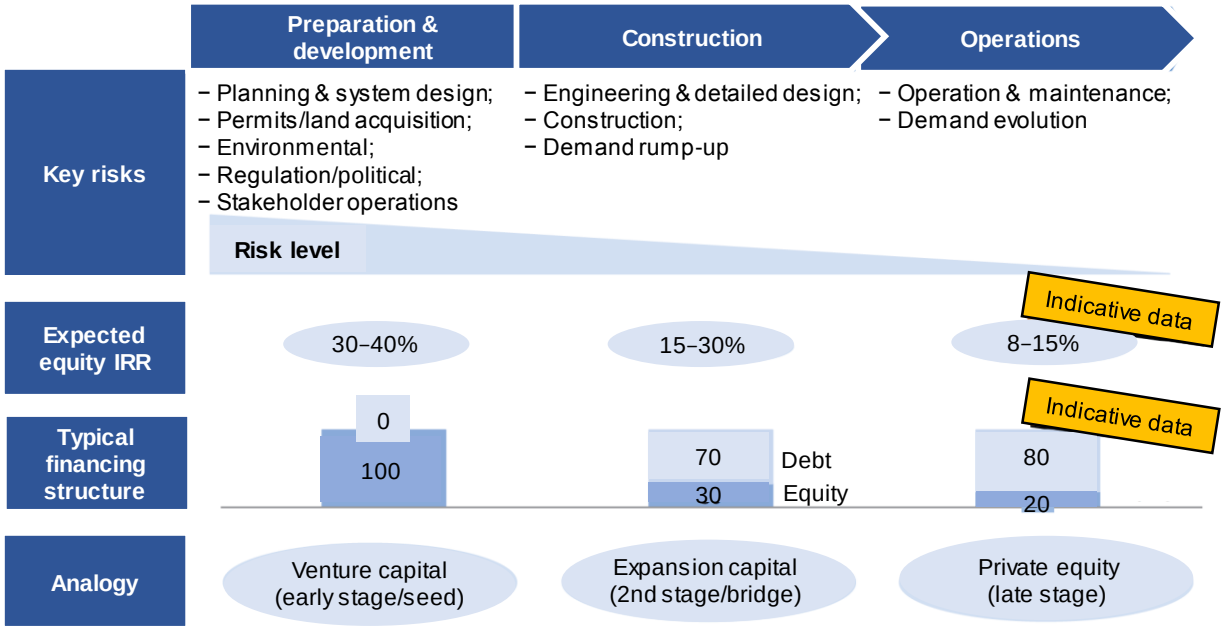
PPP = public–private partnership.
Source: International Bank for Reconstruction and Development/World Bank, Asian Development Bank, and Inter-American Development Bank (2014).

A typical infrastructure project involves a large initial investment that is sunk, together with O&M costs paid over the life of the project. During the operation of the project, the operator receives a stream of payments to cover both the initial investment (capex) and O&M expenses (opex). With PPP financing, the sources of finance can change over the project's life cycle, rather than having to stick to a government budget. During construction, expenses are financed with sponsor equity (which may be complemented with loans and subordinated or mezzanine debt) and bank loans. According to Yescombe (2007), banks exercise control over all changes to the PPP contract and tightly control the project company's behaviour. They are, therefore, well suited to lending during construction, whereas

bondholders are better suited to financing the project during its operational phase. This is because bondholders only have control over issues that may significantly affect the security of cash flows.

Regarding sharing of public–private financial commitments, the challenge is how to reach a reasonable agreement when the operation is socio-economically beneficial but not financially viable. This is common amongst various types of infrastructure development projects and is particularly true for transport infrastructure development. Infrastructure is designed for a long economic life, while its traffic only builds up gradually to the design capacity. This creates a host of risks and returns, and suggests that the revenue stream from operations may fall short. It is also common for the government to contribute to the funding of infrastructure projects from its budget pool at the expense of other public services. It would be different, however, if the capital market offered financing on a cycle equal to the investment cycle of the project. Figure 7.5 and Table 7.1 respectively depict these characteristics and the classification of three major risks facing each phase of the project life cycle.

Figure 7.5: Risk and Return Characteristics of Project Life Cycle Phases



IRR = internal rate of return.
Source: World Economic Forum (2013).

Table 7.1: Classification of Risk Linked to Infrastructure Assets

<table>
<tr><th>Risk category</th><th>Development phase</th><th>Construction phase</th><th>Operation phase</th><th>Termination phase</th></tr>
<tr><td rowspan="9">Political and regulatory</td><td>Environmental review</td><td>Collection of permits</td><td rowspan="2">Change in tariff regulation</td><td>Contract duration</td></tr>
<tr><td rowspan="2">Rise in pre-construction costs (longer permitting process)</td><td rowspan="2">Contract renegotiation</td><td>Decommission</td></tr>
<tr><td>Asset transfer</td></tr>
<tr><td colspan="3">Currency convertibility</td></tr>
<tr><td colspan="4">Change in taxation</td></tr>
<tr><td colspan="4">Social acceptance</td></tr>
<tr><td colspan="4">Change in regulatory or legal environment</td></tr>
<tr><td colspan="4">Enforceability of contracts, collateral and security</td></tr>
<tr><td rowspan="5">Macroeconomic and business</td><td>Pre-funding</td><td colspan="3">Default of counterparty</td></tr>
<tr><td colspan="2" rowspan="3">Financing availability</td><td>Refinancing risk</td></tr>
<tr><td>Liquidity</td></tr>
<tr><td>Volatility of demand/market risk</td></tr>
<tr><td colspan="4">Inflation</td></tr>
<tr><td colspan="4">Real interest rates</td></tr>
<tr><td colspan="4">Exchange rate fluctuation</td></tr>
<tr><td rowspan="6">Technical</td><td colspan="3">Governance and management of the project</td><td rowspan="5">Termination value different from expected</td></tr>
<tr><td colspan="3">Environmental</td></tr>
<tr><td>Project feasibility</td><td rowspan="2">Construction delays and cost overturns</td><td rowspan="2">Qualitative deficit of the physical structure/service</td></tr>
<tr><td>Archaeological</td></tr>
<tr><td colspan="3">Technology and obsolescence</td></tr>
<tr><td colspan="4">Force majeure</td></tr>
</table>

Source: Organisation for Economic Co-operation and Development (2015).

The choice between PPP and government borrowing should be based on the need to balance the socio-economic merits of the project and its financial profitability. For transboundary infrastructure development, the decision becomes more sensitive as it involves the value judgment and financial commitment of each participating government over a long period (e.g. 25–30 years). Moreover, the stages of capital market development in each participating country are diverse. Deciding on the sources of finance to be used depends on many criteria. These include the required rate of return, guarantees, conditions, and flexibility acceptable to the financial markets. Seeking the optimal terms and conditions of finance and coverage for the project is based on an analysis of the constraints and risks specific to each locality. The bankability of the project depends on how various risks are mitigated throughout the project life cycle. These are summarised in Table 7.2. The policy actions and tools may have some costs and side effects, which should be taken into account in seeking appropriate risk mitigation measures.

Table 7.2: Financial Risk Mitigation and Incentives

Type of measure	Instrument
1. Guarantees, realised directly by government or by its own controlled agency or development bank	1. Minimum payment, paid by controlling authority
	2. Guarantee in case of default
	3. Guarantee in case of refinancing
	4. Exchange rate guarantees
2. Insurance (private sector)	1. Wrap insurance, technology guarantees, warranties, commercial and political risk insurance
3. Hedging (private sector)	1. Derivatives contracts such as swaps, forwards, options, etc.
4. Contract design, paid by contracting authority	1. Availability of payment mechanisms
	2. Offtake contracts
4. Provision of capital, realised directly by government or by its own controlled agency or development bank	1. Subordinated (junior) debt
	2. Debt: 2.1. At market condition; 2.2. At lower interest rate
	3. Equity: 3.1. At market condition; 3.2. At more advantageous condition
5. Grants, generally delivered by contracting authority, even if a dedicated fund exists at the national level. Tax incentives can be delivered by national or local authorities.	1. Lump-sum capital grant
	2. Revenue grant: 2.1. Periodic fixed amount (mitigating the demand risk) 2.2. Revenue integration (it leaves the demand risk on the private player)
	3. Grant on debt interests
	4. Favourable taxation schemes for SPV
	5. Favourable taxation schemes for equity investors

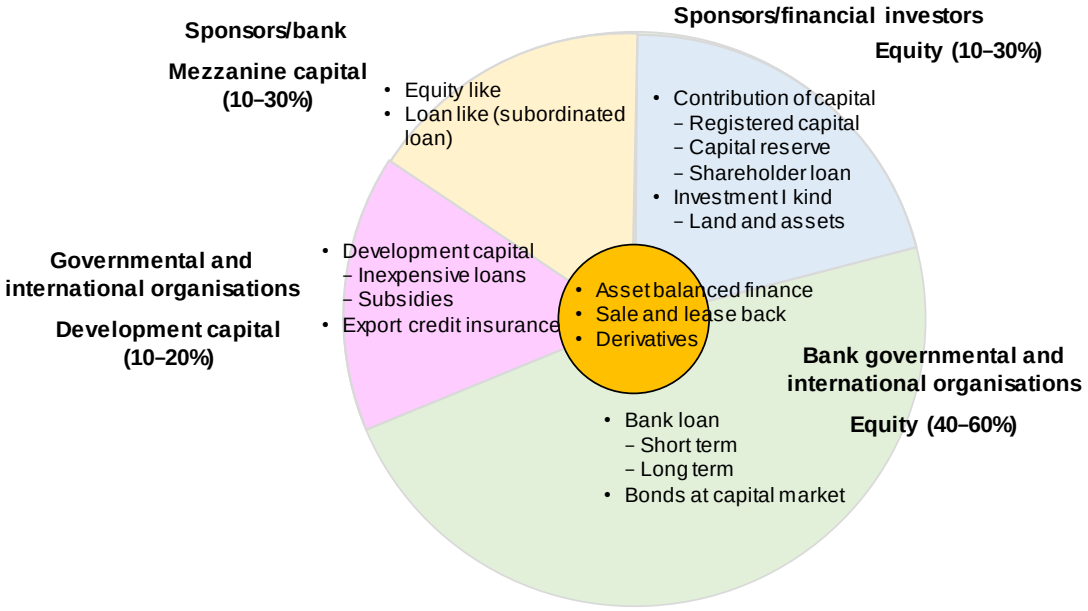
SPV = special purpose vehicle.
Source: Organisation for Economic Co-operation and Development (2015).

In project finance, the structure of the operating firm's liabilities stems directly from the project's ability to service its debts. The main measures proposed by the World Bank (2007: 241) are:

- Capital structure ratio = (equity + quasi equity) divided by all the financial resources invested. A capital ratio below 15% would likely lead the lenders to demand an increased equity or quasi-equity contribution from the sponsors.
- Annual debt service coverage ratio (ADSCR) = available cash flow for servicing the debt divided by the annual debt service. An annual ADSCR below 1.3 would require restructuring of a financing arrangement.
- Net present value debt coverage ratio (NPV DCR) = NPV of cash flow available for servicing the debt divided by its outstanding debt. The discount rate used in calculating the NPV is that of the average interest rates of the financial debts. An NPV DCR below 1.7 would run the risk of deterring potential private investors. Thus, the public financial contribution must increase.

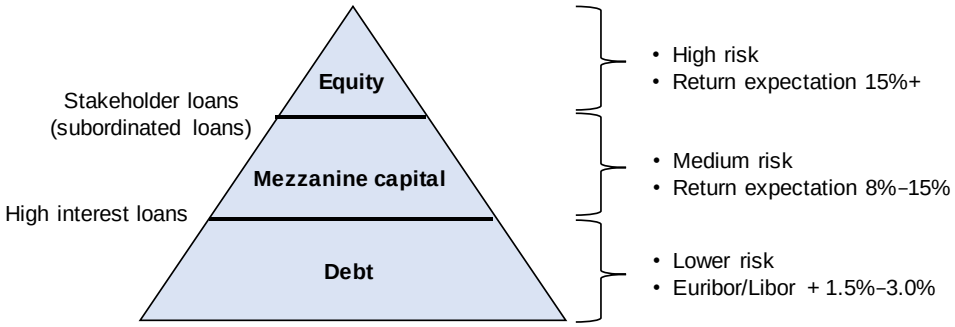
The three ratios enable assessing, from the outset, the amount of debt with limited recourse that is acceptable to banks. Weber and Alfen (2010) compiled the share of finance based on different sources used in infrastructure development. This is depicted in Figure 7.6, which shows that debt and equity are two of the most popular financing instruments. Figure 7.7 reveals the rationale behind Figure 7.6 – risk exposure is lowest where the investment fails, though the expected return on debt is also low.

Figure 7.6: Percentage of Financing Volume Used in Infrastructure Development



Source: Weber, Staub-Bisang, and Alfen (2016).

Figure 7.7: Risk Profile of Financing Instruments

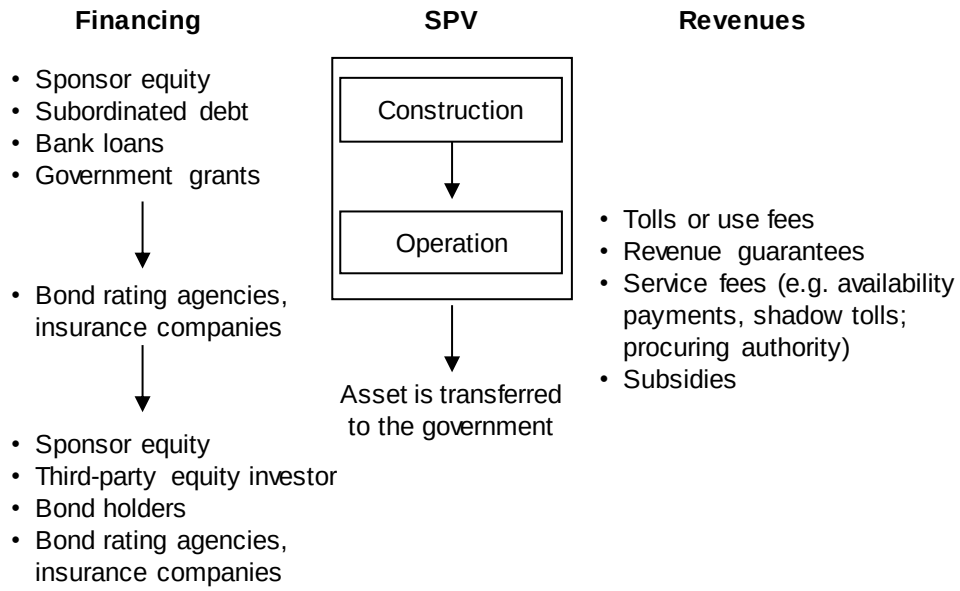


Euribor = Euro Interbank Offered Rate, Libor = London Interbank Offered Rate.
Source: Weber and Alfen (2010).

4. Financing the Provision of Infrastructure

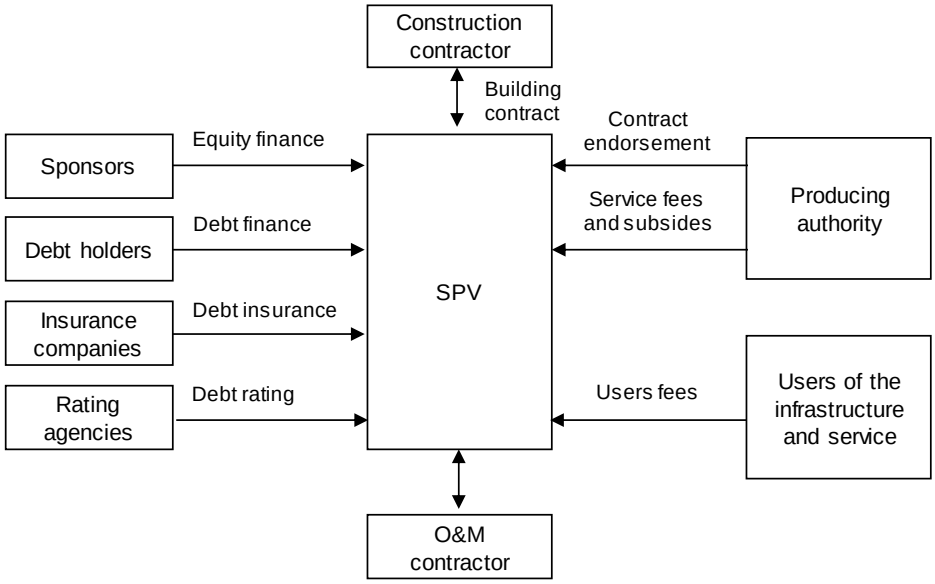
Yescombe (2007) pointed out that a financial technique called project finance, based on lending against the cash flow of a project, is both legally and economically self-contained. Some economic characteristics of most PPP projects include (i) high sunk costs with little value for the alternative usage, (ii) subcontracted tasks during construction and operation, and (iii) efficient bundling of construction and operation. Bundling incentivises investors to internalise O&M costs at the design stage to ensure that the project life cycle costs are minimised. The growth and spread of PPPs are thus closely linked to the development of project finance. To manage the three tasks mentioned above efficiently, without undertaking any business other than the construction and operation of the project, a special purpose vehicle (SPV) must be created. Figures 8 and 9 depict the typical financial life cycle and SPV arrangement of a PPP, respectively.

Figure 7.8: Financial Life Cycle of a PPP Project



SPV = special purpose vehicle, PPP = public–private partnership.
Source: Engel, Fischer, and Galetovic (2010).

Figure 7.9: Typical SPV Arrangement



O&M = operation and maintenance, SPV = special purpose vehicle.
Source: Engel, Fischer, and Galetovic (2010).

For transboundary infrastructure, financing schemes and organisational arrangements must be adapted to consider the institutional limitations and weaknesses in each participating country. Estache, Serebrisky, and Wren-Lewis (2015) have examined a number of factors that are important for developing countries when considering financing choices. They built a framework to analyse how a variety of factors which are important in developing countries may influence the source of financing used, i.e. public finance, private debt, and private equity. Table 7.3 depicts factors that could influence the financing source available for infrastructure development.

Table 7.3: Factors Influencing Financing Sources

Factors	Public finance	Public debt	Public equity
Cost of public funds	↓	↑	0
Cost of private debt	↑	↓	↑
Cost of private equity	0	↑	↓
Operational costs	↑	↓	0
Potential cost savings	0	↑	↑
Equity expropriation risk	↑	↕	↓
Exogenous risk	↑	↕	↓
Need for cross subsidies	↑	↓	0
Government discounting	↓	↑	0
Government favouritism	↑	↓	0

Note: The ↑ means that the factor increases the amount of that financing source that will be used, the ↓ symbol means that it decreases, and the ↕ symbol means that the effect is ambiguous. The last two rows correspond to the actions of an unconstrained non-benevolent government, but note that social welfare is improved by promoting financing in the other direction.
Source: Estache, Serebrisky, and Wren-Lewis (2015).

5. Institutional Arrangements and Burden Sharing Mechanism

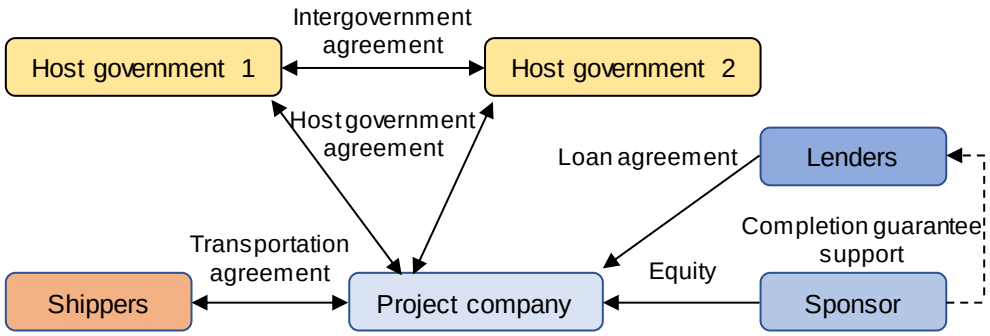
For cross-border infrastructure development, international pipeline projects present a high-risk profile for investors and lenders given their complexity and long-term horizon. Political risks are heightened when several countries are involved, and geopolitical considerations often interfere. Environmental and social issues may also generate significant delays. Transport infrastructure projects forming the Bangkok–Vientiane–Hanoi economic corridor could also be subject to a myriad of risks.

For land-linked countries such as the Lao People's Democratic Republic (Lao PDR), it is legitimate to raise questions regarding the benefits to the country based on its relatively few industries and production. Sharing the burden based on the proportionate length of road portion to be constructed in the Lao PDR might not be perceived as fair by the country. At the same time, countries like Thailand and Viet Nam may also argue that the expected gross domestic product (GDP) to be generated by the connectivity might be illusory, although many foreign companies located in both countries are the real beneficiaries of the above-mentioned transport infrastructure development. Economic assessment, based on the expected improvement of GDP stemming from the project, cannot be the only determining factor to share the investment burden amongst the potential beneficiaries. At the development stage, various parameters are subject to change contingent upon conditions such as the political, regulatory, technical, macroeconomic, and business environment. These will at least affect demand, trade flows, and hence the economic and financial return of the project. The appropriate

approach to deal with various inherent uncertainties is to set up an enterprise that is flexible enough to adapt to the changing conditions, yet able to ensure that the interests of stakeholders are well represented.

From a contractual point of view, this kind of project necessitates different agreements. These include an availability agreement to ensure that the infrastructure operating company gets paid as long as the infrastructure availability is intact. An intergovernmental agreement (IGA) amongst the involved governments is also concluded to establish the rights of the company for awarding the construction and operational services. Another type of agreement necessary for cross-border infrastructure development project is a host government agreement (HGA), to be signed by the infrastructure operating company with each host country, as shown in Figure 7.12.

Figure 7.10: Typical Transboundary Project Structure



Source: United Nations Economic and Social Commission for Asia and the Pacific (2017).

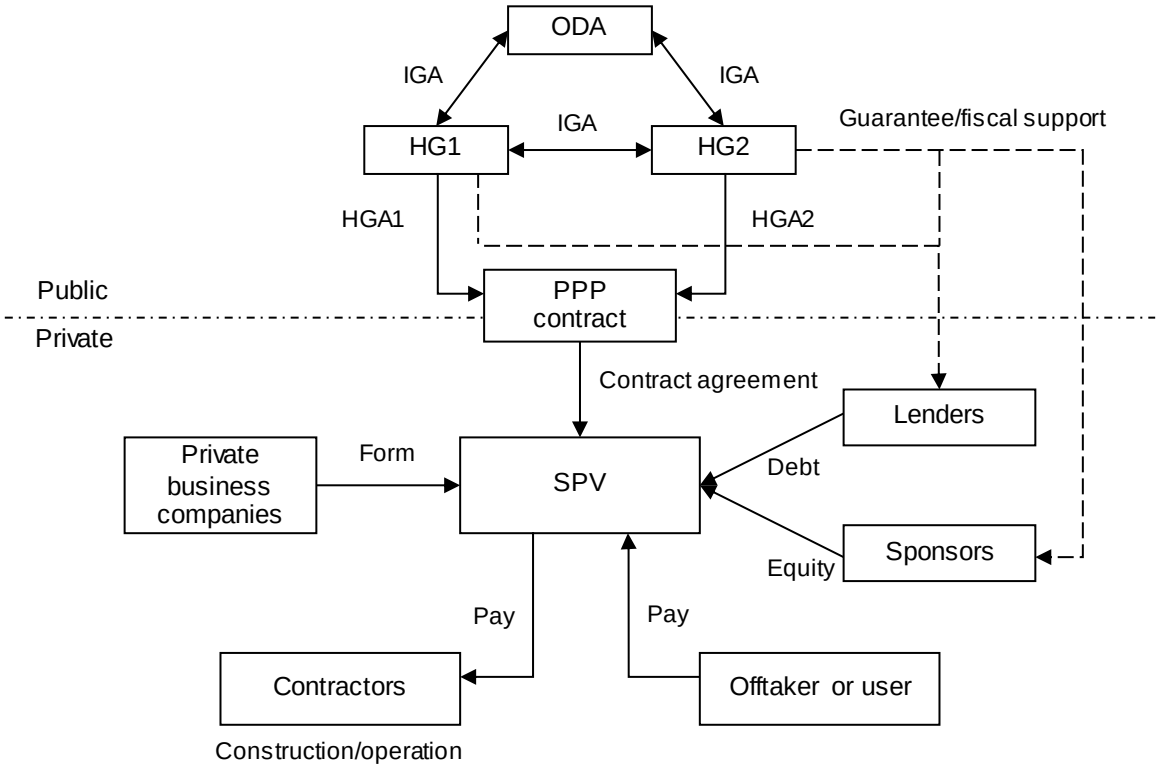
As mentioned above, various uncertainties can affect project viability. Thus, it is necessary to establish a mechanism to ensure that financial strategies and conditions are appropriately adjusted, taking into account stakeholders' interests. The steps of the contract design mechanism are as follows: (i) determine the amount of financing required for construction, management, and operation; (ii) enumerate the financing sources (e.g. public financing, public debt, and private equity) in accordance with the amounts, financial conditions, and costs; and (iii) select the financing source. If this step cannot generate a solution, adjust the amount of the source and restart from (i). If the amount cannot be increased, adjust the conditions for granting assets from the source and restart from step (ii).

It should be noted that the financing strategy mentioned is necessary but not sufficient to ensure successful project implementation. A good contract design has a clear allocation of responsibilities and risks between stakeholders, a workable price adjustment mechanism, performance-based measurement, fair rewards and penalties, appropriate contract duration, and a dispute settlement mechanism, all of which should be considered.

6. Financing Strategy for the Vientiane–Hanoi Expressway

Based on a typical SPV arrangement and a transboundary project structure discussed previously , Figure 7.11 proposes a PPP project structure for the Vientiane–Hanoi Expressway (VHE). It depicts interrelationships amongst the parties concerned: host governments and official development assistance agencies on the public side; and the SPV, private business companies, contractors, lenders, sponsors, and users on the private side.

Figure 7.11: Proposed Transboundary PPP Project Structure for the Vientiane–Hanoi Expressway



ODA = official development assistance, HG = host government, HGA = host government agreement, IGA = intergovernmental agreement, PPP = public–private partnership, SPV = special purpose vehicle.
Sources: Adapted from Zen and Regan (2014); United Nations Economic and Social Commission for Asia and the Pacific (2017; 2011).

The public side has two types of agreement: the IGA and the HGA. Both agreements aim to assist in facilitating project-specific negotiations and implementation, which make infrastructure projects foreseeable and transparent with respect to practices in cross-border infrastructure construction, operation, and investment. The alignment of both agreements is a necessary condition to shorten the lead time for the mobilisation of project-specific investment. This results in a reduction in the cost of project implementation. It is important to emphasise that the IGA and HGA are interdependent and are designed to represent a single package.

The IGA represents a treaty model which is governed by public international law. The treaty spells out the interrelationships amongst the states through whose territories an identified portion of the infrastructure system is to be constructed and operated. Issues dealt with by the IGA model include co-operation, the provision of land rights, the harmonisation of tax structures applicable to the project, and issues relevant to project implementation. On the other hand, the HGA model is an agreement between each state within whose territory a portion of the infrastructure system is to be realised and the project investors. The HGA model deals mainly with issues concerning the project activities within the territory of each state. The entry into force of the HGA is conditioned on the IGA by expanding on some of the issues identified in the IGA model. Issues dealt with in the HGA model include various governmental obligations (e.g. guarantee and fiscal support), investor duties, environmental and other relevant standards, liability, termination, and issues relevant to the implementation of the project in each territory.

It is important to note that the two models have to be structured with the aim of striking a reasonable balance between the obligations of the public side wishing to attract essential and/or competitive investment and the rights of private investors prepared to invest. The underlying principle is to enhance a sustainable allocation of risk (refer to previous discussion regarding Figures 5 and Tables 1 and 2) and fairness in the distribution of the overall benefits amongst parties engaged in the project.

The development of international transport and logistics includes the three dimensions of interconnectivity, interoperability, and market access. Increasingly, governments seek to cooperate across borders on transportation. The IGA and HGA facilitate the harmonisation of transport infrastructure as the interoperability dimension. Consequently, increasing cross-border transportation enhances performance and utilisation, such as cost and time reductions.

7. Stylised Financial Model

In general, the financial life cycle of a PPP project consists of two phases. The first is the construction phase, characterised by high sunk costs as well as little economic value for alternative usage. The second is dealing with O&M. Project finance is viable only in light of the size and volatility of the flows generated by the initiative. The project pays back its loans and pays out dividends to the SPV's shareholders with these operating cash flows. Where inflows fall short of operational costs, lenders have to resort to sponsors for subsidies. However, this needs to be specified in the HGA of each state for the terms and conditions to qualify for fiscal support from the host government. To be commensurate with the risk level associated with each phase, a host of financing elements and institutions has to be applied appropriately. These include sponsor equity, subordinated debt, bank loans, government grants, bondholders, bond rating agencies, and insurance companies. The parties involved and sources of financing depend on the activities and risks at different stages of the project life cycle. This was discussed previously in relation to the financial life cycle of a PPP project and a typical SPV arrangement in Figures 8 and 9, respectively.

This section employs a financial model which incorporates various financing instruments with a hypothetical %age of financing volumes for a PPP project. The objective is to assess, based on a number of scenarios and operating conditions, how each financing element is related and how the viability of the project will alter subject to different terms and conditions facing each host government. To date, information regarding the terms and conditions referred to above has not been readily available for testing. This section has, therefore, hypothesised a set of parameters to be tested, which are included in Tables 7.4 to 7.6.

Table 7.4 depicts three sources of funding: (i) equity and mezzanine capital supported by a government grant, e.g. granting the lessee the right to occupy and make use of the land but only during the term of the lease, with the right terminating when the lease expires; (ii) debt for construction credited by lenders or banks; and (iii) development capital contributed by the host government. The cost of capital involves two types of expenditure: initial investments and construction costs (Table 5). During the operating period, O&M costs consist of (i) maintenance, (ii) salaries, (iii) power and consumables, and (iv) others (Table 6. All costs are assumed to grow at market growth rates.

Table 7.4: Financing Structure

Financing structure	Amount ($ million)	Share* (%)
Equity and mezzanine capital	1,200	30
Debt (for construction costs)	2,000	50
Development capital (for land purchase)	800	20
Total project	**4,000**	**100**

* Share is a hypothetical structure.
Source: Author's calculation.

Table 7.5: Cost of Capital

Cost of capital	Amount ($ million)	Share* (%)
Initial investments		
Land purchase	800	20.0
Machine, equipment	1,080	27.0
Site preparation	60	1.5
Others	60	1.5
Total initial investments	**2,000**	**50.0**
Construction costs	**2,000**	**50.0**
Total project	**4,000**	**100.0**

* Share is a hypothetical structure.
Source: Author's calculation.

Table 7.6: Annual Operation and Maintenance Costs

Operation and maintenance costs	Amount ($ million)	Share* (%)
Maintenance	112	70
Salaries	32	20
Power and consumables	8	5
Others	8	5
Total O&M costs	**160***	**100**

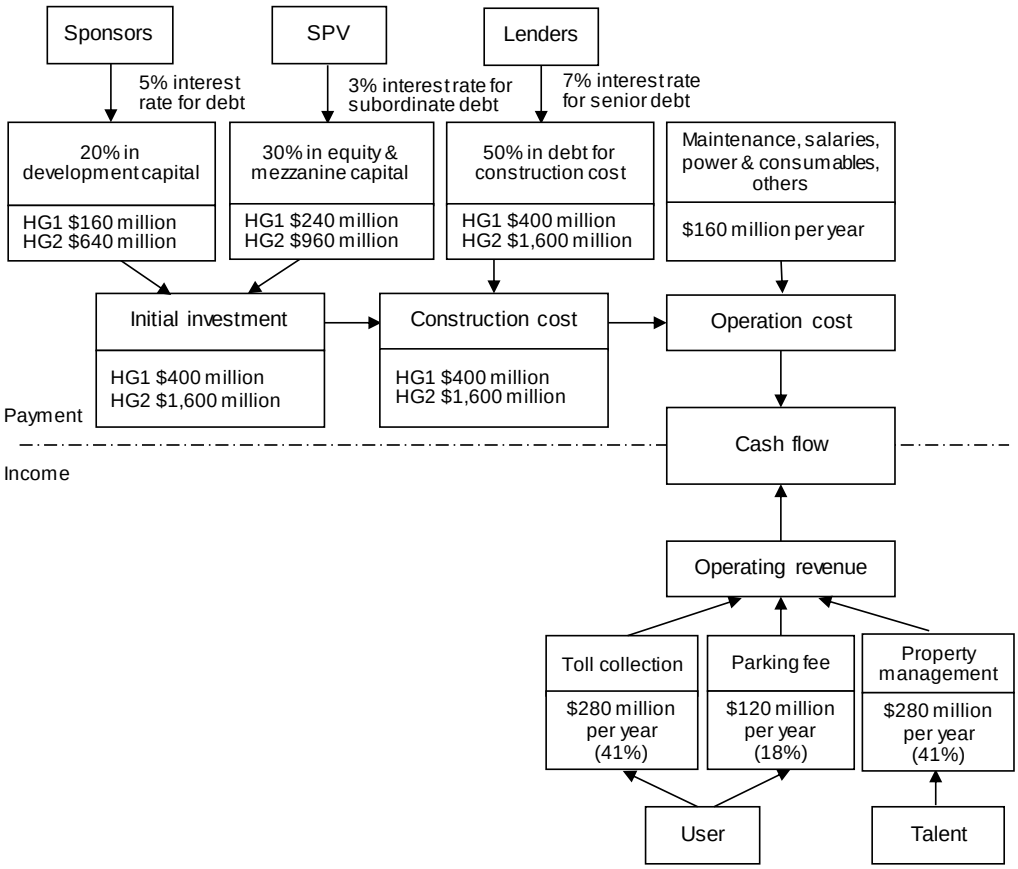
O&M = operation and maintenance.
* Share is a hypothetical structure.
Source: Author's calculation.

The financial model assumes 25 years as the project period, 2 years as the construction period, 5.4% as the discount rate (equal to the weighted average cost of capital (WACC)), 5.0% as depreciation, 7.0% as the market growth rate, 7.0% as the interest rate of senior debt, 3.0% as the interest rate of subordinated debt, and 5.0% as the interest rate of official development assistance (given the equal

interest rate for both host governments). The share of the cost of capital between host government 1 (Government of Viet Nam) and host government 2 (Government of the Lao PDR) in the SPV is assumed to be 20:80, respectively. This share is based on the length and hence the construction cost in each host country.

The model is illustrated in Figure 7.12. The cost of capital comprises 20% in development capital, 30% in equity and mezzanine capital, and 50% in construction costs, which are hypothetical structures. The output of modelling, i.e. internal rate of return (IRR), NPV, and payback period, is determined by the interest rate. The increase in the debt interest rate extends the years of debt redemption (including the payback period). The change in the operating revenue and cost drives cash flow changes throughout the project period. There are three sources of revenue: toll collection, parking fees, and property management.

Figure 7.12: Relationship amongst Financial Elements/Institutions in the Model



HG = host government, SPV = special purpose vehicle.
Note: The project budget, share, operation cost, and revenue are hypothetical structures.
Source: Author's compilation.

Two cases were tested in this section. Case 1 assumed an equal interest rate for both host governments as the base case. Scenario I tested a 3% increase of the base interest rate during construction. Scenario II explored a drop from 7% to 1% in the market growth rate. Case 2 is the most likely condition (different interest rate for both host governments) where the share of the cost of capital between host government 1 (Government of Viet Nam) and host government 2 (Government of the Lao PDR) in the SPV is 20:80, as detailed in Table 7.7.

Table 7.7: Test Case/Scenario

Case/Scenario	Test Case/Scenario
Case 1: Equal interest rate for both host governments	
Scenario I	Interest rate of senior debt increases by 3% from 7% during construction
Scenario II	Growth rate of users dropped from 7% to 1%
Case 2: Most likely condition (different interest rates for both host governments)	Interest rate of senior debt of Viet Nam is 7% Interest rate of senior debt of the Lao PDR is 6.6% (minimum lending interest rate of commercial banks in the Lao PDR)

Lao PDR = Lao People's Democratic Republic.
Source: Author's compilation.

The estimated results for case 1 are an IRR of 17.1%, an NPV of $11,729 million, a WACC (equal discount rate) of 5.4%, and a payback period of 8.6 years. For scenario I, increasing the interest rate of construction results in extending the years of senior debt redemption (construction costs), increasing the WACC, and raising the debt–equity ratio. In scenario II, the effect of decreasing demand results in extending the payback period, the years of all debt redemption, and reducing the NPV and IRR. In case 2, the most likely condition, the NPV is $12,083 million, the WACC is 5.2%, the payback period is 8.6 years, and the years of senior debt redemption of the Lao PDR are shortened, as shown in Table 7.8. Details of all the scenarios' estimated cash flows are in the Appendix.

The vital financial indicators are the years of debt redemption (including the payback period), which increase the debt interest rate – extending the years of debt redemption. Consequently, the project's operating service requires fiscal support from the government. Moreover, the revenue from operations must be used for debt service before paying a dividend to shareholders. In the case of demand falling short of the estimate specified in the HGA, the SPV should be compensated. These conditions should be clarified from the outset and included in the HGA.

Table 7.8: Project Summary

Financial indicators	Case 1			Case 2
	Base case	Scenario I	Scenario II	
IRR	17.1%	17.1%	11.8%	17.1%
NPV	$11,729 million	$9,165 million	$8,127 million	$12,083 million
WACC	5.4%	6.9%	5.4%	5.2%
Payback period in years	8.6 years	8.6 years	9.5 years	8.6 years
Capital structure ratio	50%	50%	50%	50%
Debt–equity ratio (lower–upper)	0.02–1.17	0.04–1.20	0.05–1.17	0.004–1.17
ADSCR (lower–upper)	1.00–17.37	1.00–9.41	1.00–4.90	1.00–85.50
NPV DCR (lower–upper)	0.16–91.74	0.11–50.84	0.12–42.34	0.12–455.13
Years of senior debt redemption	12 years	14 years	15 years	12 years
Viet Nam (host government 1)	12 years	14 years	15 years	12 years
Lao PDR (host government 2)	12 years	14 years	15 years	11 years
Years of subordinated debt Redemption	10 years	10 years	12 years	10 years
Viet Nam (host government 1)	10 years	10 years	12 years	10 years
Lao PDR (host government 2)	10 years	10 years	12 years	10 years
Years of equity redemption	11 years	11 years	13 years	11 years
Viet Nam (host government 1)	11 years	11 years	13 years	11 years
Lao PDR (host government 2)	11 years	11 years	13 years	11 years

ADSCR = annual debt service coverage ratio, IRR = internal rate of return, Lao PDR = Lao People's Democratic Republic, NPV DCR = net present value debt coverage ratio, WACC = weighted average cost of capital.
Source: Author's compilation.

8. Conclusion

This chapter proposed a transboundary PPP project structure for the Hanoi–Vientiane Expressway. A financing model was used to explore terms and conditions, with a varying financing structure, cost of capital, and O&M costs. A stylised financial model, depicting the relationship amongst financial elements and institutions, was proposed to examine the viability of the project via three important measures as proposed by the World Bank (2007). The implication of this section is that the parties involved can propose the terms and conditions that seem to best fit the respective objectives of each party and country. To draft an agreement and contract for the whole project, however, pragmatic terms and conditions must be reached. This chapter provided an alternative tool to help seek such an agreement.

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Appendix

Table 7A.1: Project's Estimated Cash Flows in Case 1 – Equal Interest Rates for Both Host Governments

($ million)

Item	Year											
	1	2	3	4	5	6	7	8	9	10	11	12
Investment (cash outflow)	3,000	1,000	-	-	-	-	-	-	-	-	-	-
Equity	3,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Equity after depreciation	2,890	3,736	3,589	3,449	3,317	3,191	3,071	2,958	2,850	2,747	2,650	2,558
Revenue (cash inflow)												
Toll collection	-	-	280	300	321	343	367	393	420	450	481	515
Parking fee	-	-	120	128	137	147	157	168	180	193	206	221
Property management	-	-	280	300	321	343	367	393	420	450	481	515
Total revenue	-	-	680	728	779	833	891	954	1,020	1,092	1,168	1,250
Operation and maintenance costs	-	-	(160)	(171)	(183)	(196)	(210)	(224)	(240)	(257)	(275)	(294)
Operating cash flow	(3,000)	(1,000)	520	556	595	637	682	729	780	835	893	956
Total debt												
Interest	146	224	237	223	207	187	164	137	107	71	35	4
Debt payments	-	-	520	556	595	637	682	729	780	687	501	55
Debt balance (principal)	3,146	4,370	4,087	3,754	3,366	2,916	2,399	1,807	1,133	517	51	-
Debt–equity ratio	1.09	1.17	1.14	1.09	1.01	0.91	0.78	0.61	0.40	0.19	0.02	-
ADSCR	-	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.22	1.78	17.37
NPV DCR	-	-	0.12	0.26	0.45	0.69	1.06	1.70	3.19	8.05	91.74	-

Table 7A.1: Project's Estimated Cash Flows in Case 1 – Equal Interest Rates for Both Host Governments (continued)

($ million)

Items	Year												
	13	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Investment (cash outflow)	-	-	-	-	-	-	-	-	-	-	-	-	-
Equity	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Equity after depreciation	2,470	2,386	2,307	2,232	2,160	2,092	2,027	1,966	1,908	1,852	1,800	1,750	1,702
Revenue (cash inflow)													
Toll collection	551	589	631	675	722	773	827	884	946	1,013	1,084	1,159	1,241
Parking fee	236	253	270	289	309	331	354	379	406	434	464	497	532
Property management	551	589	631	675	722	773	827	884	946	1,013	1,084	1,159	1,241
Total revenue	1,338	1,431	1,531	1,639	1,753	1,876	2,007	2,148	2,298	2,459	2,631	2,816	3,013
Operation and maintenance costs	(315)	(337)	(360)	(386)	(413)	(441)	(472)	(505)	(541)	(579)	(619)	(662)	(709)
Operating cash flow	1,023	1,095	1,171	1,253	1,341	1,435	1,535	1,643	1,758	1,881	2,012	2,153	2,304
Total debt													
Interest	-	-	-	-	-	-	-	-	-	-	-	-	-
Debt payments	-	-	-	-	-	-	-	-	-	-	-	-	-
Debt balance (principal)	-	-	-	-	-	-	-	-	-	-	-	-	-
Debt–equity ratio	-	-	-	-	-	-	-	-	-	-	-	-	-
ADSCR	-	-	-	-	-	-	-	-	-	-	-	-	-
NPV DCR	-	-	-	-	-	-	-	-	-	-	-	-	-

( ) = negative, ADSCR = annual debt service coverage ratio, NPV DCR = net present value debt coverage ratio.
Source: Author's calculation.

Table 7A.2: Project's Estimated Cash Flows in Scenario I – Interest Rate Increased by 3% from 7% During Construction

($ million)

Item	Year											
	1	2	3	4	5	6	7	8	9	10	11	12
Investment (cash outflow)	3,000	1,000										
Equity	3,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	1,000
Equity after depreciation	2,890	3,736	3,589	3,449	3,317	3,191	3,071	2,958	2,850	2,747	2,650	2,558
Revenue (cash inflow)												
Toll collection	-	-	280	300	321	343	367	393	420	450	481	515
Parking fee	-	-	120	128	137	147	157	168	180	193	206	221
Property management	-	-	280	300	321	343	367	393	420	450	481	515
Total revenue	-	-	680	728	779	833	891	954	1,020	1,092	1,168	1,250
Operation and maintenance costs	-	-	(160)	(171)	(183)	(196)	(210)	(224)	(240)	(257)	(275)	(294)
Operating cash flow	(3,000)	(1,000)	520	556	595	637	682	729	780	835	893	956
Total debt												
Interest	176	289	313	304	291	275	255	231	202	166	129	94
Debt payments	-	-	520	556	595	637	682	729	780	687	501	478
Debt balance (principal)	3,176	4,465	4,258	4,006	3,702	3,340	2,914	2,416	1,837	1,316	945	561
Debt–equity ratio	1.10	1.20	1.19	1.16	1.12	1.05	0.95	0.82	0.64	0.48	0.36	0.22
ADSCR	-	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.22	1.78	2.00
NPV DCR	-	-	0.11	0.24	0.39	0.58	0.84	1.21	1.86	2.97	4.65	8.71

Table 7A.2: Project's Estimated Cash Flows in Scenario I – Interest Rate Increased by 3% from 7% During Construction (continued)

($ million)

Item	Year												
	13	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Investment (cash outflow)	-	-	-	-	-	-	-	-	-	-	-	-	-
Equity	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Equity after depreciation	2,470	2,386	2,307	2,232	2,160	2,092	2,027	1,966	1,908	1,852	1,800	1,750	1,702
Revenue (cash inflow)													
Toll collection	551	589	631	675	722	773	827	884	946	1,013	1,084	1,159	1,241
Parking fee	236	253	270	289	309	331	354	379	406	434	464	497	532
Property management	551	589	631	675	722	773	827	884	946	1,013	1,084	1,159	1,241
Total revenue	1,338	1,431	1,531	1,639	1,753	1,876	2,007	2,148	2,298	2,459	2,631	2,816	3,013
Operation and maintenance costs	(315)	(337)	(360)	(386)	(413)	(441)	(472)	(505)	(541)	(579)	(619)	(662)	(709)
Operating cash flow	1,023	1,095	1,171	1,253	1,341	1,435	1,535	1,643	1,758	1,881	2,012	2,153	2,304
Total debt													
Interest	56	11	-	-	-	-	-	-	-	-	-	-	-
Debt payments	511	116	-	-	-	-	-	-	-	-	-	-	-
Debt balance (principal)	106	-	-	-	-	-	-	-	-	-	-	-	-
Debt–equity ratio	0.04	-	-	-	-	-	-	-	-	-	-	-	-
ADSCR	2.00	9.41	-	-	-	-	-	-	-	-	-	-	-
NPV DCR	50.84	-	-	-	-	-	-	-	-	-	-	-	-

( ) = negative, ADSCR = annual debt service coverage ratio, NPV DCR = net present value debt coverage ratio.
Source: Author's calculation.

Table 7A.3: Project's Estimated Cash Flows in Scenarios II – Growth Rate of Users Dropped from 7% to 1%

($ million)

Item	Year											
	1	2	3	4	5	6	7	8	9	10	11	12
Investment (cash outflow)	3,000	1,000										
Equity	3,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	1,000
Equity after depreciation	2,890	3,736	3,589	3,449	3,317	3,191	3,071	2,958	2,850	2,747	2,650	2,558
Revenue (cash inflow)												
Toll collection	-	-	280	283	286	288	291	294	297	300	303	306
Parking fee	-	-	120	121	122	124	125	126	127	129	130	131
Property management	-	-	280	283	286	288	291	294	297	300	303	306
Total revenue	-	-	680	687	694	701	708	715	722	729	736	744
Operation and maintenance costs	-	-	(160)	(162)	(163)	(165)	(166)	(168)	(170)	(172)	(173)	(175)
Operating cash flow	(3,000)	(1,000)	520	525	530	536	541	547	552	558	563	569
Total debt												
Interest	146	224	237	223	209	192	175	157	137	116	93	68
Debt payments	-	-	520	525	530	536	541	547	552	558	563	413
Debt balance (principal)	3,146	4,370	4,087	3,786	3,464	3,120	2,755	2,365	1,950	1,508	1,038	693
Debt–equity ratio	1.09	1.17	1.14	1.10	1.04	0.98	0.90	0.80	0.68	0.55	0.39	0.27
ADSCR	-	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.38
NPV DCR	-	-	0.12	0.26	0.41	0.59	0.82	1.13	1.56	2.27	3.63	5.92

Table 7A.3: Project's Estimated Cash Flows in Scenarios II – Growth Rate of Users Dropped from 7% to 1% (continued)

($ million)

Item	Year												
	13	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Investment (cash outflow)	-	-	-	-	-	-	-	-	-	-	-	-	-
Equity	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Equity after depreciation	617	2,470	2,386	2,307	2,232	2,160	2,092	2,027	1,966	1,908	1,852	1,800	1,750
Revenue (cash inflow)													
Toll collection	309	312	316	319	322	325	328	332	335	338	342	345	349
Parking fee	133	134	135	137	138	139	141	142	144	145	146	148	149
Property management	309	312	316	319	322	325	328	332	335	338	342	345	349
Total revenue	751	759	766	774	782	789	797	805	813	822	830	838	846
Operation and maintenance costs	(177)	(179)	(180)	(182)	(184)	(186)	(188)	(189)	(191)	(193)	(195)	(197)	(199)
Operating cash flow	574	580	586	592	598	604	610	616	622	628	634	641	647
Total debt													
Interest	47	26	8	-	-	-	-	-	-	-	-	-	-
Debt payments	364	290	120	-	-	-	-	-	-	-	-	-	-
Debt balance (principal)	376	112	-	-	-	-	-	-	-	-	-	-	-
Debt–equity ratio	0.15	0.05	-	-	-	-	-	-	-	-	-	-	-
ADSCR	1.58	2.00	4.90	-	-	-	-	-	-	-	-	-	-
NPV DCR	11.78	42.34	-	-	-	-	-	-	-	-	-	-	-

( ) = negative, ADSCR = annual debt service coverage ratio, NPV DCR = net present value debt coverage ratio.
Source: Author's calculation.

Table 7A.4: Project's Estimated Cash Flows in Case 2 – Most Likely Condition

($ million)

Item	Year											
	1	2	3	4	5	6	7	8	9	10	11	12
Investment (cash outflow)	3,000	1,000	-	-	-	-	-	-	-	-	-	-
Equity	3,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Equity after depreciation	2,890	3,736	3,589	3,449	3,317	3,191	3,071	2,958	2,850	2,747	2,650	2,558
Revenue (cash inflow)												
Toll collection	-	-	280	300	321	343	367	393	420	450	481	515
Parking fee	-	-	120	128	137	147	157	168	180	193	206	221
Property management	-	-	280	300	321	343	367	393	420	450	481	515
Total revenue	-	-	680	728	779	833	891	954	1,020	1,092	1,168	1,250
Operation and maintenance costs	-	-	(160)	(171)	(183)	(196)	(210)	(224)	(240)	(257)	(275)	(294)
Operating cash flow	(3,000)	(1,000)	520	556	595	637	682	729	780	835	893	956
Total debt												
Interest	143	217	230	216	199	179	156	130	99	64	29	1
Debt payments	-	-	520	556	595	637	682	729	780	687	464	11
Debt balance (principal)	3,143	4,360	4,070	3,729	3,332	2,874	2,349	1,749	1,068	445	10	-
Debt–equity ratio	1.09	1.17	1.13	1.08	1.00	0.90	0.76	0.59	0.37	0.16	0.004	-
ADSCR	-	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.22	1.93	85.50
NPV DCR	-	-	0.12	0.27	0.45	0.71	1.09	1.77	3.40	9.41	455.13	-

Table 7A.4: Project's Estimated Cash Flows in Case 2 – Most Likely Condition (continued)

($ million)

Item	Year												
	13	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Investment (cash outflow)	-	-	-	-	-	-	-	-	-	-	-	-	-
Equity	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Equity after depreciation	2,470	2,386	2,307	2,232	2,160	2,092	2,027	1,966	1,908	1,852	1,800	1,750	1,702
Revenue (cash inflow)													
Toll collection	551	589	631	675	722	773	827	884	946	1,013	1,084	1,159	1,241
Parking fee	236	253	270	289	309	331	354	379	406	434	464	497	532
Property management	551	589	631	675	722	773	827	884	946	1,013	1,084	1,159	1,241
Total revenue	1,338	1,431	1,531	1,639	1,753	1,876	2,007	2,148	2,298	2,459	2,631	2,816	3,013
Operation and maintenance costs	(315)	(337)	(360)	(386)	(413)	(441)	(472)	(505)	(541)	(579)	(619)	(662)	(709)
Operating cash flow	1,023	1,095	1,171	1,253	1,341	1,435	1,535	1,643	1,758	1,881	2,012	2,153	2,304
Total debt													
Interest	-	-	-	-	-	-	-	-	-	-	-	-	-
Debt payments	-	-	-	-	-	-	-	-	-	-	-	-	-
Debt balance (principal)	-	-	-	-	-	-	-	-	-	-	-	-	-
Debt–equity ratio	-	-	-	-	-	-	-	-	-	-	-	-	-
ADSCR	-	-	-	-	-	-	-	-	-	-	-	-	-
NPV DCR	-	-	-	-	-	-	-	-	-	-	-	-	-

( ) = negative, ADSCR = annual debt service coverage ratio, NPV DCR = net present value debt coverage ratio.
Source: Author's calculation.