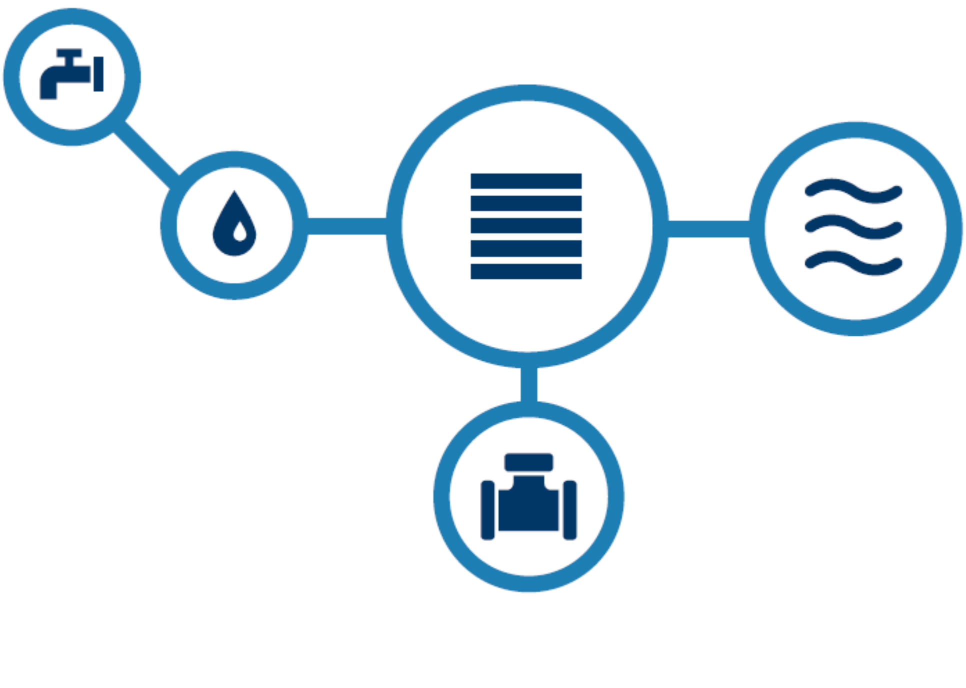
A Typology of Water Infrastructure Projects

Task Force on Financing Water Infrastructure

World Water Council



Draft Working Document

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A TYPOLOGY OF WATER INFRASTRUCTURE PROJECTS

Background:

This working document was prepared in the framework of the Task Force on Financing Water Infrastructure of the World Water Council. It is based on the actions identified in the report Ten Actions for Financing Water Infrastructure, published by the World Water Council in March 2018. This working document will be presented at the 8th World Water Forum in Brasilia, Brazil to gather comments and feedback from a wide range of stakeholders during the Forum and beyond. If you wish to contribute, we invite you to contact the World Water Council at m.khemiri@worldwatercouncil.org

Summary:

Water infrastructure projects could be made more 'bankable' by improving how their investment case is made. We propose a typology of water projects that aims to reduce the information asymmetries that exist between projects and finance. Through an outcomes-based approach to evaluate risk and return, the framework draws on models that are increasingly being used to measure progress against the Sustainable Development Goals. We propose a classification that is adaptive to the varying expectations of project investors, based on the *scope, system, structure, security and sustainability* of different projects.

Prepared by Alex Money

Overview

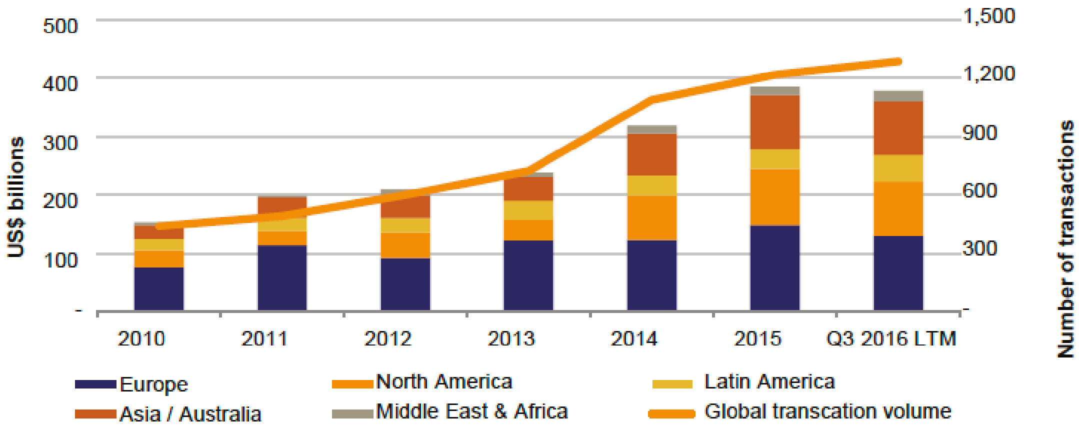
There is broad consensus that it will be impossible to achieve the targets of SDG 6 unless there is a step change in the quantum of investment in water infrastructure, particularly across the developing world. Estimates of the gap between current levels of investment compared to what is necessary to meet the goals, range between $150bn and $300bn per annum. These are big numbers by any measure, particularly as the gap does not appear to be closing. A lot of time and effort has already been expended by various organisations to evaluate the impediments to funding water infrastructure. This work has helped to yield a much better understanding of the problem, and indeed has led to improvements in many areas. However, for three in ten people worldwide – over two billion souls - the quality of access to water supply and services still remains woefully inadequate[1]. From the perspective of the SDGs, which emphasise the requirement of universality ('leaving no one behind'), this sober fact has a particular resonance.

Recognising the important role that finance and investment should play as part of the solution, the World Water Council established a task force to investigate what practical measures could be taken to lower the barriers to financing water infrastructure, and to unlock new sources of capital investment. A positioning document[2] was published that identified a series of actions, including developing a typology of water infrastructure projects. This white paper sets out the rationale for the typology.

Water's share of infrastructure investment

Recent underlying trends around infrastructure investment as an asset class are positive. Since the global financial crisis, there has been a sharp rise in the volume and value of infrastructure transactions[3] across most parts of the world [Fig 1].

Fig 1: Global Infrastructure Transaction Activity



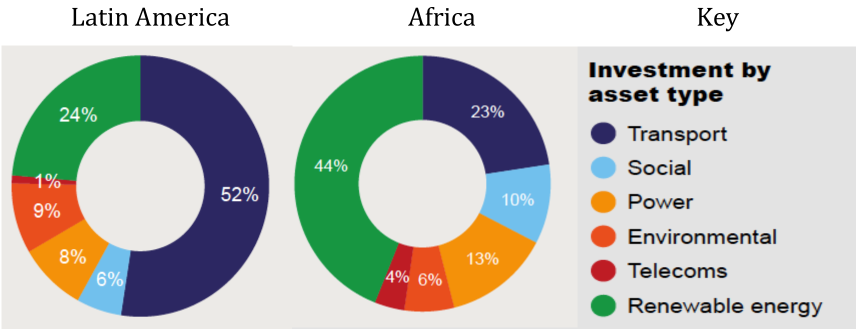
Source: Infradeals

[1] Progress on drinking water, sanitation and hygiene, JMP (2017)
[2] Ten Actions for Financing Water Infrastructure, WWC (2018)
[3] Global Infrastructure Investment, PwC (2017)

But if this is indicative of a renaissance in infrastructure as an investable asset, there remains a high risk that water will miss out. The sector has long been plagued by the perception that investment returns on a risk-adjusted basis are low. The water industry is capital intensive, and the underlying physical assets require continual monitoring, regular maintenance, periodic repair and occasional replacement. Charges to consumers for water supply and services are usually regulated by government, and the rates are often set below the full economic replacement cost of the underlying assets. The governance and political economy of water and sanitation services are also highly context-dependent. Analysis of how this issue contributes to project delays and policy uncertainty has generally focused on the developing world, but the sensitivities are universal. For example in the United Kingdom, generally considered a bastion of economic and policy liberalism, there is every prospect that a new government would attempt to re-nationalise the country's water utilities.

Anecdotal evidence suggests that the water sector is indeed receiving a smaller allocation of incremental investment, relative to its share of total infrastructure. In the USA, the overall share of federal spending on transport infrastructure has remained broadly steady over the last 40 years. However, government spending on water infrastructure decreased from US$ 76 per person in 1977, to just US$ 11 per person in 2014, according to the Congressional Budget Office[4]. Meanwhile, in Latin America and Africa it is the transport and renewable energy sectors that account for over two-thirds of private sector investment in infrastructure [Fig 2]. Non-public investments in water projects are sometimes not even material enough to warrant their own asset classification[5], as the charts below indicate.

Fig 2: Non-Public Sector Investments by Asset Type: Latin America and Africa



Source: PwC

The investment case for water projects

We suggest that one of the ways in which the water sector could access a greater share of private sector capital is by improving how the 'supply side' (e.g. project developers) makes its investment case to the 'demand side' (e.g. project investors). In order for this investment case to be made effectively, we believe that there is the need to develop and use a typological framework of projects that recognises the heterogeneity of water infrastructure as an asset class.

[4] The Economic Benefits of Investing in Water Infrastructure, Value of Water Campaign (2017)
[5] Global Infrastructure Investment, PwC (2017)

At present, water infrastructure is usually characterised in the policy-facing literature as a unitary 'thing'. This approach effectively reduces the investment gap to a common set of problems that simply require a generic solution. In reality, the opportunities and challenges of financing water infrastructure need to be understood from the project level, as that is the unit of account for investment. We believe that without a project-level typology, knowledge asymmetries between the supply side and the demand side are inevitable.

These asymmetries can create a form of market failure where unsuitable or inappropriate sources of finance are pursued to fund projects, while investors whose objectives are better aligned with the projects are either not identified or not approached. We suggest that by aligning projects with their most appropriate funding sources, it could be possible to reduce the frictional costs associated with project financing. This should help to accelerate the pace at which projects are funded; which in turn could increase the probability of a broader spectrum of water infrastructure projects finding appropriate funding.

Classifying water projects

Traditional classifications of water infrastructure include scale, status, function, operating environment and ownership model. As we have described in our positioning paper, infrastructure exists at every scale, from the river basin or catchment, to networks of pipes, to the household tap. Scale is typically correlated with capital commitment and project complexity. Frequently it is also material to the attributes of a project. Large scale projects such as flood defence usually exhibit the non-rivalrous and non-excludable characteristics associated with a public good, with ownership correspondingly within the public sector. Small scale projects such as water kiosks are more likely to operate as private enterprises and present a different profile as an investment prospect.

Classification by function typically covers upstream components including pumping, diversion, transportation, storage, treatment and distribution. Downstream functions include sewerage, treatment and sanitation services. There are distinctions to be made between water services and water functions, particularly when identifying and attributing economic value. Projects as diverse as water supply and sanitation, flood protection, irrigation and reservoirs embed different levels of capital intensity and repayment periods. They bear distinct credit, commercial and legal risks; and offer varied economic, financial and social return.

The operating environment for water infrastructure varies widely between (and often within) countries. At the sector level, the ownership of water utilities, regulatory and governance arrangements, municipal water provision and NGO activities are some of the many issues that influence the bankability of water projects. At the country level, factors such as tax rates, development allowances, devolution to local government, sovereign creditworthiness and so on are all important aspects of the operating environment.

There is extensive and excellent literature already available on these classifications, and our objective here is not to reinvent the wheel[6]. Instead we propose that the value of

[6] See e.g. Private Sector Participation in Water Infrastructure, OECD (2009)

classifications in getting infrastructure financed could be enhanced by embedding them within a project typology that recognises the heterogeneity of the asset class and helps to reduce information asymmetries. The aim of our approach is to improve how the supply side makes its investment case to the demand side. Our contribution comes through applying a novel approach to evaluating project risk and return.

Project risk

Private sector investment in infrastructure projects are governed by the perceived risk and return attributes[7] of those projects. The practitioner literature around financing infrastructure consistently emphasises the importance of *de-risking* projects in order to make them bankable. Infrastructure risk can be an amorphous concept, but we suggest that is can be helpful to decompose risk into four components: project development, off-taker, political and regulatory, and currency risk. Of these, political and regulatory risk and currency risk will be familiar as 'top-down', country level measures. The other two risk components are 'bottom-up', or project level measures. Project development incorporates the risk of a project's delay or failure due to technical, operational, environmental, governance or other factors. Off-taker risk is more commonly associated with the energy sector, but it refers to the credit-worthiness of the entity who pays for the project – which may be a government, a utility, or indeed consumers.

Variations of this risk decomposition include a taxonomy developed by the OECD that combines top-down risk attributes such as political and macroeconomic risk, with bottom-up attributes such as the project lifecycle phase, and technical risks of implementation (Fig 3).

Fig 3: Risks linked to infrastructure assets over the project lifecycle

<table>
<tr><th>Risk Categories</th><th>Development Phase</th><th>Construction Phase</th><th>Operation Phase</th><th>Termination Phase</th></tr>
<tr><td rowspan="8">Political and regulatory</td><td>Environmental review</td><td>Cancellation of permits</td><td>Change in tariff regulation</td><td>Contract duration</td></tr>
<tr><td rowspan="3">Rise in pre-construction costs (longer permitting process)</td><td colspan="2" rowspan="2">Contract renegotiation</td><td>Decommission</td></tr>
<tr><td>Asset transfer</td></tr>
<tr><td></td><td colspan="2">Currency convertibility</td></tr>
<tr><td colspan="4">Change in taxation</td></tr>
<tr><td colspan="4">Social acceptance</td></tr>
<tr><td colspan="4">Change in regulatory or legal environment</td></tr>
<tr><td colspan="4">Enforceability of contracts, collateral and security</td></tr>
<tr><td rowspan="7">Macroeconomic and business</td><td>Prefunding</td><td colspan="3">Default of counterparty</td></tr>
<tr><td colspan="2" rowspan="3">Financing availability</td><td colspan="2">Refinancing risk</td></tr>
<tr><td colspan="2">Liquidity</td></tr>
<tr><td colspan="2">Volatility of demand/market risk</td></tr>
<tr><td colspan="4">Inflation</td></tr>
<tr><td colspan="4">Real interest rates</td></tr>
<tr><td colspan="4">Exchange rate fluctuation</td></tr>
<tr><td rowspan="6">Technical</td><td colspan="3">Governance and management of the project</td><td rowspan="5">Termination value different from expected</td></tr>
<tr><td colspan="3">Environmental</td></tr>
<tr><td>Project feasibility</td><td rowspan="2">Construction delays and cost overruns</td><td rowspan="2">Qualitative deficit of the physical structure/ service</td></tr>
<tr><td>Archaeological</td></tr>
<tr><td colspan="3">Technology and obsolescence</td></tr>
<tr><td colspan="4">Force majeure</td></tr>
</table>

Source: OECD (2015)

[7] The Oxford Guide to Financial Modelling (2014)

The OECD taxonomy works well at a conceptual level, though it was not explicitly designed to evaluate project risk in practice. But we believe there is a strong case to be made for an applied typology that enables investors to identify, evaluate and compare project-specific risk. A good starting point would be to unpack project development and off-taker risk into a series of constituent elements. Here again, there is some excellent literature[8] to draw upon, without reinventing the wheel. Incorporating this bottom-up risk typology with the traditional country-level measures of economic and political risk would give a more textured perspective on the heterogeneity of the water infrastructure asset class.

This may seem like a challenging undertaking. Measurement of risk is subjective, and the approach is sensitive to the critical observation that 'the devil is always in the detail'. But there is inspiration to draw from the energy sector, where the rapid growth of investment in renewables has prompted the development of iterative models to address project risk. As methodological approaches become familiar, best practices will emerge, and over time, it is likely that new datasets will develop. This is important: according to a recent report from the OECD[9], improving the availability and quality of data could transform the prospects of infrastructure financing. One of the most commonly cited reasons for the dearth of bankable infrastructure projects is the lack of comparable data. A typology that incorporates project-specific risk could potentially help to bridge this knowledge gap.

Project return

In contrast to infrastructure risk, which features extensively in the literature, comparatively little is written about the return to investors on infrastructure investment. In generic terms, returns accrue to countries through gains in productivity, economic growth, trade, connectivity and inclusion. In specific terms, returns accrue to investors through the economic rents or cash flows that are generated through the use of this infrastructure. Examples of these rents include road tolls, electricity tariffs and water rates. For assets that have the attributes of public goods, these returns are usually only indirectly monetised, for example though municipal charges and airport departure taxes. In countries where installed infrastructure is predominantly a public good, the state is typically the largest investor.

For private sector investors, then, financial return has traditionally been the only metric that appears to matter. On this basis, it is not difficult to see why water infrastructure does not attract a larger share of capital. Unlike for most other scarce resources, there is a non-linear relationship between the value of water and its price. Returns on investment for what is substantively the same end product therefore vary widely, based on a complex matrix of social, cultural, political and economic drivers that exhibit inconsistent dynamics over both time and space.

While it is beyond the ambitions of this paper to solve the perennial water pricing conundrum, we believe that there is an argument to be made for a typology of water infrastructure that incorporates a broader perspective on measures of return. Indeed, we

[8] See e.g. Managing Cost Risk and Uncertainty in Infrastructure Projects, IRG (2013)
[9] Breaking Silos: An agenda for G20, OECD (2017)

propose that many private sector investors increasingly have a mandate that extends beyond purely financial returns on infrastructure investment. We expand on this idea in our second white paper, but for our purposes here, we simply suggest that non-financial returns can be attractive to investors in the private.

Whereas we decomposed risk into four components, we apply a different lens to non-financial return. This image [Fig 4] of the 17 Sustainable Development Goals has perhaps inevitably already featured in so many reports that we include it here with some trepidation. But the SDGs are invaluable in contextualising the concept of non-financial return that we propose.

Fig 4: The Sustainable Development Goals

Source: United Nations

The SDGs provide an 'out of the box' framework to evaluate and compare returns on water infrastructure investment, at all levels of scale from country down to single project. While SDG 9 (industry, innovation and infrastructure) is the most obviously connected, fully twelve of the seventeen goals are underpinned by the quantity and quality of infrastructure investment[10]. And while it is fairly intuitive to explain how and why improved water infrastructure should in principle contribute to reduced poverty, better health, less inequality, decent work, sustainable cities, and so on – the SDGs provide a framework to empirically test and validate these hypotheses.

A positive network effect is being generated as academic institutions, NGOs, governments and corporations variously direct their collective energies towards these goals. For the water sector this is particularly important, it provides a framework to assess the outsize contribution that investment in infrastructure could make. Critically, this contribution extends significantly beyond SDG 6. We argue that it is both necessary and desirable to re-frame the value proposition around non-financial returns on water infrastructure investment if the SDGs are to have a realistic chance of being met.

As to the question of which investors beyond the public sector are interested in such returns – the list is growing. The commitments from COP 21 alone on climate finance imply that US$ 100 billion per annum of additional investment will eventually come on stream. In the near term, impact funds, sovereign wealth funds, DFIs and other investors with mandates beyond non-financial returns are already well established. A nascent but rapidly growing segment is the corporate sector, where investment in sustainable

[10] International Institute for Sustainable Development (2015)

infrastructure may be an attractive option for reducing Scope 3 emissions, for example. Moreover, financial innovation such as green bonds are accelerating change.

We consider the role of investors in more detail in our second white paper, but in short, there are new and emerging investors for whom water infrastructure may be (or become) an attractive asset class. But as these are largely not the same investors who have traditionally funded water infrastructure, there are likely to be knowledge asymmetries on both the demand side and the supply side. A typology of infrastructure projects could lower these asymmetries and make water infrastructure more accessible as an asset class to.

A typology of infrastructure projects

We propose a model of classification that is based on the *scope, system, structure, security and sustainability* of different types of projects. Each element is underpinned by a set of common questions, which are summarised in general terms below. The questions are in development and will be validated through stakeholder review.

- **Scope** incorporates a range of traditional classifiers described above, including the size and scale of a project, i.e. likely levels of capital commitment, project complexity and government involvement; and its stage in the lifecycle, i.e. from development through to termination.

- **System** incorporates the operating environment for the project, including the role of the public sector in provision, governance and regulatory arrangements, environmental standards, fiscal arrangements, access to local capital, sovereign creditworthiness, devolution and so on.

- **Structure** incorporates project-specific attributes such as ownership arrangements and models of operation, levels of equity and debt, project guarantees, private sector participation, access to financial instruments including green bonds and blended finance.

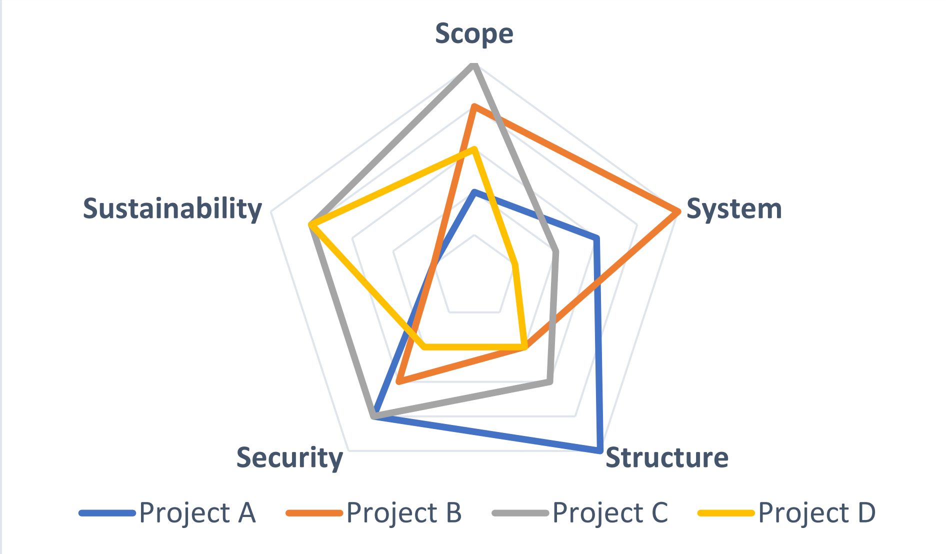
- **Security** incorporates measures of risk including project development risk, off-taker risk, political and regulatory risk, and currency risk. Includes enforceability of contracts, risk of construction delays and cost overruns, volatility of demand, counterparty and liquidity risk and so on.

- **Sustainability** incorporates measures of return including financial and non-financial return. Framing could include how the project contributes to the SDGs including reduced poverty, better health, less inequality, decent work, industry and innovation, sustainable cities, and so on

Different projects would score differently on each of these measures, not just because of the individual project's attributes, but also because of the different expectations of each scorer. The typology is adaptive to both dynamics. Its purpose is not to create a universal scorecard of all projects – but instead to create a common basis of comparison for investors to evaluate different projects.

We consolidate these attributes through a stylised example in Fig 5:

Fig 5: Typology of Projects



Source: author

The framework is extensible, in that it allows a comparison at different scales. Just by way of example, we suggest that Projects A through D could potentially represent:

i) individual projects of a single functional type (e.g. treatment plants)
ii) consolidated projects across different countries
iii) current projects across an investor's portfolio
iv) projects applying for purposed finance (e.g. green finance, blending)

Various other combinations are obviously also possible. The examples here are purely illustrative.

Next steps

In our framing paper[11] we set out ten discrete issues that we associated with barriers to investment in water infrastructure. The absence of an adequate typology of projects was one of those issues, and the purpose of this paper is to set the terms of reference for discussion, debate and engagement with informed stakeholders.

In our view, the value or otherwise of this typology will eventually boil down to three questions. First, does it help to lower the knowledge asymmetries that exist between projects and investors? Second, are there sustainable models to collect the information necessary, and to keep it up to date? Third, exactly what are the improved outcomes that can be credibly be attributed to using the framework?

[11] Ten Actions for Financing Water Infrastructure, WWC (2018)

If the principal output of this research is another set of worthy and uncontroversial recommendations, it will be obvious that we have failed to answer these questions. This is not, of course, to claim that recommendations are unimportant. However, we feel our incremental contribution to the excellent recommendations already published in this field would be small. Instead, we want to advance best practice around getting water infrastructure financed. We take an applied approach and seek to engage an extensive network of stakeholders. Critical and constructive comments from all parties are welcome and desired. These inputs will determine if and how we can convert conceptual frameworks into an applied programme of change.

When it comes to financing sustainable water infrastructure, the scale of the challenge leaves no room for complacency. But nor can pessimism be justified. Over two billion souls still lack access to adequate water supply and sanitation due to insufficient infrastructure. We have to fix the financing gap.