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# Unlocking Public and Private Investments in Water Reuse

## Activity 1: Composing of an Input Study

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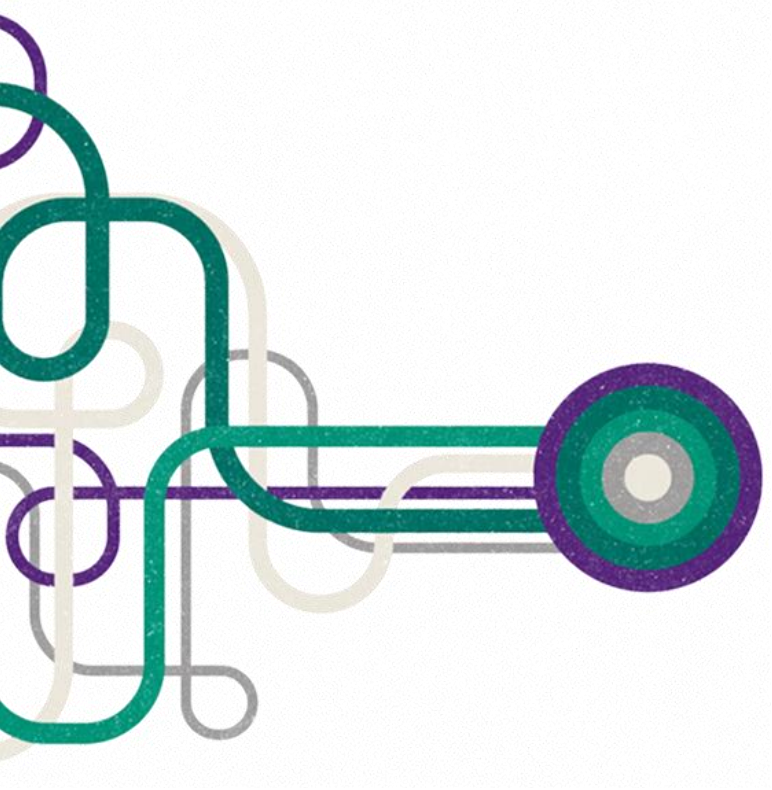

THE ENERGY & WATER AGENCY

AQUARES Interreg Europe

European Union
European Regional Development Fund

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# Context to the input study

## Country background

The Maltese archipelago is located in the centre of the Mediterranean and is constituted of 3 main islands – Malta (246km$^2$), Gozo (67km$^2$) and Comino (3.5km$^2$) with a total area of 316km$^2$.

According to data released by Eurostat in 2018, the inhabitants of the Maltese islands exceed 480,000, having the highest population density among European Countries, that of 1,450 inhabitants per km$^2$.

The high population density and the natural shortage of water resources result in the Maltese islands having the lowest natural freshwater per person per year of all the EU Member States. In fact, freshwater availability per capita is estimated to be between 80m$^3$ and 120m$^3$, significantly below 500m$^3$ – which the United Nations (UN), through the Falkenmark Index, considers the limit for the manageable capacity to ensure the basic water needs required for the sustained development of a country.

Thus, water reuse is an important factor for securing a good quantitative status within the islands and securing a sufficient supply of water reuse for its inhabitants, and its agricultural and farming sectors.

## Current state of affairs in the relevant sector

This input study is one of the objectives of a call for quotations for External Support Services for the development of a "Report on unlocking Public and Private Investments in Water Reuse" issued by the Energy and Water Agency Malta. The report forms part of the AQUARES project, a larger project co-financed by the European Union (EU) through the INTERREG-Europe and the Government of Malta. The completion of the project will support future policy implementing decisions on water reuse for better securing a sufficient water supply, and therefore support the implementation of Malta's 2nd River Basin Management Plan (2nd RBMP) as requested under the EU's Water Framework Directive (WFD).

The Energy and Water Agency (EWA) is a government agency whose main functions include the formulation, evaluation, monitoring and implementation of national policies concerning the use of energy and water in a sustainable manner, the preparation and update of plans to meet national and EU energy and water resource management targets, and the implementation of projects conducive to the achievement of such targets through energy efficiency initiatives, renewable energy penetration and water conservation measures. The Energy and Water Agency is sub-divided into the Energy unit and the Water unit.

# The AQUARES project

## Introduction to the AQUARES project

The AQUARES project focuses on the advancement of water reuse policies as a means to promote resources efficiency. The Energy and Water Agency is one of 10 partners involved in the implementation of this project which has a total budget of €1,967,086.

The main project outputs of the project shall focus on the development of action plans to improve current and future policy instrument to enable safe water reuse and also identify ways how water reuse technology can be better integrated into existing markets. The involvement of various project partners from across the EU will also allow for the exchange of good practices at EU level to support the safe reuse of treated sewage effluent. The AQAURES project is financed through the Interreg Europe funding program.

## Project description

Water reuse is a key approach to both promote resource efficiency in water scarce areas in Europe, and to profit from opportunities in the expanding water market, thereby alleviating pressure on wetlands and littoral areas of Europe. The European Commissions' "Strategic Implementation Plan of the European Innovation Partnership in Water", was set in place to promote and support efficient water management in Europe, where water scarcity is estimated to affect 11% of its population.

In this context, AQUARES will support public authorities to initiate efforts, join forces and exchange experiences to:

a) identify viable strategies to utilise water reuse to confront inefficient uses of water;

b) make the most of EU financing tools; and

c) promote public dialogue to address conflicting interests.

## Geographical area to be covered by the AQUARES project

The AQUARES project involves 10 project partners from 9 European Union countries:

1. The Regional Government of Murcia, Ministry of Water, Agriculture, Livestock and Fisheries, General Direction of Water – Spain;
2. Ministry of Environment and Energy, Special Secretariat of Water – Greece;
3. Lodzkie Region – Poland;
4. The Regional Development Agency of the Pardubice Region – Czech Republic;
5. The Energy and Water Agency – Malta;
6. Lombardy Foundation for the Environment – Italy;
7. Water Board of Oldenburg and East Frisia – Germany;
8. Euro-Mediterranean Water Institute Foundation – Spain;
9. Association "Baltic Coasts" – Latvia; and
10. The Municipality of Trebnje – Slovenia.

## Overall objectives of the AQUARES project

The overall objectives of the AQUARES project are to improve policy instruments, by articulating a process of integration of water reuse in national, regional and local development plans, to promote efficient use and management of water in EU regions and to support sustainable development and eco-innovation across the agricultural, industrial, urban and recreational sectors. To do so, AQUARES will:

- Objective 1: Support public authorities to plan for and support the utilisation of untapped water resources;
- Objective 2: Promote the adoption of water reuse technological and managerial innovations; and
- Objective 3: Highlight best practices for ensuring compliance with water quality standards across different sectors.

# Objectives of the Call for Quotations

## Specific objectives of the Call for Quotations

The Call for Quotations for External Support Services for the development of a "Report on unlocking Public and Private Investments in Water Reuse" under the AQUARES Project has the following objectives:

- Develop input documentation for an Interregional Workshop on how to unlock public and private investments in water reuse;
- Develop policy guidelines that will assist in facilitating water re-use investments for Public-Private Partnerships (PPPs) across the European Union;
- Participate in an Interregional Workshop, organized by the Energy and Water Agency, which will be held in Malta, and present the results obtained from the input study on investment opportunities in water reuse; and
- Prepare a Workshop Summary Report following the completion of all other objectives.

## The expected results

As the winning bidder for this Call for Quotations, we will be delivering the following results:

- Result 1: Develop an input study that shall outline the economic and environmental benefits and challenges investors could obtain from investing in water re-use technologies;
- Result 2: Develop an interactive agenda for the speakers and attendees during the Interregional Stakeholders Meeting;
- Result 3: Participate during the Interregional Workshop by presenting results obtained from the input study and chairing roundtables; and
- Result 4: Prepare a Workshop Summary Report.

# An overview of the Input Study

## Objectives of the Input Study

The remainder of this document features 'The Input Study', which forms the first Activity required as part of the Call for Quotations.

We have developed an Input Study which focuses on the application of Public-Private Partnerships and investment opportunities in the water-reuse sector. The Input Study is based on the baseline studies provided to us by the Contracting Authority and other sources identified as a result of desktop research.

The Input Study seeks to outline the role of financial and legal incentives at European level, while also proposing guidelines on how to setup Public–Private Partnerships.

The Input Study is based on significant desktop research into the development and application of Public-Private Partnerships, especially within the water-reuse sector, while making reference to the European PPP Expertise Centre's (EPEC) guidelines on PPPs. We also consulted with key local experts in the field to ensure a high quality deliverable. Furthermore, we leveraged on our significant experience with PPPs in the preparation of this Input Study.

In line with the requirements of the Call for Quotations, the Input Study focuses on the following:

- ➢ Financial and legal incentives of Public–Private Partnerships at the regional level:
  - Public–Private Partnership theory and basic concepts;
  - Different Public–Private Partnership models applicable to water management;
  - Project financing - a primer to financial analysis and economics analysis;
  - Risk identification and mitigation techniques.
- ➢ Provide guidelines on how to setup public–private partnerships:
  - Shifting from theory to practice - introducing potential enablers and barriers of using public-private partnerships to achieve water efficiency;
  - Public–Private Partnership implementation and project management;
  - Case Study 1: Setting up Public–Private Partnerships relevant to water management and reuse techniques in densely populated areas within the EU;
  - Case Study 2: Setting up Public–Private Partnerships in EU areas with low natural freshwater resources;
  - Case Study 3: Setting up Public–Private Partnerships in EU areas with abundant natural freshwater resources.

## Structure of the Input Study

In line with the previously mentioned focus areas, the Input Study is structured as follows:

- A brief overview of the current water shortage situation in Europe and in Malta;
- An introduction to financing resource recovery and reuse;
- An understanding of Public–Private Partnerships;
- Public–Private Partnerships in practice;
- The European PPP market; and
- Overview of relevant case studies.

# Section 2: Overview of the current water shortage situation

# Water shortage in Europe

## Water Scarcity & Droughts in the European Union

According to the Environment Directorate General of the European Commission (EC)[1], while Europe is considered as having adequate water resources, water scarcity and drought is an increasingly frequent and widespread phenomenon in the European Union. In fact, the long term imbalance resulting from water demand exceeding available water resources is no longer uncommon.

The EC estimates that by 2007, at least 11% of Europe's population and 17% of its territory had been affected by water scarcity, putting the cost of droughts in Europe over the past thirty years at €100 billion. The Commission expects further deterioration of the water situation in Europe if temperatures keep rising as a result of climate change. Water is no longer the problem of a few regions, but now concerns all 500 million Europeans.

## Objectives of EU water policy

The main overall objective of European Union (EU) water policy is to ensure access to good quality water in sufficient quantity for all Europeans, and to ensure the good status of all water bodies across Europe. Therefore, policies and actions are set up in order to prevent and to mitigate water scarcity and drought situations, with the priority to move towards a water-efficient and water-saving economy.

## About water scarcity and droughts

Water scarcity and drought are different phenomena, although they are liable to aggravate the impacts of each other. In some regions, the severity and frequency of droughts can lead to water scarcity situations, while overexploitation of available water resources can exacerbate the consequences of droughts. Therefore, attention needs to be paid to the synergies between these two phenomena, especially in river basins affected by water scarcity.

## What is water scarcity?

Water scarcity occurs where there are insufficient water resources to satisfy long-term average requirements. It refers to long-term water imbalances, combining low water availability with a level of water demand exceeding the supply capacity of the natural system.

Water availability problems frequently appear in areas with low rainfall but also in areas with high population density, intensive irrigation and/or industrial activity. Large spatial and temporal differences in the amount of water available are observed across Europe. Beyond water quantity, a situation of water scarcity can also emerge from acute water quality issues (e.g. diffuse or point source pollutions) which lead to reduced fresh/clean water availability.

Currently the main way of assessing Water Scarcity is by means of the Water Exploitation Index (WEI) applied on different scales (i.e. national, river basin). The WEI is the average demand for freshwater divided by the long-term average freshwater resources. It illustrates to which extent the total water demand puts pressure on the available water resource in a given territory, and helps identify the territories that have high water demand compared to their resources.

## What is drought?

Droughts can be considered as a temporary decrease of the average water availability due to various factors, such as rainfall deficiency. Droughts can occur anywhere in Europe, in both high and low rainfall areas and in any seasons. The impact of droughts can be exacerbated when they occur in a region with low water resources or where water resources are not being properly managed, resulting in imbalances between water demands and the supply capacity of the natural system.

Over the past thirty years, droughts have dramatically increased in number and intensity in the EU. The number of areas and people affected by droughts went up by almost 20% between 1976 and 2006. Several indicators can be taken into account to illustrate the severity of a drought event. The level of precipitation in a particular area represents one of these indicators.

Sources: [1] Environment Directorate General of the European Commission
http://ec.europa.eu/environment/water/quantity/scarcity_en.htm
http://ec.europa.eu/environment/water/quantity/about.htm

# Section 3: An introduction to the financing of resource recovery and reuse

# An introduction to the financing of resource recovery and reuse

According to the report "Financing Resource Recovery and Reuse in Developing and Emerging Economies: Enabling Environment, Financing Sources and Cost Recovery"[3], published by the Consultative Group for International Agricultural Research (CGIAR) Research Program on Water, Land and Ecosystems, the resource recovery and reuse (RRR) of domestic and agroindustrial waste has the potential to contribute to a number of financial, socioeconomic and environmental benefits. Furthermore, despite the proven benefits and increasing political will to recycle nutrients, water and energy, barriers to meeting up-front capital requirements, engaging the private sector, and achieving sustainable, pro-poor cost recovery continue to limit the widespread adoption of RRR.

The report outlines how a systematic understanding of the enabling environment, public and private funding sources, risk-sharing mechanisms and pathways for cost recovery can help to identify opportunities to improve the viability of RRR solutions.

We believe an understanding of the above mentioned factors, as provided by the report, is a prerequisite to a discussion on unlocking public and private investments in water reuse. These factors are thus discussed briefly below.

## Creating an enabling environment for investment in RRR

Encouraging a more rapid uptake of RRR, while ensuring public safety, requires the implementation of an enabling environment governed by a public policy and regulatory framework.

This involves the adoption of regulations and policies by regulatory authorities that remove disincentives for RRR and identify different forms of waste as potential resources for business and public sector entities.

Thus, market forces and economic incentives also need to be considered, as they play a critical role in supporting supply chains which prioritize recovered resources as inputs, rather than encouraging the current model of 'make-take-dispose'.

Furthermore, stakeholder capacity and engagement are critical to change negative public perception on RRR, and improve project feasibility at the household, community and government level.

## Public and private funding sources

Access to diverse public and private funding sources for capital and operational costs is also critical for financing RRR. This is because RRR solutions have unique characteristics that introduce challenges to financiers, including high up-front costs, a range of project scales, long payback periods, lack of track record, limited technology diffusion and challenges valuing non-economic benefits.

These issues have limited the involvement of certain stakeholders in financing RRR, although potential to diversify financing sources to include a range of options has been demonstrated around the world. Examples include concessional or asset finance, green and climate-aligned bonds, institutional investors interested in environmental, social and governance investment criteria, and hybrid finance.

## Addressing risk through blending and structuring finance

Supporting RRR projects requires addressing risk through blending and structuring finance. Blended finance strategically uses development and philanthropic funds to mobilize private capital flows. Various financial structures and mechanisms exist including Public–Private Partnerships (PPPs), project aggregation, multilateral investment guarantees, results-based financing and revolving funds.

## Resource pathways for operational cost recovery

Beyond funding capital costs, a critical challenge for RRR is finding resource pathways for operational cost recovery. The system for collecting user fees, tariffs, sales revenue or taxes for an RRR product or service must be designed to be situation- and industry-specific to overcome challenges with low collection rates and low taxes or ability to pay.

## The role of PPPs in unlocking public and private investments in water reuse

As outlined previously, PPPs can have a critical role in addressing risk by blending and structuring finance. In line with the objectives of this report, this input study focuses on the specific role of PPPs in unlocking public and private investments in water reuse, however further information on the above mentioned factors can be found in the report published by the CGIAR.

Source: [3] The report was published as part of the Resource Recovery and Reuse Series by the CGIAR Research Program on Water, Land and Ecosystems, and was one of the baseline studies identified by the Energy and Water Agency.

# Financing solutions for water reuse schemes

Prior to focusing on PPPs as a tool for unlocking public and private investments in water reuse, we provide a brief understanding of the comprehensive financing solutions for water reuse schemes. The following information was sourced from deliverable D4.5 of the DEMOWARE Project, "Financing solutions for water reuse schemes"[4].

The report outlines the financing solutions available to entities forming part of the European Members States, outlining the possibilities for leveraging public and private funding.

According to the report, a financing strategy is defined and composed by three main elements:

- Where do the funds come from? i.e. Funding sources;
- How are funds delivered to the recipient? i.e. Resource pathways; and
- Who is the recipient, i.e. who owns and manages the wastewater treatment and recycling facilities? i.e. Governance structure and utility ownership.

These three elements are discussed briefly below.

## Funding sources: where do financial resources come from?

Funding sources can be distinguished based on where they come from (private, public, water users), as well as on the level from which they are provided (European, national, local).

European funds are normally provided through the general EU budget. These funds include for example the European Agricultural Fund for Rural Development (EAFRD), the European Regional Development Fund (ERDF), the European Fund for Strategic Investment (EFSI) and the Cohesion Fund among others.

In the case of national public funding, common sources and mechanisms include:

- General government budgets;
- Bonds;
- State Revolving Funds; and
- End-User fees.

Private funding can be provided at different levels. Some funds are provided by private companies to water infrastructure projects all over the world. An overview of each of these funding opportunities is provided in the report published by the DEMOWARE Project. In other cases, private investment occurs at the national level, often taking the form of already existing water companies financing water reuse projects.

Water users contribute to the financing of water reuse schemes through water pricing mechanisms (tariffs). In many cases, tariffs cover 100% of operation and maintenance (O&M) costs, and they often also contribute to the recovery of investment costs. In the case of water reuse projects, costs can be recovered by different pricing mechanisms, or by a combination of them, such as:

- Tariffs for recycled water;
- Tariffs for wastewater collection and treatment; and
- Tariffs for freshwater supply (cross-subsidy).

According to the report, in most cases, water reuse projects are funded by a combination of different funding sources.

Investment costs are often funded through European and national funding sources as well as through private investment, and through different combinations of these three sources. In some cases, investment costs are first covered by public budget and then recovered through user tariffs.

Operation and maintenance costs are often recovered by recycled water tariffs charged to users, although public subsidies can sometimes come into play. In a few cases, water tariffs also contribute to recover (part of) the investment costs.

Private investment can also be employed in the construction phase and be refunded by public funding later on.

Source: [4] The report was published as part of the Innovation Demonstration for a Competitive and Innovative European Water Reuse Sector: DEMOWARE, and was one of the baseline studies identified by the Energy and Water Agency.

# Financing solutions for water reuse schemes (contd.)

## Resource pathways: how are financial resources transferred to the water re-use project?

When private capital is invested, the delivery mechanism is straightforward: there is a direct transfer of private capital to the water reuse project.

On the other hand, when public resources are invested, these resources can be delivered through different pathways, and in particular:

- Grants;
- Loans;
- Rebates; and
- Tax credits.

When water reuse projects are funded by a combination of different funding sources, funds are delivered through a combination of resource pathways, and in particular a combination of grants and loans. When loans come into play, the amount received must be recovered later on through user tariffs.

In some cases, the combination of funding sources and resource pathways can have quite a complex structure. In none of the case studies reviewed by the DEMOWARE Project were funds delivered through tax rebates or end-user fees, although this is possible in principle.

## Governance structures and utility ownership: who owns wastewater and re-cycling facilities? And who manages them?

Financing schemes can be dependent on the governance structure and ownership of the water reuse facilities, as well as their management. Governance and ownership arrangements for water services (thus including water reuse projects) include:

- Direct public management;
- Delegated public management;
- Direct private management; and
- Public–Private Partnerships.

## Developing and operating a water reuse systems: when does financing come into play?

Apart from developing a finance strategy for a water reuse system, responsible authorities need to assess at which stage financing will be required.

The development and operation of a water reuse system has four distinct phases, with financing requirements possible at each stage:

- Research and development;
- Planning the water reuse scheme;
- Implementing the water reuse scheme; and
- Operating the water reuse scheme.

## Comprehensive list of financing sources for water reuse projects

The report moves on to identify and discuss a comprehensive list of different financing sources available to water reuse projects, such as Cohesion Funds and the European Investment Bank (EIB), while also outlining several case studies of successfully financed projects. A full list of the available financing sources and case studies can be found in the report published by the DEMOWARE Project.

The next section of this input study focuses on providing an understanding of PPPs, which can serve as a key tool in unlocking public and private investments in water reuse.

# Section 4: An understanding of Public–Private Partnerships

# Public–Private Partnerships theory and basic concepts

The report "Harnessing the Power of Public Private Partnerships: The role of hybrid financing strategies in sustainable development"[5] provides a comprehensive understanding of PPPs. The following information in this section of the input study was sourced from this report, unless otherwise indicated.

The last 20 years have seen the rise to power of PPPs as a means of crowding in investment and expertise from the private sector to the delivery of public goods and services. Widely utilized because of their purported advantages in off-budget funding, PPPs are a mechanism that modern governments regularly turn to in order to fulfil their responsibilities on public infrastructure and services. This trend is likely to continue following the 2007–2008 global financial crisis that resulted in many jurisdictions undertaking less large scale public investment projects, thus seeking alternative methods of meeting the increasing demands for investment in public sector development.

## Definition of Public-Private Partnerships

Public-Private Partnership is a generic name that is applied to several different types of contractual agreements between the State and the private sector for the purpose of public infrastructure development and services provision. A long time provider of goods and services to the government through traditional methods of procurement and privatisation, PPPs see the private sector increasingly taking on activities previously considered the exclusive responsibility of the State, as the State becomes the "buyer" rather than the supplier of services.

As the word "partnership" suggests, the aim is to create an infrastructure "dream team" by combining the best capabilities of the public (legislation, regulations, social concern) and private (innovation, efficiency, finances) sectors to find a solution to infrastructure-related public needs. PPP therefore describes the structure of the relationship between the two parties and ensures that the best of both contributes to the provision of optimal public services. There is no one single, concise definition of PPP. Accurately defining a PPP is problematic because by nature it is a contextual concept, responding to the various institutional, legal, investment and public procurement settings of different jurisdictions, whilst also considering the contextual nature of individual agreements.

What this involves and the part each of the parties will play in a project is obviously highly contextual, but there are some general principles that frame a PPP and separate it from other procurement methods.

## Common characteristics of PPPs

Although in a constant state of flux, PPPs can generally be said to include:

- long-term contracts/agreements/relationships;
- a private funding component;
- provision of services or infrastructure through the private sector;
- significant transfer of risk to the private sector, such as investment, design, construction, or operational risks;
- complex contractual responsibilities and deliverables that vary over the contract period as the project moves through its phases, such as from the finance phase to the construction and operation phase;
- the return of infrastructure/services to the control of the State at the end of the contract term; or
- the provision of services by the private sector on behalf of the State following the fulfilment of design and build responsibilities.

Common areas where jurisdictions differ in their application of PPP are:

- whether there is a public sector finance component, and if so, the percentage to which financial investment is generally divided between public and private sectors; and
- the method of remuneration to the private sector, i.e., user fees (concession) or government payments (availability-based).

Source: [5] The report was published by the International Institute for Sustainable Development (IISD) and was one of the baseline studies identified by the Energy and Water Agency.

# Different forms of public procurement

## The difference between a PPP and privatisation

PPPs are not to be confused with privatisation, where a service or facility is fully transferred to the private sector by sale/disposal, including all its associated assets and liabilities, for operation according to market forces.

PPP sees the temporary transfer of a service or facility to the care and responsibility of the private sector through a long-term lease agreement, with the service or infrastructure potentially returned to government control at the completion of the contract term.

The extent to which the government regains ownership at the completion of a PPP depends on whether the facility or service was, in fact, originally owned by the public sector and the terms of the PPP agreement. PPP agreements may see the private partner operate services according to market forces, but it is generally within a protected framework of minimum incomes and thresholds guaranteed by the public sector, and minimum services or supply demanded of the private partner.

PPPs are therefore, according to individual project choices, positioned at various points along a continuum that sees total public sector provision at one end and privatization at the other.

## Concessions and Concession PPPs

There exists some confusion on the delineation between concession contracts and concession PPPs, which has arisen because these two forms of public procurement do share some features; this confusion was exacerbated during the early years of PPPs by the use of the terms interchangeably. Some overlap still exists today, where emerging nations, for example, lack the capacity to undertake sophisticated PPP agreements and concessions can form simple or early forms of PPP and can often be included in statistics as PPP agreements. Concession contracts and the term "concessions" as utilized within PPP are, however, separated by subtle points of difference.

Public service concessions describe a contract for the private sector to have exclusive rights to operate, invest in and maintain a public sector responsibility or utility, whereby the private company derives part or all of its income from the operation of the service. As distinct contract types, a concession agreement's main point of difference from a PPP is the reduced emphasis on large private finance components and the fact that ownership of the facility remains with the public sector during concessions.

Where the two terms are combined, a "concession PPP" refers specifically to the manner in which the private sector generates its income or is paid for its services, which is generally through the collection of user fees (tolls, water usage), such as in the case of a tolled roadway.

# Different forms of public procurement (contd.)

## Availability based PPPs

In availability-based PPPs, on the other hand, the private sector partners derive their income from government payments. Here, the public authority makes payments to the private company based on pre-arranged contractual conditions relating to when, how, and to what extent a public service is provided or made available. This may be found, for example, in the provision of power, where the public sector will make payments according to the plant's output capacity, regardless of whether that output is utilized or not.

Availability-based PPPs are also more common in soft infrastructure such as education or health that has no clear user fee or self-funding ability. A further limited application of availability payments are the so-called "shadow tolls," where the private sector will not collect real tolls but will receive payment from the public authority based on infrastructure usage.

## Private Finance Initiatives

The Private Finance Initiative (PFI) is a form of PPP commonly used within the United Kingdom and the term used to describe all such agreements, with the title "PPP" rarely appearing. First introduced by the British government in 1992, the PFI is a form of PPP that insists on private sector finance provision. Just as in PPP, a PFI will see the public sector as both an enabler and purchaser of projects, while the private sector becomes the designer, builder and operator on behalf of the government.

Whereas the inclusion of public finance is optional to some PPP models, the responsibility for project finance also falls to the private partner within PFI, making most agreements design-build-finance-operate mandates.

As a variant of PPP, any reference to PFI can be reasonably equated with PPP theory and practice at its core level and considered to infer the same meaning. Indeed, the United Kingdom is considered to be the leading developer and practitioner of PPP over the last 20 years, with major contributions through PFI practice and experience.

# PPP models applicable to water management

There are a range of options available[6] to public authorities that wish to involve the private sector in the procurement process, and within that continuum, a PPP can take many forms according to the jurisdiction in which it is operating.

The PPP models in place vary to fit various construction, operation, ownership, and revenue-generating scenarios. Several types of PPP models are outlined below. These are all applicable to water management.

## Design-Build PPPs

A design-build PPP is similar to a client-contractor arrangement. The private partner designs and builds the facility, while the public partner provides the funds for the project. The public partner retains ownership of the project and any assets generated through its use.

## Design-Build-Maintain PPPs

Under this form of PPP model the contractor designs and builds the project. However, the owner operates the constructed asset while the contractor performs routine maintenance and/or repairs on the project for the duration of the PPP contract meeting the availability or project usability requirements of the contract.

## Design-Build-Operate PPPs

Design-build-operate PPPs are similar to design-build PPPs but include ongoing operation and maintenance of the property facility or project by the private party. The public partner acts as the owner of the installation and provides the funds for construction and operation.

## Lease-Operate-Maintain PPPs

Unlike the PPP models discussed above, under this model the private contractor leases the facility from the public owner and then, using its funds, modernizes or expands the facility and then operates and maintains the facility under a contract with the owner. The contractor is paid by the owner for the owner's use of the facility

## Design-Build-Operate-Maintain PPPs

Under this PPP model, the contractor is responsible for all four elements of the contract. Under this form of contract the PPP contractor is typically paid from the revenue gained through the operation of the constructed project

## Build-Own-Operate-Transfer PPPs

In some cases, the public partner builds, possesses, and operates the project for a limited time, then the facility is transferred, free of charge and including ownership, to the public agency. This may be known as a build-own-operate-transfer PPP.

## Concession PPPs

With a concession PPP, the private agency operates and maintains the facility for a specific period of time. The public partner has power over the ownership of the facility, but the private partner possesses owner rights over any addition incurred while the facility is being operated under its domain.

## Build-Own-Operate PPPs

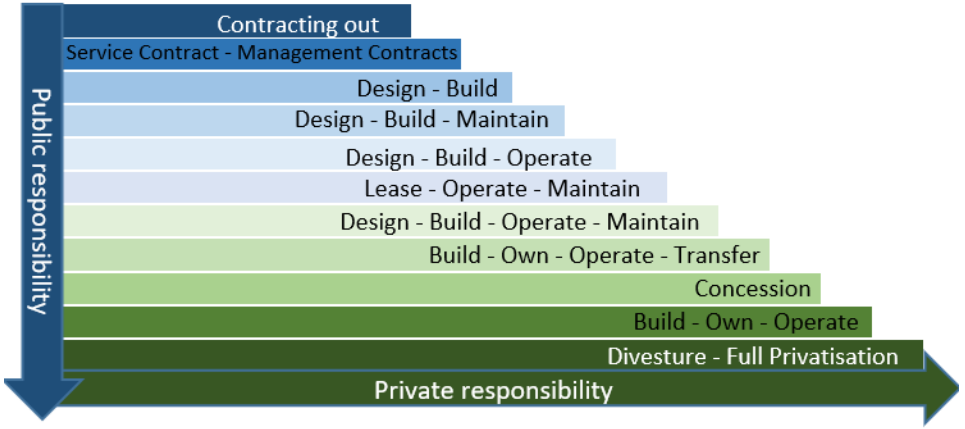
Under a build-own-operate contract, the private contractor builds, possesses, and operates the facility and also has control over profits and losses generated by the facility. This is very close to a full privatization process.

Source: [6] Public-Private Partnership Models
https://www.thebalancesmb.com/public-private-partnership-types-845098

# The PPP continuum

The figure below illustrates the PPP continuum, also demonstrating the diverging correlation of responsibility for the public and private sectors according to various PPP models.

On one end of the spectrum lies traditional service/management contracts, where the government procures services directly from the private sector. On the other end of the spectrum lies privatisation, where a service or facility is fully transferred to the private sector by sale/disposal, including all its associated assets and liabilities, for operation according to market forces.




Source: Adapted from Public Private Partnerships: Literature Review - Draft. Aid Delivery Methods, Palmer, G (2009)

# Advantages of PPPs

The advantages and disadvantages of implementing a PPP model need to be understood well by contracting authorities before opting for public procurement through a PPP.

The key advantages of PPP models, as outlined by the report published by the International Institute for Sustainable Development (IISD), are outlined below:

- *Value for money:* PPPs leverage private sector skills and technology to deliver projects in a more efficient manner, resulting in either lower costs or a superior product for the same investment;
- *Optimization of the design and operation:* Using outputs based specification allows room for and promotes innovative solutions from the private sector on the design, operation and maintenance aspects of the project, with the intention of improving effectiveness whilst reducing costs over the whole life cycle of the project;
- *Faster delivery of project:* Private sector capacity and flexibility are seen to be superior to the public sector, and PPPs therefore allow projects to be finished in less time and on schedule as opposed to those attributed to public sector provision;
- *Risk transfer:* Project risks (e.g. finance, timeframe, planning permits, community consultations) are transferred to the party best equipped to deal with it, both in terms of expertise and costs, to the stability and benefit of the project;
- *Increased investment in public infrastructure:* Governments are able to implement projects more frequently and on a larger scale because the private sector finance element reduces governments needs to raise or budget additional funds, as is the case in standard procurement;
- *Increased budget/financing certainty:* The transfer of responsibility (and risk) to the private sector for some of the project elements shields governments from unforeseen financial liabilities following cost overruns, delays, or operational difficulties that would otherwise impact upon the government's budget bottom line. Furthermore, project finances are secured for the length of the contract and not subject to cyclical political budget adjustments, allowing for greater investment planning and efficiencies throughout the management, operation, and maintenance phases of the project;
- *Improved service delivery:* PPPs allow the government to focus on policy and governance, with the private sector focusing on the technical aspects of design, construction, operation, and management. Furthermore, performance targets or requirements provide an incentive for the private sector to perform;
- *Whole of life cycle approach:* The design, construction and operation are often undertaken by the selected consortium, resulting in a greater integration of the different elements and more coherence to the final product, unlike standard procurement options which may involve several different subcontractors. Motivated by the desire to preserve long-term value of assets and to minimize costs, whole of life cycle responsibilities encourage the private sector to choose the most appropriate technology for the long term and adequately maintain it. This may be in contrast to decisions by governments that are often guided more by short-term financial pressures and think in much shorter cycles according to political terms and budget constraints;
- *Access to additional capital/off-balance sheet financing:* A large percentage of finance in PPP is provided by the private sector, thus the government is not responsible for raising funds or adjusting budgets to allow for large infrastructure spending. This is particularly advantageous during times of fiscal crisis where the government is already budget constrained or where the government may have a poor credit rating and is not able to raise the necessary finance. International and national accounting standards provide guidance as to what and how PPPs are recorded on balance sheets, but the issue is far from secure;
- *Political advantage:* There is political leverage to be gained from PPP agreements in terms of public perception and financial management credentials, as projects tend to be delivered on time with less impact on the government's budget, providing superior quality infrastructure or services; and
- *Private sector growth and stability:* PPPs provide the private sector with access to reduced risk, secure, long-term investment opportunities that are underwritten by government contracts. Such agreements ensure private capital flows, provide investment opportunities, and stimulate local industry and job markets.

# Disadvantages of PPPs

The key disadvantages of PPP models, as identified by the IISD, are outlined below:

- *Higher cost:* The borrowing rates given to the private sector may be higher than those typically available to governments, while an expensive tender and negotiation process, including higher contract transaction costs paid to legal and accounting firms, can neutralize any savings made in design and construction phases. Furthermore transferring risk from one party to another has its price, and the private sector will expect guarantees of income proportionate to its risk burden;
- *Reduced competitiveness:* High tender and transaction costs, along with complicated and long-term contracts, reduce the pool of private sector companies with the capacity to apply for certain projects, reducing the government's choice and competitive tender processes. Furthermore, exclusivity agreements awarded to winning companies lock them into guaranteed profits and, in reality, create monopoly markets, reducing competitive pressure to reduce costs and enhance services;
- *Complicated and lengthy tender process:* PPP contract and negotiation periods are often more complex and protracted due to the nature of the multi-party, financially intricate, and long agreement terms inherent in the relationship;
- *Lack of capacity:* It is necessary for both the public and private sectors to possess PPP-specific capacity for an agreement to be signed and administered successfully. Such capacity is absent from many jurisdictions, both at a national and regional level, and it takes both time and experience to establish it. Furthermore, an over-reliance on external consultants also leads to an expertise flight, where any knowledge gathered throughout projects is not retained by public bodies or private companies, but rather lost to external sources, making it difficult to build knowledge and lessons for the future;
- *Rigid/inflexible/long contracts:* In order to provide stability and security over time, long contracts can become rigid and inflexible, reflecting point-in-time circumstances and then locking them in over the contract period. It remains difficult for governments to adequately structure contracts that take into account future unforeseen events or circumstances, and it is often difficult to adapt and change contractual responsibilities as the context changes. Future generations cannot respond to their individual circumstances but must adhere to outdated operations from previous decades. Building flexibility into contracts is an expensive proposition because as the investment become less secure it may become necessary to further incentivize the private sector;
- *Delays and hold ups:* The private sector is not impervious to project stoppages, and the complicated nature of the agreements between PPP partners can increase delays, as disputes take longer to be settled and any unforeseen eventualities that take place in future years involve a lengthy renegotiation of the contract. The start of projects is also delayed by complex partner negotiations, sometimes further exacerbated by the political debate and public opposition that can surround PPP projects;
- *Higher consumer prices:* Driven by a need to cover high levels of cost plus make a return on investment, market-driven pricing can see services cost the consumer more than if delivered by the public sector. The issues of competitiveness and monopolies also mean there is potential for abuse in regards to user fees;
- *Double taxation;* The general public may perceive user fees as a form of "double taxation", whereby they are paying for services they feel their taxes should be providing or already have paid for. This will be noticeable in the case of toll ways, for example, where tolls have not existed under previous public sector provision and where there was previously no tangible cost to the user; and
- *Less accountability/transparency:* Project transparency is weakened under the PPP model because of the difficulty in accessing private sector information, now considered of commercial value or commercial-in-confidence by the consortium. Thus, whole of project evaluation becomes problematic for similar reasons, as data is spread over numerous sources, compiled differently, and not always available for public scrutiny.

# PPP market maturity

While PPP has been in use as an officially defined concept since the 1990s, its application has been patchy and inconsistent across jurisdictions. The U.K. has been at the forefront of PPP use, and led its development through policy and experience - no country comes close to its number of projects. There is, however, a difference between the number of PPPs that a jurisdiction undertakes and the maturity of its PPP market.

The maturity of a market refers to the sophistication of its PPP mechanisms and is judged through its understanding of PPP as seen through its framework and models, and is influenced by contextual factors such as political climate, culture, capital markets, or policy framework.

The three stages of PPP maturity, as described in the report "Harnessing the Power of Public-Private Partnerships: The role of hybrid financing strategies in sustainable development", are outlined in the table across.

Stages of PPP Maturity

| |
|---|
| **Stage 1** |
| 1. Establish policy and legislative framework. |
| 2. Initiate central PPP policy unit to guide implementation. |
| 3. Develop deal structures. |
| 4. Get transactions right and develop public sector comparator model. |
| 5. Begin to build marketplace. |
| 6. Apply early lessons learned. |
| **Stage 2** |
| 1. Establish dedicated PPP units in agencies. |
| 2. Begin developing new hybrid delivery models. |
| 3. Expand and help shape PPP marketplace. |
| 4. Leverage new sources of funds from capital markets. |
| 5. Use PPPs to drive service innovation. |
| 6. PPP market gains depth — use is expanded to multiple projects and sectors. |
| **Stage 3** |
| 1.Refine new innovative models. |
| 2. More creative, flexible approaches applied to roles of public and private sector. |
| 3. Use of more sophisticated risk models. |
| 4. Greater focus on total lifecycle of project. |
| 5. Sophisticated infrastructure market with pension funds and private equity funds. |
| 6. Public sector learns from private partner methods as competition changes the way government operations function. |
| 7. Underutilized assets leveraged into financial assets. |
| 8. Organizational and skill set changes in government implemented to support greater role of PPPs. |

# Dedicated PPP units

As PPP popularity and practice have grown, so too has knowledge about them and the methods by which they are administered. The creation of dedicated PPP units is seen as a mechanism by which governments can define, regulate and build public sector capacity in regards to PPPs, and has been attributed by the United Nations (UN) as an indicator by which a nation's PPP maturity is assessed[7].

The Organisation for Economic Co-operation and Development (OECD) recently conducted an investigation into this under-reported area of PPP and identified that over half of its members reported the existence of a dedicated PPP unit at the national level. In its 2010 book on dedicated PPP units[8], the OECD identifies the practice whereby jurisdictions that undertake multiple PPPs create a dedicated unit as a single oversight body. This does not mean a unit existing within a given public sector department to oversee an individual project, but a unit that is specifically mandated to deal with all PPPs within the jurisdiction.

Potential functions of a PPP unit include:

- *Policy guidance:* developing and advising on policies, procedures, guidelines and legislation;
- *Technical support:* assisting government bodies throughout the PPP project cycle;
- *Capacity building:* training and education of public sector officials;
- *Promotion:* ensuring awareness and understanding of PPP within the private/public sectors and the wider community at large; and
- *Green lighting or "gatekeeper":* responsible for approving various stages of the PPP process, potentially including final approval.

Within the OECD, dedicated units were found in three different locations within the public sector framework. The vast majority are located within the finance ministry and operate according to regular departmental structures. The second option is a variation that places the unit within a specific relevant department that is likely to utilise PPP, such as an infrastructure ministry. Lastly is the creation of an independent government agency that may be partly or fully owned by the government, and connected via a secretariat through which regulation and authority are administered.

While some of the roles fulfilled by dedicated units can be fulfilled by traditional procurement authorities or individuals with relevant knowledge, the unit represents a real centre of expertise, gathering together the knowledge and providing the capacity to improve PPP operation through the points listed above. Some genuine concerns do exist, however, regarding conflicts of interest and accountability within dedicated units. Establishing a dedicated unit could also imply to public sector departments the pre-eminence of PPP at the expense of other procurement methods, leading to a biased and shallow procurement assessment process.

A dedicated unit is not wholly funded by the government and derives part of its income through user fees it charges to other government bodies, thus there is a risk that PPP can be pushed into inappropriate situations because the unit has a vested interest in producing business. Similarly, in the role of "gate keeper," it is imperative to ensure adequate regulatory controls and transparency and accountability measures are in place to ensure honest practices and protect government interests and limit exposure to liability. Both these points are greater emphasized when the unit is partly owned and represented on the secretariat by the private sector.

The next section of this input study focuses on PPPs in practice, outlining the typical PPP project cycle, with a particular focus on project financing, which serves as a primer to the project's financial and economic analysis, risk identification and mitigation, and PPP implementation and project management. Furthermore, the enablers and barriers to utilising PPPs are outlined.

Sources: [7] United Nations Economic Commission for Europe (UNECE). (2008). Guidebook on Promoting Good Governance in Public-Private Partnerships. Geneva, 2008
[8] Organisation for Economic Cooperation and Development (OECD) (2010). Dedicated Public–Private Partnership Units: A survey of institutional and governance structure.

# Section 5: Public–Private Partnerships in practice

# EPEC and the EPEC PPP Guide

## An introduction to EPEC

The European PPP Expertise Centre[9] (EPEC)'s mission is to support the public sector across Europe in delivering better PPPs. EPEC was created in 2008 to support Member States of the EU, EU Candidate States and others in their work on PPPs.

Today, EPEC's team of 14 experienced PPP professionals, based in the Advisory Services Department of the EIB, serves 41 EPEC member organisations. These organisations are typically national or regional PPP units, and other public entities in charge of PPPs, as well as the European Commission.

EPEC's work is focused around the following three main activities:

## Sharing good practice

EPEC brings together the collective expertise and experience of its Members to:

- address practical issues in implementing PPPs;
- share PPP market intelligence; and
- develop PPP guidance and tools.

## Assisting policy development

EPEC supports policy makers in the development of their:

- PPP legal and regulatory frameworks;
- PPP institutional arrangements; and
- processes for preparing, approving and managing PPPs.

## Supporting PPP project preparation

EPEC helps public authorities in the preparation and procurement of PPPs through:

- high-level strategic advice;
- early stage involvement; and
- support tailored to individual projects.

## The EPEC PPP Guide

As part of its mission to share good practice among PPP stakeholders, EPEC publishes the EPEC PPP Guide[10].

The EPEC PPP Guide has been designed as a tool gathering "good practice" sources of information. It seeks to identify the "best of breed" guidance available from PPP guidelines worldwide and from selected professional publications. It is designed to assist public officials responsible for preparing, launching and implementing PPP projects and to facilitate their understanding of the key issues and steps involved in the delivery of PPP arrangements.

The EPEC PPP Guide can be used in a number of ways. For example:

- as a broad guide to procurement and implementation issues in PPPs;
- as an introduction to the information public procuring authorities should request from their advisers; and
- as a starting point to learn more about specific aspects of PPP design.

## Structure of the EPEC PPP Guide: the typical project cycle

Each section of the EPEC PPP Guide deals with a "phase" of the PPP project cycle and is broken down into two "stages". For each stage, key "steps" which the public procurement authority and its advisers need to take are identified. The discussion of the key steps includes the rationale for the step and the key tasks involved.

The PPP project cycle phases and stages, as identified by EPEC, are discussed further in this section of the input study. Particular focus is given to steps relating to project financing, risk allocation, and PPP implementation and project management, in line with the objectives of this input study.

Further insight into the individual steps identified in the PPP project cycle, including additional guidance resources, can be found in the EPEC PPP guide.

Sources: [9] EPEC website: https://www.eib.org/epec/
[10] The EPEC PPP Guide: https://www.eib.org/epec/g2g/intro1-guide.htm

# Summary of PPP phases and stages

The EPEC PPP Guide provides the following figure summarising the 4 PPP phases and 8 stages identified:

| Phase | Stage | Step |
|---|---|---|
| 1 Project Identification | 1.1 Project Selection | • Investment assessment<br>• Output specification |
| | 1.2 Assessment of PPP Option | • Affordability<br>• Risk allocation<br>• Bankability<br>• Value for money analysis<br>• Debt and deficit treatment of PPPs according to Eurostat |
| 2 Detailed Preparation | 2.1 Getting organised | • Set up project team and governance structure<br>• Engage team of advisers<br>• Develop project plan and timetable |
| | 2.2 Before launching the tender | • Carry out further studies<br>• Prepare detailed design of PPP arrangement<br>• Select procurement method<br>• Select bid evaluation criteria<br>• Prepare draft PPP contract |
| 3 Procurement | 3.1 Bidding process | • Procurement notice, prequalification and shortlisting<br>• Invitation to tender<br>• Interaction with bidders<br>• Evaluation of tenders and PPP contract award |
| | 3.2 PPP contract and financial close | • Finalise PPP contract<br>• Conclude financing agreements<br>• Reach financial close |
| 4 Project Implementation | 4.1 Contract management | • Attribute management responsabilities<br>• Monitor and manage project delivery and service outputs<br>• Manage changes permitted in the PPP contract<br>• Manage changes not provided for in the PPP contract<br>• Dispute resolution<br>• When the contract ends |
| | 4.2 *Ex post* evaluation | • Define institutional framework<br>• Develop analytical framework |

# Phase 1: The Project Identification phase

The project identification phase is critical because it determines whether the selected project can (and should) be delivered as a PPP instead of using conventional public procurement.

## Stage 1: Project Selection

Authorities are normally faced with a number of potential investment projects which they need to assess and prioritise. The ultimate goal of the project selection process is to ensure that the investments that will be carried out offer value for money.

Value for money refers to the best available outcome for society, account being taken of all benefits, costs and risks over the whole life of the project.

A necessary condition for a project to represent value for money, irrespective of the procurement option chosen to deliver it, is that the benefits to be derived from the project outweigh the costs. This is normally tested by undertaking a cost-benefit analysis of the project and its requirements.

## Stage 2: Assessment of the PPP option

According to the EPEC PPP Guide, in order to consider the PPP procurement option, the Authority and its advisers need to answer a set of key questions:

- Is the project affordable? Will users or the Authority, or both, pay for the project? How will they pay (e.g. user charges, operating subsidies, public sector or EU grants)? Are the procurement costs significant if the project is procured as a PPP?
- What are the key sources of risk in the proposed project? What is the optimal risk allocation and risk management strategy?
- What are the financing sources for the proposed project? Will the project be "bankable" (i.e. capable of raising debt finance)? Will it attract investors? Will it comply with the requisites for EU or national public funding?
- Even if the project is affordable and bankable, does the project represent value for money?
- Has the issue of the "balance sheet treatment" of the project (i.e. the classification of the project as a public sector investment for the purposes of national debt and deficit under the "excessive deficit procedure" of the Maastricht Treaty) been considered?

The first six steps of the PPP project cycle, consisting of the majority of the project identification phase, are critical, and in line with the objectives of this input study, are discussed in further detail. During these steps, the project is defined, allowing for an identification of project financing requirements, which serve as a primer to financial and economic analysis. Furthermore, the PPP project risks and mitigation techniques are identified at this stage, allowing for a decision on the allocation of risks between the public and private partner.

# Determining the project details

The project details are defined in the project selection stage. This stage has a critical impact on the subsequent financing requirements of the project.

## Investment assessment

In the project selection stage, the Authority and its advisers will look at alternative project options, sometimes following guidelines that the public sector will use to assess PPP projects.

Once the key features and specifications for a project are drawn up, the Authority and its advisers will undertake a series of preliminary studies, including supply or demand analysis, cost analysis and a preliminary environmental assessment of the potential impacts of the project.

## Output specifications

A distinctive feature of PPP projects is that their requirements are defined in terms of outputs rather than inputs. Conventional project procurement has usually focused on inputs. PPPs therefore involve fundamental changes in the way projects are prepared and in the information that the Authority needs to provide to private sector sponsors.

While the typical set of feasibility studies used in the public procurement of projects focuses on inputs, PPP projects demand a clear set of output requirements and service quality standards, which will be reflected in the PPP contract. As a result of the output nature of PPPs, the bulk of the expensive and time-consuming technical design activities for a project will be carried out by the private partner.

# Determining the financing requirements

The Project's financing requirements are primarily determined in the third step of the PPP project cycle, in the affordability analysis. The financial analysis is undertaken in this steps, on the basis of the project details defined in the first two steps of the PPP project cycle.

## Affordability

Affordability relates to the capacity of the public and private partner to pay for building, operating and maintaining the project. This is determined by the capacity of users to pay for the services or that of the Authority that has identified the need for the asset to be built.

An affordability assessment requires a careful analysis of the expected operating and maintenance costs of the project, together with the levels of cash flow required to repay the loans and provide a return to the investors in the PPP Company (the private partner). The financial and technical advisers will develop a financial model to assess alternatives in terms of a range of capital, operating and maintenance cost estimates, appropriate cost escalation indices, assumed financing structure and preliminary PPP contract terms.

At this project preparation stage, the financial model is developed to a fairly basic level. It is developed further as the design of the PPP arrangement develops.

This assessment of costs translates into an estimate of the required revenues to meet those costs:

- In PPPs where users pay directly for the service ("user-pay PPPs"), the Authority and its advisers need to examine the capacity and willingness of users to pay, especially if tariffs need to be increased from current levels. In many PPPs, the public sector will need to subsidise the service in order to make it affordable. The use of public subsidies can impact the value for money of a PPP arrangement, requiring that the efficiency savings from the PPP option be large enough to compensate for the use of public funds.
- In PPPs where the Authority makes the payments ("authority-pay PPPs"), the assessment of affordability is a key consideration in the design of the transaction. The Authority will enter into payment obligations over the life of the PPP contract (the so-called "service fee"), which represent long-term commitments. This can influence the design of the transaction and therefore its value for money proposition.

Sometimes options that combine direct charges to users with service fees may need to be examined.

Thus affordability relates not only to the financial aspects of the PPP arrangement itself, but also to public expenditure issues in general. A PPP project is considered to be affordable if the public expenditure associated with it can be accommodated within the public sector's budget ceiling over time.

# Risk management in PPPs

The allocation of risks in the PPP contract is another critical step in the PPP project cycle. Decisions taken in this step will determine the "bankability" of the private partner, i.e. the probability of the project being financed, thus having an impact on the financial analysis of the project. Furthermore, it will determine the value for money achieved by the Authority, thus influencing the economic analysis.

## Risk management in PPPs

Justifying the PPP option also depends on the ability to identify, analyse and allocate project risks adequately. Failure to do so will have financial implications for the public sector and/or the failure of the project to achieve its objectives. Thus, at the project identification stage, in addition to assessing the sources of revenue linked with the affordability of the project, the Authority and its advisers need to undertake a broad assessment of the risks that arise from the project requirements in order to manage them. This can take the form of a risk matrix or a risk register.

Risk management is an ongoing process which continues throughout the life of a PPP project. It takes place in five stages:

- **risk identification:** the process of identifying all the risks relevant to the project, whether during its construction phase or its operational phase;
- **risk assessment:** determining the likelihood of identified risks materialising and the magnitude of their consequences if they do materialise;
- **risk allocation:** allocating responsibility for dealing with the consequences of each risk to one of the parties to the PPP contract, or agreeing to deal with the risk through a specified mechanism which may involve sharing the risk;
- **risk mitigation:** attempting to reduce the likelihood of the risk occurring and the degree of its consequences for the risk-taker; and
- **risk monitoring and review:** monitoring and reviewing identified risks and managing new risks as the PPP project develops and its environment changes. This process continues during the life of the PPP contract.

PPP project risks can be divided broadly into three types; commercial, legal and political:

- **Commercial risks** can be divided into supply and demand risks. Supply risk concerns mainly the ability of the PPP Company to deliver. Supply risk can be subdivided into construction risk and supply-side operational risk (where construction and operation constitute the two main phases of the project). Construction and supply-side operation risks include financial market risk due to, for example, changes in the cost of capital or changes in exchange rates and inflation. Demand risk relates to insufficient user volumes compared to base case assumptions.
- **Legal and political risks** relate to, among other factors, the legal framework, dispute resolution, the regulatory framework, government policy, taxation, expropriation and nationalisation.

In general, the private sector is better placed to assume commercial risks while the public sector is better placed to assume legal and political risks.

Further detail on individual PPP risks, risk allocation principles, limitations on risk allocation, and risk mitigation, is outlined in this section of the input study, prior to a discussion on the assessment of a project's bankability and value for money.

# PPP risk categories

The following information on PPP risk categories, risk allocation principles, limitations on risk allocation, and risk mitigation, was sourced from the PPP knowledge lab. The PPP Knowledge Lab brings together relevant and authoritative resources on Public–Private Partnerships in one location to empower governments and their advisors to design and deliver best in class infrastructure projects. It was launched in 2015 by the Asian Development Bank (ADB), the European Bank for Reconstruction and Development (EBRD), the Inter-American Development Bank (IaDB), the Islamic Development Bank (IsDB), and the World Bank Group.

## PPP risk categories

The following categories of risk are common to many PPPs:

- **Site -** risks associated with the availability and quality of the project site, such as the cost and timing of acquiring the site, required permits or assuring rights of way for a project, the effect of geological or other site conditions, and the cost of meeting environmental standards.
- **Design, construction and commissioning -** risk that construction takes longer or costs more than expected, or that the design or construction quality means the asset is not adequate to meet project requirements.
- **Operation -** risks to successful operations, including the risk of interruption in service or asset availability, the risk that any network interface does not work as expected, or that the cost of operating and maintaining the asset is different than was expected.
- **Demand, and other commercial risk -** the risk that usage of the service is different than was expected, or that revenues are not collected as expected.
- **Regulatory or political -** risk of regulatory or political decisions that adversely affect the project. For example, this could include failure to renew approvals appropriately, unjustifiably harsh regulatory decisions, or in the extreme, breach of contract or expropriation.
- **Change in legal or regulatory framework -** the risk that a change in general law or regulation adversely affects the project, such as changes in general corporate taxation, or in rules governing currency convertibility, or repatriation of profits.
- **Default -** the risk that the private party to the PPP contract turns out not to be financially or technically capable to implement the project.
- **Economic or financial -** risk that changes in interest rates, exchange rates or inflation adversely affect the project outcomes.
- **Force Majeure -** risk that external events beyond the control of the parties to the contract, such as uninsurable natural disasters, war or civil disturbance, affect the project.
- **Asset ownership -** risks associated with ownership of the assets, including the risk that the technology becomes obsolete or that the value of the assets at the end of the contract is different than was expected.

PPP projects often have unique features or circumstances - for example, the specific geological conditions on the route of a proposed road. This means that contracting authorities should make use of experienced advisors to help identify a comprehensive list of project risks.

# Allocating risk

## Allocating risk

Allocating risk, in the context of a PPP, means deciding which party to the PPP contract will bear the cost (or reap the benefit) of a change in project outcomes arising from each risk factor. Allocating project risk efficiently is one of the main ways of achieving better value for money through PPPs, which will be discussed in further detail at a later stage of this input study.

There are two main goals of risk allocation, which are to create incentives for the parties to manage risk well - and thereby improve project benefits or reduce costs, and to reduce the overall cost of project risk by insuring parties against risks they are not willing to bear.

## Risk allocation principles

A central principle of risk allocation is that each risk should be allocated to whoever can manage it best. Each risk should be allocated to the party:

- **Best able to control the likelihood of the risk occurring -** for example, the private party is usually in charge of project construction because it has the most expertise in that area. This also means it should bear the cost of construction cost over-runs or delays.
- **Best able to control the impact of the risk on project outcomes**, by assessing and anticipating a risk well and responding to it. For example, while no party can control the risk of an earthquake, if the private firm is responsible for project design, it could use techniques to reduce the damage should an earthquake occur.
- **Able to absorb the risk at lowest cost**, if the likelihood and impact of risks cannot be controlled. A party's cost of absorbing a risk depends on several factors, including: the extent to which the risk is correlated with its other assets and liabilities; its ability to pass the risk on (for example, to users of the service through price changes, or to third parties by insuring); and the nature of its ultimate risk bearers. For example, the ability of governments to spread risk among taxpayers means they may have lower risk-bearing cost than private firms, whose ultimate risk-bearers are their shareholders.

Applying these principles does not imply transferring the maximum possible risk to the private sector. Transferring to the private party the risks that it is better able to control or mitigate can help lower the overall project cost, and improve value for money. However, the more total risk transferred to the private party, the higher the return - or risk premium - the equity investors will require, and the harder it will be to raise debt finance. Thus, it is evidently clear that decisions on allocating risk also have an impact on a project's financial and economic analysis.

## Limitations on risk allocation

There are some limits to how risks can be allocated in a PPP project. These include the following:

- **Level of detail of risk allocation -** in theory, every project risk could be identified and allocated to the party best able to bear it, thereby improving value for money. In practice, the cost of doing so would be high, and likely outweigh the benefits in the case of less significant risks. In most cases, risks are allocated in groups, sometimes with exceptions for certain significant risks. For example, the private party may bear all construction risks, except certain key geological risks, against which the government could provide an indemnity.
- **Risks that cannot be transferred** - certain types of risk cannot be transferred through the PPP contract. For example, the private party will always bear certain political risks - in particular, the risk that the government will renege on the contract or expropriate the assets.
- **Extent of risk transfer to private party -** the equity holders of the private party to the PPP contract - the PPP company - are only exposed up to the value of their equity stake. Moreover, lenders will typically only accept a relatively low level of risk, in line with their expected returns. In practice, this means that the extent to which risk can be transferred is limited by the level of equity in the project company. If losses due to a risk turn out to be greater than the equity stake, the equity holders can walk away from the project. Since the government is ultimately responsible for making sure services are provided, the remainder of the project risk remains with the government.

# Allocating risk (contd.)

- **Incomplete contracts** - even well-designed contracts may suffer from the absence of certain necessary provisions. While PPP contracts cannot provide solutions for every possible situation, they should provide rules (templates or formulas) for the range of foreseeable scenarios, and a decision-making methodology for any other situation.

A combination of these limitations can mean that country characteristics affect the possibilities of risk transfer.

## Risk allocation matrices

The output of the risk allocation process at this stage is often a risk allocation matrix. The risk allocation matrix lists risks - often sorted by category - and defines who bears each risk. This risk allocation is then put into practice by including the appropriate clauses in the PPP contract.

Some governments capture the risk allocation principles described above in preferred risk allocations, often presented in the form of a preferred risk allocation matrix. These preferred allocations may be generic, or specific to sectors or types of project. They are usually a starting point for allocating risk on a particular project, since projects often have specific characteristics where a different risk allocation would provide better value for money. Risk allocation matrices should be checked again prior to signing the contract to review the responsibilities of each party before it is legally binding. This final review could also serve as an additional gate-keeping mechanism.

## Mitigating risks

After full identification of project risks, a mitigation process should occur - wherein, based on a cost-benefit analysis, some project characteristics or procedural steps may be adjusted. For instance, additional geological surveys or traffic studies may be conducted before the tender to reduce uncertainty and contain bidding costs. Performance requirements that are not critical to project success and may create unacceptable risk to private operators may be eliminated.

# Assessing the private partner's access to finance

Once a financial analysis has been undertaken, and as a result the project's financing requirements determined, and the risks allocated between the public and private partner, the contracting authority needs to assess the project's "bankability". In simpler terms, the contracting authority needs to ascertain that the PPP is designed in a way that optimizes the selected private partner's probability of securing financing.

## Bankability

Put simply, a PPP project is considered bankable if lenders are willing to finance it. The majority of PPPs are funded on a project finance basis, where a special purpose vehicle is established to ring fence the project revenues and debt liabilities. PPP projects are also sometimes funded on a "corporate basis" (i.e. the project funding requirement is met by one or more sponsors of the PPP Company).

For project finance deals, much of the funding requirement is met through long-term debt, which typically varies from 70% to as much as 90% of the total funding requirement depending on the perceived risks of the project. Debt is a cheaper source of funding than equity, as it requires a lower level of return in exchange for carrying relatively less risk. Lending to PPP projects (usually referred to as non or limited-recourse finance) looks to the cash flow of the project as the principal source of security.

The Authority and its advisers need to assess financial risks thoroughly. The financial risks experienced by PPP projects tend to be related to some or all of the following factors:

- reliance on optimistic revenue assumptions and predicted levels of demand from a poorly chosen 'baseline' case;
- lack of attention to the project's financing needs at the early stage, which leads to larger amounts of debt in projects than is optimal or bearable;
- financing with short-term debt, with a sometimes unjustified assumption that the short-term debt can be refinanced at the same or even better terms; and
- floating rate debt that creates interest rate risk.

If a project faces bankability issues, the Authority may be tempted to consider providing guarantees. In this case, the Authority and its advisers need to assess the guarantee's impact on the risk allocation and its future implications for public finances before granting it..

The Authority and its advisers will also need to carefully consider two financial risks which may materialise after signature of the PPP contract:

- the incentives the PPP Company may have to renegotiate the contractual arrangements in its favour; and
- refinancing that can create unforeseen benefits for the PPP Company, which the Authority might not share if the contract does not explicitly provide for this possibility.

The EPEC PPP guide includes an annex on project financing, which introduces some basic concepts of project finance and shows how they relate to the financing structure of PPP projects. It is not meant to cover all the issues relevant to PPP financing structures, which are many, complex and often project-specific. Authorities should rely on the expertise of financial and legal advisers to understand the relevant trade-offs in project finance issues.

PPP projects are generally financed using project finance arrangements. In project finance, lenders and investors rely either exclusively ("non-recourse" financing) or mainly ("limited recourse" financing) on the cash flow generated by the project to repay their loans and earn a return on their investments. This is in contrast to corporate lending where lenders rely on the strength of the borrower's balance sheet for their loans.

It is important to stress that the project finance structure should be designed to optimise the costs of finance for the project. It should also underpin the allocation of risks between the public and private sectors as agreed in the PPP contract. In particular, the project financing should ensure that financial and other risks are well managed within and between the PPP Company shareholders, sponsors and its financiers. This should give comfort to the Authority that the PPP Company, and particularly its funders, are both incentivised and empowered to deal in a timely manner with problems that may occur in the project.

# Value for money analysis

The steps discussed previously will result in the authority having a clearer picture of the project, including its output, cost, and risks. These can be compared to the project's likely benefits, in the form of economic, environmental, social benefits etc. This exercise is known as a value for money analysis.

## Value for money analysis

A PPP project yields value for money if it results in a net positive gain to society which is greater than that which could be achieved through any alternative procurement route. It is good practice to carry out a value for money analysis (essentially a cost-benefit analysis) as part of the initial preparation of a project, regardless of whether it is procured conventionally or as a PPP.

In some countries like the UK, which have extensive PPP programmes, a PPP project is said to achieve value for money if it costs less than the best realistic public sector project alternative (often a hypothetical version of the project) which would deliver the same (or very similar) services. This public sector alternative is often referred to as the "public sector comparator" ("PSC").

Carrying out a PSC exercise is part of building the business case for a PPP project. It is a legal requirement in many PPP programmes worldwide. Advisers need to model various cost scenarios to be able to undertake a detailed quantitative comparison between the PPP project and the PSC (e.g. differences in tax treatment).

It is generally assumed that the PPP option will be more efficient in investment, operating and maintenance costs than the PSC. So the key question in assessing value for money is usually whether the greater efficiency of the PPP project is likely to outweigh factors that might make the PPP more costly, the main ones being transaction and contract oversight costs (i.e. additional bidding, contracting and monitoring costs in a PPP setting) and financing costs (i.e. possible added costs due to private sector financing, especially equity financing). The value for money assessment should also take into account the potential non-financial benefits of PPPs such as the accelerated and enhanced delivery of projects.

According to EPEC, experience suggests that the likelihood that a PPP project or a PPP programme will provide value for money is higher when all or most of the following conditions are met:

- there is major investment involved, which would benefit from the effective management of risks associated with construction and delivery. This may be a single major project or a series of replicable smaller projects in a given sector;
- the private sector has the expertise to design and implement complex projects;
- the public sector is able to define its service needs as outputs that can be written into the PPP contract ensuring effective and accountable delivery of services in the long run;
- risk allocation between the public and private sectors can be clearly identified and implemented;
- it is possible to estimate on a whole-life basis the long-term costs of providing the assets and services involved;
- the value of the project is sufficiently large to ensure that procurement costs are not disproportionate; and
- the technological aspects of the project are reasonably stable and not susceptible to short-term or obsolescence.

The project identification phase therefore involves an early assessment of what payment structure is feasible, what the Authority or the users can afford to pay (and when), the impact on the project scope and the service levels, and the associated risks the private sector might be prepared to accept. This exercise should help the Authority to identify and manage any long-term fiscal obligations (implicit and explicit) that may result from the PPP project. Furthermore, it also helps the authority determine if a PPP project results in a net positive gain to society which is greater than that which could be achieved through any alternative procurement route.

The remaining stages of the PPP project cycle are outlined in this section, with a focus on the project management requirements at each stage, in line with the objectives of this input study.

# Phase 2: The Detailed Preparation phase

The aim of the detailed preparation phase is to seek initial approval of the relevant public authorities in view of the project procurement. Such approval should support the development of the project as a PPP. The approval of the main project features is an important prerequisite since project procurement is a resource-intensive undertaking.

Detailed preparation work is necessary at two levels. EPEC refers to these levels as (i) getting organised and (ii) finalising all preparation before launching the tender.

## Stage 1: Getting organised

A detailed project preparation is of utmost importance in order to meet the initial objectives set when deciding for the PPP procurement route.

Due to the complexity of PPP projects, procuring authorities will need to set up an appropriate organisational structure at this stage. A key initial task will consist in the development of a detailed project plan. The support of specialised external advisers (regarding legal, technical, financial, environmental and organisational issues) is also often required to ensure project procurement.

From this stage onwards, project management becomes a priority, and it is critical that the authority sets up a project team and governance structure. The complexity and scale of most PPP projects require a range of skills and resources to be applied. A common way of implementing effective project governance for the development of a PPP project is through the use of boards/committees. Many arrangements can be adopted, but they normally include:

- A project board, or steering committee, comprising the main public sector stakeholders and led by a senior officer within the Authority; and
- A project management team, responsible for the day-to-day management of the PPP project (including the management of the advisers) and reporting to the steering committee. Appointing a project director is of particular importance (the project director should to the highest extent possible have experience of both the public and the private sector). During the procurement phase, managing the project will be a full-time job for the project director.

Where an Authority is involved in more than one PPP contract, it is good practice to have a single team managing all the contracts, to enable knowledge sharing across projects and make the best use of the Authority's resources.

Even though at this early stage of project preparation, contract signature may seem far away, the process of setting up the project team and governance structure should take into account the management of the project post-signature. For example, it is important to ensure some continuity between the preparation/procurement stages and the post-signature stage and to include in the PPP contract provisions related to the management of the project by the Authority (e.g. regular information provision).

The importance of having a strong group of expert advisers in place cannot be overstated. The engagement of PPP advisers requires sufficient resources to be budgeted for early in the project cycle. The project management team will require different types of advisers for different phases of the PPP project preparation and procurement process.

A key initial task for the project management team or teams (in fact, probably an initial task for the advisers) is to develop a detailed project plan, including a timetable for project preparation and procurement. The plan needs to take into account all the key steps in the process including:

- Document development;
- Stakeholder consultation;
- Bidding process and private sector interface; and
- Government approval process.

PPP preparation is a complex undertaking with parallel activities feeding into critical paths. It is important that activities that are on the critical paths be initiated at the right time and monitored closely to ensure that they proceed as planned and do not cause delays to other activities. It is helpful to use project-planning software to create the timeline, normally in the form of a "Gantt" chart (a type of bar chart that illustrates a project schedule). The chart can then be easily updated from time to time.

# Phase 2: The Detailed Preparation phase (contd.)

## Stage 2: Before launching the tender

This stage has two main goals:

- to further develop all aspects of the PPP design (e.g. responsibilities, risk allocation, payment mechanism) in a progressive and iterative manner, concluding with a full draft PPP contract; and
- to select the tendering method, decide on bid evaluation criteria and prepare the complete tender documents.

At the end of this stage, the project management team will be ready to formally launch the tender process for the PPP contract. It is useful to end this stage at that point because in some jurisdictions high-level clearance will be required before publishing the procurement notice and proceeding with the invitation to tender. The end of the stage is therefore an important milestone in the project delivery phase of the PPP cycle.

Some steps of the PPP cycle may not proceed in the rigid chronological order implied by the EPEC PPP Guide. For example, the final tasks of detailed PPP design preparation may continue during the later prequalification exercise. This will often be the most efficient way for the advisers to proceed.

# Phase 3: The Procurement phase

The procurement phase, as the term is used in the Guide, commences with the publication of the procurement notice and ends with financial close, the point at which project activities (beginning with detailed design and construction) can start. The EPEC PPP Guide divides this phase into two stages: (i) the bidding process and (ii) the period from the selection of the preferred bidder to financial close.

## Stage 1: The bidding process

The goal of the bidding process is to maximise value for money by creating appropriate incentives through a competitive process for the award of the long-term PPP contract.

During the bidding process, sufficient attention should be placed on the key good procurement principles of "transparency" and "equal treatment", which will help bolster the legitimacy of the PPP and its acceptance by stakeholders.

These good procurement principles must be respected from the time the formal tendering process begins. Informal discussions with companies may take place before the process formally begins (this is particularly important in respect of large projects). For example, while keeping in mind that achieving a level playing field amongst potential bidders is the eventual goal, the Authority may organise information days, technical briefings, early public release of technical documents and so on. As soon as the procurement notice is published, all potential bidders must be given equal treatment and a careful audit trail of all contacts with potential bidders must be kept. The equal treatment principle dictates that information provided to one potential bidder should be made available to the other potential bidders in a timely manner.

The EPEC PPP Guide focuses primarily on commercial principles of procurement having general applicability and not on the detailed requirements of EU legislation transposed into national law (although certain EU requirements will be noted in some instances). The goal is to convey to readers the logic and rationale behind the various steps and considerations, rather than to present them simply as procedures prescribed by law.

Authorities are encouraged to seek advice on all procurement activities, in particular on how to ensure that the procurement activities described here comply with the requirements of national law. The proper handling of procurement activities is crucial to the success of the PPP project in achieving value for money but also in avoiding legal challenges that could adversely delay the implementation of the project.

## Stage 2: PPP contract and financial close

The activities involved in this phase often deal with detailed fine-tuning matters. Close interaction between the Authority, the PPP Company, its sponsors and its financiers is essential. This stage requires thorough organisation and management for it to proceed efficiently. It should be planned carefully, generally making use of experienced advisers. Many PPP projects have experienced lasting difficulties as a result of a lack of adequate planning or expert advice during this critical stage.

# Phase 4: The Project Implementation phase

This phase covers the period during which the PPP project is being implemented (i.e. from financial close to the expiry of the PPP contract). The Guide addresses the most common issues which officials at the Authority may have to face during the life of the project. A PPP project requires regular monitoring of performance and the undertaking of appropriate actions in accordance with the terms of the PPP contract. In some circumstances, a project may require changes to the contract (e.g. modifying the service specifications or the scope of the project).

It is important to stress that the Authority's responsibilities for project management and contract management may differ considerably during the project's construction phase and operational phase.

## Stage 1: Contract management

Although good preparation and procurement of a PPP project are important, the manner in which the PPP contract is overseen and managed during implementation is critical to its success or failure and to its actual ability to deliver the value for money expected at the procurement stage.

After the PPP contract has been signed, responsibility for contract management will normally be transferred to a contract management team established by the Authority.

A contract management team, reporting to a contract director, will carry out many day-to-day contract management activities. It is desirable to include the proposed contract director in the Authority's project management team at an early stage of the procurement process, or at least to allow him/her to follow the procurement process and have access to procurement team members. A good understanding of the project and its inherent risks will enable him/her to devise an adequate contract management strategy.

Before this transfer of responsibilities occurs, the Authority will need to ensure:

- that responsibilities are clearly defined, by appointing a team responsible for contract management separate from the project management team;
- that the provisions for handling contract changes and managing under performance of the PPP Company are in place;
- that a system of on-going contract management review is in place; and
- that there are sufficient budgetary and staff resources to undertake the contract management responsibilities.

It is important for the Authority to set out, during the procurement stage, the basic framework under which the contract management team will operate. This will reduce the bidders' cost and obligation uncertainties, as bidders need to incorporate monitoring and contract compliance costs into their bids. They should therefore be provided with a clear indication of the type and frequency of information required from them.

At the start of the PPP contract, the contract management team will need to develop management tools and processes, including contingency plans. The drafting of a user-friendly contract manual is also advisable. It will set out the overall Authority's operational management strategy and list the management tasks to be undertaken by the Authority.

The PPP contract should have clearly stated the obligations of the PPP Company and defined the expected service characteristics, outputs and quality standards.

Effective contract management depends, in the first place, on getting the PPP contract right. This implies setting out the procedures that guarantee close monitoring of the PPP Company's performance and general compliance with the agreed contract.

The contract management team will normally start by agreeing with the PPP Company all the tasks that each party needs to undertake and the appropriate timeframes for their completion. These operational details need to be set out in the contract management manual (consistent with the project contracts) at the start of the project implementation phase.

# Phase 4: The Project Implementation phase (contd.)

In order to effectively monitor the implementation of the project, the PPP Company will need to provide the contract management team with operational and financial data on an ongoing basis. The PPP contract should have set out the basic information requirements and frequency. Often, more detailed requirements are specified at the start of the implementation phase. The contract management team should limit its request for information to the data necessary for effective monitoring and ex post evaluation of the project. Excessive data collection imposes an unnecessary burden on the PPP Company and the Authority.

The contract management team will, for example, need to:

- monitor the attainment of key performance indicators;
- review quality control and quality assurance procedures to ensure that these systems are in place and effective;
- establish and manage the day-to-day relationship with the PPP Company; and
- report regularly to the stakeholders.

In a PPP project, a financial model is typically developed during the preparation and procurement stages as a result of interactions between the Authority and the bidders. Once the PPP contract is signed, it is important to develop this financial model into one which helps the Authority's monitoring and decision-making throughout the life of the project. For example, the financial model can be used to calculate periodical payments to be made to the PPP Company, to evaluate the impact of changes or to assess the long-term economic and financial sustainability of the contract.

The contract management team is also responsible for managing any changes, both those permitted in the PPP contract and those not captured by the contract, and any dispute resolution. Furthermore, a PPP contract should include detailed provisions dealing with its termination.

The contracting team will also be responsible for managing risks. It is essential for the contract management team to have a clear understanding of the requirements of the PPP contract and the rationale for those requirements. The role of the team will vary according to whether or not these risks have been identified in the contract and contingency plans have been established.

The risks that the contract management team will need to manage can be classified as follows:

- project risks contractually allocated between the parties;
- intrinsic risks borne by the Authority;
- project risks not contractually allocated; and
- risks associated with changes to the PPP contract.

## Stage 2: Ex post evaluation

A sound evaluation of a PPP project requires the public sector to:

- identify the public body that will undertake the review of a particular PPP project;
- ensure the independence of that body vis-à-vis the teams responsible for implementing and managing the PPP contract; and
- define the questions that need to be answered in the evaluation exercise.

# Enabling environment for PPPs

After outlining the typical PPP project cycle, it is important to understand the potential enablers and barriers to utilising PPPs in practice.

The Public – Private Infrastructure Advisory Facility (PPIAF), an entity housed within the World Bank Group, outlines the ideal enabling environment for PPPs[11].

According to the PPIAF, from its experience the successful implementation of a PPP program requires an enabling environment to be in place for PPP projects to be implemented effectively and with maximum benefit to the public sector. The enabling environment is composed of four principal components, which are outlined below.

## Public sector commitment

This is essential for a stable public role within PPP and the provision of multi-annual public funding and fiscal support.

Public sector commitment is best reflected in an appropriate PPP policy framework. Sustained political support and commitment is essential, particularly for large projects and projects representing a first attempt at developing and implementing PPP. This is required to generate and maintain sufficient private interest and to allay any concerns over potential public reaction, notably related to the potential use of user charges and its associated promises of increased service provision or quality standards as justifications for their use. Public sector commitment is the translation of political will into the political and cultural "mainstream" of the government and public authorities in order to ensure the required government support for PPP in its many diverse areas, such as those listed below:

- support in obtaining grants, development rights on publicly-owned land, environmental approvals and other permits;
- assurances that competing projects will not be commissioned;
- government capital grants or loans;
- fiscal support or incentives, sovereign loan guarantees etc;
- support, including political if necessary, of user charges;
- payment of operating subsidies;
- public construction of complementary facilities; and
- transfer of existing revenue-generating assets.

## Favourable investor climate

This encourages private funding under optimal conditions for the public sector.

A favourable investor climate is one which is conducive to private sector funding. Private investment requires a set of established rules and processes to allow reasonable confidence as to the protection of its investment.

A well-defined legal and regulatory framework, allied with a PPP policy, allows contracts to be determined with certainty and allows the parties to understand the boundaries of their interaction. The consequences of not having this certainty have been demonstrated to result in greater risk and cost, leading to an inability to harness the true potential of the project.

Concessions should be granted within economic and financial contexts, as all projects must be economically viable. Furthermore, either projects are financially viable according to the usual financial terms or government support is needed. Government support may be provided through a number of government instruments including by complete or partial payment for the service, where users cannot pay directly (e.g. viability gap funding). Furthermore, governments need to review the national and sector laws and legislation in relation to PPPs and examine the possible obstacles and eliminate them.

Source: [11] Enabling environment for PPPs https://ppiaf.org/sites/ppiaf.org/files/documents/toolkits/highwaystoolkit/6/pdf-version/1-43.pdf

# Enabling environment for PPPs (contd.)

## Effective risk management

This ensures maximum benefits from PPP by risk limitation, mitigation and allocation to the most suited partner.

Private investors are wary of uncertainty; thus effective risk management lies at the heart of effective PPP design. Where uncertainty is present, it is priced into PPP projects by the private sector in the form of higher expected rates of return. For certain forms of uncertainty, notably political, legal and regulatory, it may even prevent private finance altogether or result in an unsuccessful partnership. PPP projects thus require by definition the management of uncertainty in the form of risk.

As outlined previously, risk management involves risk identification, assessment, allocation and mitigation. The public sector will assess these within the feasibility study and then needs to ensure an effective strategy to mitigate the risks it is allocated. For example, the political risks of a user charge may be partially mitigated or reduced by an effective public consultation strategy.

Risk should be borne by the party best able to manage it most cost effectively. Additional costs are incurred when too much risk is transferred. A number of insights were identified for risk management under PPP:

- The greater the financial size of the project, the greater the temptation for risk transfer to the private sector. However, this must be supported by sound revenue earning potential allowing the private sector to adopt a higher risk profile.
- Certain risks are better borne by certain parties. For example, regulatory risk is more appropriate to the public sector while construction risk and quality standard risks are more suited to the private sector.
- Successful risk transfer requires the thorough understanding of the public authority of the objectives it wishes to achieve and therefore the nature of the project. This includes understanding the strengths and limitations of each party. Suboptimal risk transfer results in increased costs and loss of value for money.

## Capable public and private sectors

This provides for public and private champions of PPP, an effective partnership and the protection of public interest.

The private and public sectors have to understand and respond to their roles within the partnership for PPP to succeed. However, the lack of PPP experience in many countries results in a lack of domestic skills in PPP which may constrain the introduction of the required new methods and practices. Use of advisors may thus be sought to reinforce public and private sector capacities.

As outlined previously, reinforcement of public sector capacity may include the establishment of a PPP unit. This allows for the development of PPP methods and practices and provides information, advisory services to, and sometimes control over, public contracting authorities and private operators, and generally over the wider infrastructure sector including energy, water, telecoms and transport. The PPP unit brings together a range of skills and advises all concerned bodies including the contracting authority on contract preparation and implementation.

Moreover, public authorities awarding PPP need to have full confidence in their private partner, since the latter shall assume considerable risks in terms of services of general economic interest. The PPP policy framework referred to above shall need to consider the need for international partners to support the private sector within the PPP consortium, which will likely require market sounding.

According to the PPIAF, these enablers are closely interlinked. A favourable investor climate will thus not create private investment by itself; the other enablers related to public commitment, risk management and public sector capacity also need to be in place to ensure the reasonable security and predictability of his investment. The public sector shall require the same enabling environment to ensure that private sector involvement is being obtained at the lowest cost and therefore to the greatest benefit of the public sector. Furthermore, improvement of the enablers is collective; development of one enabler inevitably involves that of another.

# Barriers to utilising PPPs

In one of its publications, "Hurdles to PPP investments"[12], EPEC outlines several potential barriers for PPP use. These are outlined below:

## Political commitment to engage in PPPs

PPPs are a fundamentally different way of delivering public assets and services and, as such, require governments to introduce new practices and counter unfounded internal and external opposition. As long-term contractual commitments, they often do not sit comfortably within the existing administrative framework of government, frequently requiring new and separate structures for their management and implementation. It is therefore common for governments to underestimate the political commitments and resources required to put in place and implement successful PPP programmes and projects. This political commitment needs to be strong and stable if both the public and private sector partners are to be expected to devote significant resources to preparing, investing in and implementing projects. There are many examples in the EU of short-lived, weak or shifting political commitments to PPPs, which harm stakeholders' interests and hinder the development of sound PPP project pipelines. There are also examples of promotion of unrealistic pipelines (e.g. in terms of capacity or affordability) which undermine the credibility of the PPP programme.

PPPs can also be the subject of uninformed or erratic political decisions. For example, there are many cases of political pressure to proceed with PPP proposals more quickly than is feasible (without recognising the time and resources required to prepare and procure them adequately as PPPs) or to opt for a PPP delivery where the underlying investment project may not justify it. There are also cases in the EU of political pressure to renegotiate the terms of signed contracts, to change the regulatory frameworks in which PPPs sit, and even to terminate PPP contracts ahead of maturity

## Legal, regulatory and institutional frameworks, policy formulation

It is widely recognised that, in common with all large-scale public investment programmes, to be successful, PPPs require conducive legal, regulatory and institutional frameworks and processes. The hurdles in this field are multiple and often interdependent, for example:

- **Legal/regulatory frameworks:** PPP projects require an effective legal framework, in particular to regulate the ability to use PPP schemes, the procurement process and key contractual provisions.
- **PPP approval processes:** clearly defined powers and processes in the public sector are a prerequisite for the appropriate selection and subsequent effective management of the various phases of PPP project development.
- **Communication and public acceptability of PPPs:** the complex technical nature of PPPs can create a misunderstanding of their likely benefits and the rationale for their use. For example, PPPs are sometimes seen as a proxy for the privatisation or outsourcing of public services.

## Capacity of the authority responsible for delivering the PPP

PPPs involve complexities at all stages of the project cycle (preparing, procuring, financing and managing performance-based contracts) and require a wide range of skills, some of which may be new to the public sector or difficult to attract and retain in the public sector. In particular, PPPs require significant preparatory analysis ahead of procurement launch (e.g. Value for Money analysis, risk analysis, bankability analysis).

Public authorities responsible for developing PPPs are often not equipped or unaware of the required skills and resources needed to meet the challenges. In the absence of a programme of investment, many will procure one or two PPP projects only, which makes the sunk costs of building internal capacity significant. There is also, at times, some reluctance to use advisers, with budgetary constraints preventing the appointment of advisers or a poor ability to manage advisers where these are mandated (e.g. over-reliance on advice).

Weaknesses in the capacity of authorities to prepare projects can have a significant impact on their deliverability. Many examples of hurdles can be quoted in this area:

- Authorities sometimes propose poor investment projects (e.g. investments with a weak socio-economic case or a poor social acceptability) as PPPs in the hope that the private sector will be able to offer solutions to what are fundamentally project issues.

Source: [12] Hurdles to PPP investments
https://www.eib.org/attachments/thematic/epec_hurdles_to_ppp_investments_en.pdf

# Barriers to utilising PPPs (contd.)

- There are many cases of project proposals for which the "PPP business case" prepared by the authority in charge fails to address key issues satisfactorily.
- In a number of jurisdictions, PPP contracts tend to be inadequately designed or unclearly drafted (e.g. ambiguous allocation of risks, inappropriate early termination provisions).

A poorly prepared PPP will frequently fail to reach contract signature or financial close. If it does, it will often lead to a poor Value for Money outcome for the public sector mostly because of poor competitive tension.

## Capacity and buy-in of the private sector

A number of EU markets have a limited domestic market where the technical or financial capacity of contractors, service providers, investors, lenders and advisers to deliver PPPs is not well developed.

As a consequence, PPP procurement does not always provide the necessary level of competition or quality of bids (e.g. there is limited bidder interest or a single bidder only), which will in all likelihood lead to a poor outcome for the public sector. Market capacity issues also affect the effectiveness of a key incentive in PPPs, which is the ability of the public authority to replace the private partner if it were to fail during the contract life.

In some jurisdictions, a major capacity constraint may be the availability of domestic financiers or contractors to support PPP projects with long-term project finance or equity. For example, commercial banks may not have secured the skills required to engage in unfamiliar limited-recourse project financing transactions, setting aside liquidity issues.

Finally, the size of the project can be a challenge for PPPs. PPP projects usually need to be of a certain minimum size to justify the transaction costs that are involved and attract the interest of bidders and associated financing. On the other hand, projects that are too large can also face constraints in the contracting (or financing) pool available.

## Procurement

PPPs are complex contracts to procure. By focusing on service outputs and allowing more scope for the private sector to decide how best to deliver against these outputs, PPPs create incentives to innovate and to maximise efficiency in delivering public services. As a result, the way in which a PPP contract is procured is key to obtaining Value for Money. Indeed, effective competition will drive costs down and boost private sector innovation. In certain markets or for certain projects though, the PPP procurement has not been effective in capturing the benefits of competition and private sector innovation. This is particularly the case where overly prescriptive tender process requirements have been set and inappropriate procurement procedures have been used. Competitive dialogue and the negotiated procedure (recently replaced by the "competitive procedure with negotiations") have both shown their potential to deliver value when properly designed and managed.

It is also worth stressing that apparently frivolous legal challenges against the procurement process are frequent in certain EU jurisdictions as the legal framework in place does not deter challenges or enable their prompt resolution.

Finally, despite the significant efforts of the European Commission to make public procurement clearer through the recently adopted directives on public procurement and concessions, a number of important issues remain for PPPs. For example, there is a question over whether the types of risks transferred under a PPP, in particular an availability-based PPP, mean that the project should be procured as a concession or a public works/services contract. Also, although the Public Procurement Directive simplifies some procurement issues for public authorities, some ambiguity remains in a number of areas, such as post-tender changes.

# Barriers to utilising PPPs (contd.)

## Statistical (Eurostat) treatment and management of PPP fiscal risks

It is often argued that the rules on the statistical treatment of PPPs (commonly referred to as "Eurostat rules") are a hurdle to PPPs, as they make it difficult to classify PPPs off the balance sheet of government under Maastricht criteria. Many stakeholders have also expressed concerns regarding the clarity and rationale of the some of the rules, the unpredictability in their interpretation and the frequency of changes given that PPPs have long gestation times.

Eurostat and the European PPP Expertise Centre have worked together to produce a publication on the statistical treatment of PPPs - *"A Guide to the Statistical Treatment of PPPs",*[13] which was published in September 2016.

## Funding and financing

All PPP projects have to be paid for at some point, regardless of how they are financed.

When talking about "funding", reference is made to the sources of cash that ultimately bear the cost of projects. These sources broadly form two groups: tax-payers (whose taxes enable governments, for example, to make capital contributions or availability payments to PPP projects) or users (who may for example pay a toll to use a highway).

"Financing", on the other hand, is money that must be paid back (e.g. loans or equity). Finance is used to bridge the gap between project inception, when funding may not be sufficient, and later when resources are eventually available to pay for the project. As a result, contrary to what is widely believed, a financing instrument, however sophisticated, will not address a funding issue.

In today's market, raising finance is far less of a constraint than it was during the financial crisis. In many EU PPP markets there is significant liquidity available such that debt and, to a lesser extent equity, can be raised for well-prepared PPPs on attractive terms (although, in some markets, there may still be capacity constraints among domestic lenders). De facto, a more significant hurdle to PPPs (possibly the biggest) is that of the funding of projects. In the current environment, public budgets and users' unwillingness to pay for public services are such that the long-term affordability of PPP projects can be challenged.

As illustrated in EPEC's publication, many factors can inhibit the successful delivery of PPP projects. It is realistic to assume that the effective resolution of most of the PPP hurdles is a task of Member States rather than European authorities. In mature PPP markets, governments and procuring authorities have found ways to address a number of these constraints. Experience shows that some of these hurdles can be resolved if there is political will.

The next section of this input study provides a brief outline of the European PPP market, both historically and in 2018.

Source: [13] A Guide to the Statistical Treatment of PPPs
https://www.eib.org/attachments/thematic/epec_eurostat_statistical_guide_en.pdf

# Section 6: The European PPP market

# The European PPP market

## A historic overview of the European PPP market

According to a report published by the European Court of Auditors[14], based on data provided by EPEC, an estimated 1,749 PPP projects, worth a total of 336 billion euro, reached financial close in the EU PPP market between 1990 and 2016. Before the financial and economic crisis, the PPP market was experiencing a sharp increase in volume, but since 2008 the number of new PPP projects has decreased considerably.

The EU PPP market is mostly concentrated in the United Kingdom, France, Spain, Portugal and Germany, which implemented projects worth 90% of the entire market over the 1990-2016 period. While some Member States implemented numerous PPP projects, such as the United Kingdom, with over 1,000 PPP projects worth almost 160 billion euro during the period, followed by France with 175 PPPs worth almost 40 billion euro, 13 of the 28 Member States implemented fewer than five PPP projects.

## The European PPP Market in 2018

The annual market update of PPPs in Europe for 2018[15], published by EPEC, is summarised below:

*Overview*

- In 2018, the aggregate value of PPP transactions that reached financial close in the European market totalled €14.6 billion, a 4% decrease from 2017 (€15.2 billion). The European market is defined as the EU-28, countries of the Western Balkans and Turkey;
- The number of PPP transactions reaching financial close fell to 39, compared to 44 in 2017. This is the lowest number of transactions since 1997;
- However, the average transaction size increased to €375 million (€345 million in 2017);
- Eight large transactions closed, as in 2017. Their aggregate value amounted to EUR 9.6 billion, representing 66% of the total market value (compared to 69% in 2017). Large transactions are defined as deals of €500 million or more in value;
- 51% of the transactions closed were government-pay PPPs (mostly funded from availability payments).

*Country breakdown*

- Turkey was the largest PPP market in Europe in terms of value, with a total of €5.1 billion (€6 billion in 2017), and France was the largest in terms of number of projects, with 15 deals closed (nine in 2017). France was also the second largest PPP market in terms of value, with a total of €4.2 billion;
- Five countries closed at least two deals (compared to eight countries in 2017) and ten countries closed at least one PPP transaction (compared to 12 in 2017).
- Over the past five years, the United Kingdom and France have led the European PPP market in terms of number of closed deals, whilst Turkey has been the largest PPP market in value terms, with €22.8 billion worth of projects.

*Financing*

- Out of the total of 39 transactions that reached financial close in 2018, 21 (compared to 13 out of 44 in 2017) involved the provision of debt by institutional investors (e.g. insurance companies, pension funds) through a variety of financing models;
- Eight countries closed transactions involving institutional investor debt: Belgium, France, Germany, Ireland, the Netherlands, Serbia, Turkey and the UK (compared to five countries in 2017);
- The role of the EU, national governments and public financial institutions (domestic or supranational) remained significant in 2018. The A355 Strasbourg West bypass (France), A10/A24 Neuruppin-Pankow road (Germany), and the Afsluitdijk dam and Blankenburg tunnel (Netherlands) projects all benefitted from the support of the European Fund for Strategic Investments (EFSI). Furthermore, the EIB financed four of the 39 PPP projects that reached financial close during the year, for an aggregate lending volume of €1 billion.

Source: [14] Public Private Partnerships in the EU: Widespread shortcomings and limited benefits https://www.eca.europa.eu/Lists/ECADocuments/SR18_09/SR_PPP_EN.pdf
[15] Market Update: Review of the European PPP Market in 2018 https://www.eib.org/attachments/epec/epec_market_update_2018_en.pdf

# Section 7: Overview of relevant case studies

# Overview of relevant case studies

This section of the input study outlines several relevant projects related to the application of Public-Private Partnerships in the water management and reuse sector.

Several projects were identified, primarily from the EIB database of successfully funded projects, and through discussions with EPEC. A prominent project was discussed for each of the case study requirements outlined below:

- Case Study 1: Setting up Public–Private Partnerships relevant to water management and reuse techniques in densely populated areas within the EU;
- Case Study 2: Setting up Public–Private Partnerships in EU areas with low natural freshwater resources;
- Case Study 3: Setting up Public–Private Partnerships in EU areas with abundant natural freshwater resources.

A comprehensive list of the projects identified can be found in the annexes of this input study.

# Case study 1: PPPs in densely populated areas within the EU

## Dublin Waste Water Treatment Plant

The project, completed in 2003, consisted primarily of a comprehensive expansion and upgrading of the Ringsend treatment plant, as well as a pumping station and underwater pipeline to carry wastewater from the north of the city to the Ringsend plant. Insight into the project was gained from its ex post evaluation.[16]

The context and objective of the project were the following:

- The requirement to comply with the Urban Waste Water Directive 91/271/EEC, along with other Directives such as the Bathing Water Directive;
- The availability of very high funding rates from the EU Cohesion Fund for investments to address the requirements of the Directive; and
- The increasingly well-established need to improve water quality in Dublin Bay, independent of the requirements of the Directive, driven by increased population and prosperity.

The objective was to accommodate most of the waste water arising in the Dublin region (a human population of approximately 1.1 million) and comply with the Urban Waste Water Directive. There was also planned substantial future investment to increase capacity and cater for the sensitive status of the Liffey estuary, which was to be completed by 2015.

This was an exceptionally large and complex project, and at the time was the largest wastewater project grant-aided by the Cohesion Fund. The project was delivered using a Public-Private Partnership (Design-Build-Operate) procurement process, and used a number of innovative technologies to cater for the large pollution load on a constrained site (15 hectares). The public authority in charge of the project was Dublin City Council (DCC), and the concessionaire awarded the DBO contract was the ABA consortium, which included Celtic Anglian Water (CAW) as the plant operator.

The construction phase took place between 1995 and 2003. Elements of the upgraded plant commenced operations in 1999 but the plant became fully operational in 2003.

The project involved a total initial investment of €297 million, 53% of which was Co-financed through the Cohesion Fund. The remaining investment cost was covered through national public contribution (37%) and contributions by large industrial users (10%). The EC contribution was primarily justified by reference to the requirement to meet the standards of the already mentioned Urban Waste Water Directive.

There were no major time overruns on delivery of the project, but the whole project was subject to a cost overrun of approximately €23 million, as a result of the overrun on one aspect of the project – the underwater pipeline from Sutton in north Dublin to the treatment plant.

Design capacity of the plant (originally not expected to be reached until 2020) was 1.64 million population equivalent, split roughly 70:30 between domestic and non-domestic customers. However, the plant was operating at above design capacity - 1.8 to 1.9 million population equivalent - from the day it opened. This created significant operational problems, and contributed to serious odour problems during the early years of the plant's operations. The latter were eventually resolved, albeit at significant additional cost to Dublin City Council, which has also had to compensate the concessionaire for the above design capacity pollution load.

The ex-post evaluation deemed performance to be satisfactory, with the plant seen as a flagship for the technology used. Operation of the plant represented a significant financial burden on Dublin City Council. In particular, there were no water charges on households, although it was planned to introduce metered household water charges in the future. This was expected to contribute significantly to financial sustainability of the overall public water services, as well as potentially having a moderating impact on demand. Commercial customers, whose discharges are similar in nature to domestic wastewater, were paying a combined water/wastewater charge (€1.90/m3 in 2012). Industrial customers paid based on a formula in accordance with the constituents of their wastewater discharges and their licences. The formula was designed to capture the marginal cost of treating their waste water. As such, the European "polluter pays" principle was only partly being implemented, although it was expected to be fully implemented in the future with the introduction of metered household charges.

Source: [16] Ex Post evaluation of investment projects co-financed by the European Regional Development Fund (ERDF) or Cohesion Fund in the period 1994-1999: Dublin Waste Water Treatment

# Case study 1: PPPs in densely populated areas within the EU (contd.)

Project impacts were analysed using two broad methodological approaches – quantitative (i.e. Cost Benefit Analysis) and qualitative. From an economic viewpoint (taking into account household willingness to pay for improved water quality in Dublin Bay and conversion from market to shadow prices), the project was estimated to have generated highly positive returns: an economic net present value of €355 million and an internal rate of return of 11.7%.

There were some positive endogenous dynamics effects, particularly in terms of technological progress, however many of these benefits were mainly felt outside Ireland. The project also uncovered technological inadequacies, which had negative impacts on the subsequent operations of the plant.

Social cohesion was negatively impacted, through the impacts of the odour problems on the Ringsend district of the city, which was less well-off than the average, and saw itself as being poorly treated by Dublin City Council (a municipal incinerator was also proposed for the area, which exacerbated this perception). On the other hand, the extension of waste water capacity facilitated increased housing and commercial development, particularly in the north of the city where development had been constrained due to lack of water services.

It can be argued that the absence of domestic water supply and wastewater treatment charges contributes to social cohesion, by avoiding financial burdens on less-well-off households, but of course this has negative consequences for both financial and environmental sustainability. Avoidance of undue burdens on households can be more efficiently achieved through general social welfare transfers.

Environmental quality was strongly enhanced by the project, with a significant improvement in water quality in the bay, and further improvement possible with the installation of increased capacity and a long sea outfall. This resulted in a number of beaches along the bay achieving Blue Flag status in the years after the new treatment plant opened. The absence of metered domestic water supply and wastewater treatment charges had negative consequences for the environment, as economic theory indicates that this contributed to an excessive load on the plant.

The plant as designed (and as operated) was in compliance with the basic requirements of the Urban Waste Water Directive, but on designation of the Liffey Estuary as a sensitive water body in 2001, further investment was required to deliver full compliance.

There was limited impact on territorial cohesion, except in so far as development in Fingal County in the north of the city had been facilitated.

Furthermore, it is unclear whether the project had an impact on institutional quality. The project uncovered a lack of institutional quality at local authority level, in terms of capacity to plan and design the physical plant and the Design-Build-Operate contract.

Social happiness impacts, in terms of perception of the project, were mixed. Those using the amenity of Dublin Bay had largely positive perceptions, while the residents immediately neighbouring the plant had a negative perception due to the serious odour problems in the early years of the plant's operations, reinforced by the plans for a municipal waste incinerator on an adjacent site.

The assessment of the key determinants of project outcomes highlights that the context for the project was in large part highly positive, specifically:

- inadequate or no treatment of wastewater discharges from the largest city in Ireland into an enclosed bay with a high amenity value;
- growing population, housing and prosperity;
- the Urban Waste Water Directive, which brought the requirement for improved treatment into sharp legal focus; and
- the availability of very high levels of EU grant aid for projects aimed at meeting the requirements of the Directive.

Some weaknesses were highlighted under the heading of project design. Although the DBO procurement approach enabled the accommodation of the plant on a constrained site, shortfalls in the contract design made it difficult and time-consuming to resolve operational problems and allocate responsibility.

# Case study 1: PPPs in densely populated areas within the EU (contd.)

Forecasting capacity likewise was a significant source of weakness in the project, most notably in terms of projecting the design load, which was exceeded from day one of operations. That said, the acceleration of growth during the "Celtic Tiger" period exceeded all expectations. Failure to anticipate important environmental constraints was also an issue. Between them, these had significant consequences for the technical solution, the cost and the operations of the plant.

In general, governance for EU co-funded projects is stronger than for unfunded projects, because of the discipline imposed by EU procedures. However, governance of this project exhibited weaknesses in many respects, most notably in respect of the forecasting issues discussed above, but also in terms of contract design.

Managerial response exhibited positive and negatives. The project had to adapt to a number of unforeseen events, albeit that many of these should have been foreseen. Management were able to cater for the above design capacity demand quite well, but took a number of years – and high cost - to deal with the odour problem. A number of environmental designations that constrained the project also had to be dealt with. Positive managerial response was evident in the construction of the Sutton to Ringsend pipeline, and in the decision by DCC to change its consulting engineers.

A lesson from the project was to be aware of vulnerabilities with complex and innovative infrastructure projects, subject to significant constraints, in a dynamic environment. This may be particularly problematic in contexts where technical expertise is weak, and demand data or forecasting capacity is limited.

# Case study 2: PPPs in areas with low natural freshwater resources

## The freshwater situation in Cyprus

Cyprus is considered a country with significantly low freshwater resources.

Traditionally, underground reserves were the main source of water for both drinking and irrigation purposes in the country. By 1970, over-pumping driven by increased demand had left almost all of the country's aquifers seriously depleted and many of those in coastal areas were suffering sea intrusion.

Cyprus was clearly severely over-stressing groundwater resources since it was exploiting groundwater beyond its ecological limit. Thus, for more than 20 years, Cyprus embarked on a programme to safeguard and improve its water supply, including the construction of water treatment plants at Khirokitia, Kornos, Limassol Tersephanou and Asprokemmos and self-contained units at Athienou.

However, despite these developments, Cyprus still faced chronic water shortage, which was exacerbated by prolonged droughts and growing consumption.

The government decided to explore alternative solutions to meet the burgeoning needs of the major towns and tourist centres, leading to the country's first desalination plant becoming operational at Dhekelia in April 1997. Larnaca followed and, on 25 August 1999, the Council of Ministers decided to build a 20,000m³ facility at Zakaki to serve Limassol.

## Larnaca Desalination Project

In February 1999, IDE was awarded the build-own-operate-transfer contract to supply 40,000m³ of desalinated water daily by the Water Development Department of the Ministry of Agriculture, Cyprus, under a 10 year contract. When the contract period expired in 2011, the Larnaca seawater reverse osmosis (SWRO) plant became the property of the Cypriot Government, who also had the option to purchase ahead of this date, exercisable at six-months' notice. The project cost €57 million.

The scope of work included the delivery of the plant to site, erection works, civil works, start up and commissioning of the plant, training of the plant's O & M personnel, the design and erection of the sea water supply and delivery system, the product water delivery up to the battery limits and the brine reject disposal system.

Subsequently upgraded to 54,000m³/day, it was the largest, desalination facility to be built in the country, occupying some 1.6ha (four acres) of land near to Larnaca airport. Construction began in December 1999 and was completed in March 2001. The plant opened in April 2001.

Also included in the work was the provision of a seawater pumping station for a daily intake of 80,000m³, the laying of over 2,000m of intake and outfall pipelines, together with the dredging, undersea excavation and removal of 120,000m³ of sand and rock.

The plant was upgraded to 64,000m³ per day in 2008, with the installation of another unit that has a capacity of 10,000 cubic metres per day.

Larnaca also introduced the membrane management system, which helped the plant to produce 7% more water in 2007 than the existing production with 2% less energy annually consumed.

The Larnaca desalination plant received the 2007 Best Innovation Award in the manufacturing sector from the Industrial Federation of Cyprus.

# Case study 3: PPPs in areas with abundant natural freshwater resources

## Omega Waste Treatment Facilities PFI

Project Omega is one of the UK's largest PPP schemes, and provides a fifth of Northern Ireland's wastewater treatment capacity. It was originally scheduled for final completion in late 2008, but was finished two years later, in 2010. The PPP project entailed the Design-Build-Finance-Operate of waste treatment at eight sites in Northern Ireland under a 25-year concession.

The project principally comprised the construction of a new, state-of-the-art wastewater treatment plan (WWTP) at Donaghadee and a second sludge incinerator – rated at 24,000t per year – in Belfast. The scheme was intended to form a sustainable wastewater strategy to meet the Province's needs for the next 25 years.

The project also included upgrading six existing wastewater plants – at Ballynacor, Bullays Hill, Seagoe, Armagh, Richhill and Ballyrickard – refurbishing a number of sludge facilities and constructing three pumping stations and associated transfer pipelines.

The project cost was £122m, with strong competition throughout the tendering process and the high degree of innovation encouraged by the PPP performance criteria having yielded savings of more than 17% of the original £154m capital estimate.

## Project background

Northern Ireland's rapid development had taken its toll on the existing wastewater infrastructure and although there had been significant progress in improving discharge standards, pollution along large stretches of the coast and rivers had increased.

In 2003, Friends of the Earth complained about the 'inadequate, over-loaded and non-existent sewerage provision' to the European Commission – setting in motion a series of events which ultimately saw the European Court of Justice ruling against the province in February 2007.

To address these problems, a major investment programme was put in place intended to improve the provision of wastewater treatment and sludge disposal to protect the local environment and meet the strict demands of the Urban Wastewater Treatment Directive.

Project Omega arose out of this need to develop a comprehensive regional approach to wastewater and sludge disposal. Overseen by the Water Service Northern Ireland – which became NI Water Ltd – the contract to design, build, finance and operate the new treatment plant and incinerator was awarded to Glen Water, a joint venture between Thames Water and Laing O'Rourke.

## Sludge solution

Selecting a robust and secure solution for all of the province's sludge inevitably presented a major challenge. After due critical evaluation of a range of different options, incineration finally emerged as the most appropriate, since it offered a sustainable, long-term approach with minimal environmental impact.

A second incinerator constructed with an annual rated capacity of 24,000t was expected to significantly improve the existing incineration facility in Belfast, while doubling Northern Ireland's total sludge processing capacity.

Sludge is treated in a purpose-built fluidised bed incinerator, operating at a temperature of between 850 – 950°C and working at between 70 – 100% of its effective rated capacity.

The two incinerators enjoy a symbiotic relationship, the output of the new incinerator being influenced by the volume of steam produced by the existing facility. The new incinerator was designed to produce the maximum amount of power through its associated new turbine – the 45 bar / 420°C superheated steam produced by the forced circulation boiler being used to generate electricity. In essence, the more steam the current incinerator is able to send to the new one, the greater the power production.

Incoming dewatered sludge cake is initially stored within a purpose built automated bunker holding a maximum capacity of 1400m$^3$, equipped with a sophisticated ventilation system, with built-in methane and hydrogen sulphide sensors to prevent a build-up of gas. In operation, air is drawn out of the bunker to be used in the combustion process, while two additional vent fans ensure that necessary levels of ventilation are maintained during essential maintenance or in the event of the incinerator being stopped in an emergency.

# Case study 3: PPPs in areas with abundant natural freshwater resources (contd.)

The sludge cake is then fed into the incineration process from a hopper, with a coarse separator being used to remove stones and other unwanted solids, before the sludge is finally fed into a thin film dryer.

Dried sludge then travels along screw conveyors to the fluidised bed incinerator.

The new incinerator is designed around a four second flue gas reaction time to ensure the complete oxidation of organic material, its core temperature being controlled by a series of operational parameters to ensure maximum efficiency.

Incidental variations in the water content and thermal value is equalised by controlling the incineration air temperature between 150 –250°C, while longer-term fluctuations are controlled by the evaporation capacity of the dryer.

Electrostatic precipitators are used to separate the majority of the fly ash from the flue gas with the pre-cooled flue gas entering the scrubber system. The first scrubber – operating at a pH of less than three – provides a quench system and cools the flue gas down to saturation temperature. The second scrubber is a two-stage packed column to give sulphur dioxide removal and operates at pH seven, controlled by caustic soda dosing.

Direct contact with cooled water during the second stage cools the flue gas down to around 50°C. To avoid an unsightly plume visible at the stack, provision is made to mix additional hot air at 120°C with the flue gas – the air from the bunker ventilation is heated up via a low pressure exchanger to be used as mixing air in the process.

Ballynacor WwTW aerial view - Courtesy Richard Tyreman

# Appendices

A. Further case studies

B. Glossary

C. Sources of information

# A. Further case studies

## Comrepehensive list of case studies identified

| Project name | Year FC | Country | Value (€m) |
|---|---|---|---|
| Dublin Waste Water Treatment Plant | 1994 | United Kingdom | 297 |
| Inverness and Fort William Sewerage | 1996 | United Kingdom | 63 |
| Marbella Desalinisation Plant | 1996 | Spain | 61 |
| Vigo Water Plant | 1996 | Spain | 108 |
| Dhekelia Desalination Plant | 1996 | Cyprus | 22 |
| Aguas De Santa Maria Da Feira | 1999 | Portugal | 141 |
| Almond Valley Seafield and Esk Valley Sewage Project | 1999 | United Kingdom | 173 |
| Catalonia Water Project | 1999 | Spain | 57 |
| Dalmuir Sewage Treatment Works | 1999 | United Kingdom | 76 |
| Kinnegar Water Treatment Plant | 1999 | United Kingdom | 21 |
| Levenmouth Water Purification Scheme | 1999 | United Kingdom | 138 |
| Tay Sewage Treatment Works | 1999 | United Kingdom | 187 |
| Waterman Project | 1999 | Netherlands | 98 |
| Maribor Wastewater Plant | 1999 | Slovenia | 35 |
| Aberdeen Wastewater Project | 2000 | United Kingdom | 190 |
| Arroyo Culebro Waste Water Plant PFI | 2000 | Spain | 43 |
| Ayr Wastewater Treatment Project | 2000 | United Kingdom | 135 |
| Larnaca Desalination Project | 2000 | Cyprus | 57 |
| Brno Waste-Water Treatment Plant | 2001 | Czech Republic | 83 |
| Broadland Flood Alleviation Project | 2001 | United Kingdom | 265 |
| Moray Coast Wastewater Project | 2001 | United Kingdom | 125 |
| Berlin Wasser | 2002 | Germany | 922 |
| British Waterways Water Grid PPP Project | 2002 | United Kingdom | 211 |
| Delfland Wastewater Treatment | 2003 | Netherlands | 363 |
| Milan Nosedo Waste-Water Purification Plant | 2003 | Italy | 107 |
| Tuscany Water Project (ATO 4 Alto Valdarno) - Acqua Di Arezzo | 2004 | Italy | 100 |
| Aguas de Barcelos Water PPP Project | 2004 | Portugal | 85 |
| Pacos de Ferreira Water Project | 2004 | Portugal | 54 |
| Project Aquatrine Phase B | 2004 | United Kingdom | 70 |
| Project Aquatrine Phase C | 2004 | United Kingdom | 144 |
| Covilha Sewage PPP | 2005 | Portugal | 19 |
| Segarra-Garrigues Secondary Canal Network | 2005 | Spain | 1,071 |
| Ute Edar La Roca Water Treatment PPP | 2005 | Spain | 12 |
| Tuscany Water Project (ATO 2 Basso Valdarno) | 2006 | Italy | 255 |
| Alpha Water Treatment Facilities PFI | 2006 | United Kingdom | 200 |

## Comrepehensive list of case studies identified (contd.)

| Project name | Year FC | Country | Value (€m) |
|---|---|---|---|
| Cinca Water Treatment Plant | 2006 | Spain | 10 |
| North Brussels Wastewater Concession | 2006 | Belgium | 317 |
| Northern Ireland Waste Water | 2006 | United Kingdom | 235 |
| Acqualatina Water Services PPP (Lazio) | 2007 | Italy | 144 |
| Escombreras Desalination Plant | 2007 | Spain | 139 |
| Omega Waste Treatment Facilities PFI | 2007 | United Kingdom | 236 |
| ATO Orientale Goriziano Irisacqua PPP | 2008 | Italy | 114 |
| Indaqua Vila do Conde | 2008 | Portugal | 111 |
| Bajo Aragon Zone 9 Waste water Treatment Plant | 2009 | Spain | 14 |
| Water management project Turnov | 2010 | Czech Republic | 87 |
| Emahsa Water Treatment and Distribution PPP | 2013 | Spain | 28 |
| Barcelona High Pressure Water Supply PPP TIGER | 2014 | Spain | 98 |
| Toulon underground waste water pipe | 2014 | France | 37 |
| Afsluitdijk Dam PPP | 2018 | Netherlands | 810 |
| Grimaud Wastewater Treatment Plant | 2018 | France | 67 |
| Marne-La-Vallée Water Distribution Network PPP | 2018 | France | 161 |

Legend: Case studies highlighted in Grey – Case studies discussed in main body of input study
Case studies highlighted in Green – Case studies relating to water reuse
Case studies highlighted in White – Case studies relating to other types of water related projects

# B. Glossary

| | |
|---|---|
| **ADB** | Asian Development Bank |
| **CGIAR** | Consultative Group for International Agricultural Research |
| **EAFRD** | European Agricultural Fund for Rural Development |
| **EBRD** | European Bank for Reconstruction and Development |
| **EC** | European Commission |
| **EFSI** | European Fund for Strategic Investment |
| **EIB** | European Investment Bank |
| **EPEC** | European PPP Expertise Centre |
| **ERDF** | European Regional Development Fund |
| **EU** | European Union |
| **EWA** | Energy and Water Agency |
| **IaDB** | Inter-American Development Bank |
| **IISD** | International Institute for Sustainable Development |
| **IsDB** | Islamic Development Bank |
| **MEPA** | Malta Environment and Planning Authority |
| **MRA** | Malta Resources Authority |
| **O&M** | Operation and maintenance |
| **OECD** | Organisation for Economic Co-operation and Development |
| **PFI** | Private Finance Initiative |
| **PPIAF** | Public – Private Infrastructure Advisory Facility |
| **PPP** | Public-Private Partnership |
| **PSC** | Public Sector Comparator |
| **RBMP** | River Basin Management Plan |
| **RRR** | Resource Recovery and Reuse |
| **SWRO** | Seawater reverse osmosis |
| **UN** | United Nations |
| **WCMP** | Water Catchment Management Plan |
| **WEI** | Water Exploitation Index |
| **WFD** | Water Framework Directive |
| **WWTP** | Wastewater treatment plan |

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