

# THE NEW CAIRO WASTEWATER TREATMENT PLANT (EGYPT)

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## 1. Context

At the beginning of this century, a drinking water shortage was identified as a pressing issue in Egypt's environment sustainability, particularly in densely populated areas. The existing wastewater treatment infrastructure did not produce water with adequate quality to use for agricultural and urban green area irrigation, meaning fresh water had to be used instead. Therefore, the government decided to build new infrastructures to reuse urban wastewater for the mentioned purposes, reducing fresh water use.

One example of this situation was in New Cairo, a city created in the southeastern part of Cairo in 2000 in a former desert area, to ease the problems of an overcrowded capital. One of the main challenges faced by the city was the shortage of drinking water due to the harsh environmental conditions.

On the other hand, in 2006, the government of Egypt adopted a new long-term policy to increase the involvement of private firms in the country's economic development as a source of capital financing and know-how. The aim of the new policy was to expand the much-needed investment in infrastructure within the country. Using public-private partnerships (PPPs) was one of the goals of this new policy.

It is in this framework that the New Urban Communities Authority (NUCA), the national agency in charge of developing new areas and redistributing the population far from the narrow strip of the Nile Valley, was in charge of leading the implementation of a wastewater treatment plant (WWTP) in New Cairo.

The plant was designed to:

- Reduce the use of freshwater for tasks such as agriculture and urban green area irrigation, as the sludge from the wastewater will be used for agricultural activities as fertiliser.

**1.** This chapter is an adaptation of the study *New Cairo Wastewater Treatment Plant (Egypt): Case Studies PPP for Cities* prepared by: Jordi Salvador, Miquel Rodríguez Planas, Francesc Trillas, and Joan Enric Ricart.

At the beginning of this century, a drinking water shortage was identified as a pressing issue in Egypt's environment sustainability, particularly in densely populated areas.

- Limit the volume of polluted water dumped into the river with consequent negative effects on human health and the ecosystem.
- As a consequence of the previous point the project will additionally reduce the water pollutants disposed into the River Nile.

Before the New Cairo WWTP was in operation, New Cairo's wastewaters were disposed into the river with significant negative effects on the river ecosystem and public health.

## 2. The characteristics of the WWTP

It was, at the time, the first successful PPP in Egypt. In terms of capacity, the WWTP was an urban wastewater treatment plant with an average daily flow of up to 250,000m<sup>3</sup>/day, with capacity to serve over 1 million residents, the expected population growth of New Cairo at the time the project was designed.

The project company, Orasqualia, was named after the two shareholders in the special purpose vehicle (SPV), Aqualia (subsequently replaced by Aqualia New Europe in February 2015) and Orascom Construction Industries (subsequently renamed OC), each of them holding 50% of the shares in the consortium. Aqualia New Europe (ANE) is a joint venture between Aqualia (51%) and the European Bank for Reconstruction and Development (ERBD) (49%).

The construction process started in March 2010 and ran for 26 months, until May 2012. The construction period was finished with only two months of delay despite the political situation during 2011. The delay in the operation period resulted from problems deriving from the quality of the outflow during the commissioning period. During this period, NUCA did not accept – as is the common rule – any discharge of water with quality outside the parameters established in the contract.

The plant started service in October 2013, 16 months after construction finished. However, it used only one line of biological treatment out of the six constructed lines (each of them with a capacity of 41,500 m<sup>3</sup>/day). The reason was that the forecasted urban development for New Cairo did not materialise due to political instability, limiting the sewage water inflows to the WWTP.

## 3. Bidding process

In 2006, the government requested funding of \$75,000 for the Public-Private Infrastructure Advisory Facility (PPIAF) to prepare an assessment for the plant. PPIAF recommended the use of a PPP framework to carry out the project.

The procurement method of New Cairo WWTP was an international open tender with a previous prequalification stage. Five consortia presented offers in the bidding process. Of these five, Orasqualia won the tender for the following reasons:

- The technical proposal complied with all the requirements of the Instructions for Bidders and its quality was considered appropriate.
- The consortium presented the lowest-cost financial proposal with an adequate financial structure.

## 4. Internal characteristics of the project

### Finance and funding

The New Cairo plant mobilised private investments totalling approximately \$140 million and the debt related to the project amounted to \$103 million.

### Payment method

Orasqualia issues a quarterly invoice for the wastewater treatment service, the so-called Sewage Treatment Charge ("STC"). The invoice is structured in four different payment parameters:

- 1) Capacity Charge: A fixed payment covering:
  - a. Total investments made in design, construction and start-up of the plant and capital expenditure required during the operations period;
  - b. Debt service costs, including interest payments and any other fees stipulated in the financing agreement;
  - c. Return on equity;
  - d. Insurance premium for the required insurance policies.
- 2) Fixed Operating Charge: A fixed payment covering the operating costs that are not volume related.
- 3) Variable Operating Charge: The charge (per cubic metre (m<sup>3</sup>)) covering variable operating costs per cubic metre of effluent (with the exception of the electricity consumption cost).
- 4) Pass-Through Charge: Reimbursement of the full cost of electricity (up to a maximum electricity consumption proposed in the bid by the awarded consortium).

Any applicable sales tax will also be added.

### Risk assignments

As in any PPP project, a proper assessment of the risk was a critical issue for the success of the service. In the literature, it is often said that the risk should be transferred to the part that best can deal with it.

The following table shows the risk assignments between the private company and the administration.

<b>Table 1. The risk assignments between the private company and the administration</b>	
<b>Risk category</b>	<b>Assignment</b>
Land & space	Administration (NUCA)
Design & Construction	Private firm
Financing	Private firm
Inflation	Administration (NUCA)
Interest rates	Administration (NUCA)
ForEx	Private firm
Credit worthiness	Administration (NUCA)
Operations & Management	Private firm
Maintenance	Private firm
Supply of Utilities	Administration (NUCA)
Demand	Administration (NUCA)
Performance	Private firm
Political	Administration (NUCA)

Source: Salvador, et al. (2016).

### **Governance of the project**

The governance of the project concerns the mechanisms (normally through the contract itself) or the organisations in charge of dealing with the problems that might appear during the PPP's existence. PPP's are normally long-term projects (more than five years, but can reach 30 or 40 years), with very complex contracts, in which many problems can arise during the construction process and also during the operation activities. Therefore, the governance of any PPP is a crucial element to guarantee the correct development of the project.

Two of the main difficulties experienced by the consortium resulted from the absence of a specific PPP law (one was approved one year after the financial closing) and the fact of being the first implemented PPP project handled by the public administration.

The actors involved in the project were:

- **The New Urban Communities Authority (NUCA)**, the contracting authority. NUCA is in charge of defending the public administration's interest. NUCA is part of the Ministry of Housing, Utilities and Urban Development (MHUUD).
- **Orasqualia**, the SPV that was awarded the project which operates the New Cairo WWTP.
- **The PPP Central Unit** is a unit within the Ministry of Finance that is charged by the government with developing PPP practices and taking a vital role in the delivery of the initial projects.
- **Experts** – independent financial expert and independent technical expert.

Beside the specifications of the contract, the governance of the project was guaranteed by two governance committees that supervised the project's functioning and dealt with unexpected situations arising during the contract duration.

- **Partnership Committee:** comprised of senior executives of NUCA and Orasqualia for amicable dispute resolution. Composed of ten

members: five from the NUCA side (NUCA, Construction Authority for Potable Water and Wastewater, MHUUD, PPP Central Unit and the Egyptian Water Regulatory Agency (EWRA)), and five others from the Orasqualia side.

- **Performance Monitoring Committee:** to monitor the performance of the project. Composed of three members: one representative each of NUCA and Orasqualia and one of the experts, depending on the case.

## 5. External characteristics of the project

### Economic conditions

In 2008/09 Egypt weathered the impact of the global financial crisis relatively well due to limited direct exposure to the affected financial products and the country's low levels of financial integration. The reforms adopted since 2004 reduced fiscal and monetary vulnerabilities, leaving some room to manoeuvre on the macroeconomic policy response. The government undertook a package of additional (mainly infrastructure) expenditure to help support economic activity. During the first years of the contract, the exchange rate of the Egyptian currency rose from 5.64 EGP/\$ in 2010, during the bidding for the contract, to 18.14 EGP/\$ in 2017.

### Legal conditions

At the time of signing the contract for the New Cairo wastewater project there was no specific PPP legal framework in Egypt. The existing legislation for public procurement was Tender Law No. 89 adopted in 1998. With the purpose of providing regulatory support, the Egyptian government issued a special law on August 2010, Law No. 67, regulating the Private Sector in Infrastructure Projects and Public Utilities.

### Social conditions

According to the Human Development Index (HDI) published by United Nations Development Programme in 2014, Egypt stands in position number 108. Since 2009 the country has moved down three positions in the HDI ranking<sup>2</sup>.

### Political conditions

The political situation was influenced by social and political instability due to the protests that started on January 25<sup>th</sup> 2011 in Tahrir Square. The protest led to what is known as the Egyptian revolution that ended with President Hosni Mubarak's ousting after almost 30 years in power. On June 30<sup>th</sup> 2012 Mohamed Morsi, the leader of the Freedom and Justice Party, was elected president of Egypt, a position he held until July 3<sup>rd</sup> 2013 when he was succeeded by General Abdel Fattah el-Sisi, who has governed the country until now.

2. <http://hdr.undp.org/en/countries/profiles/EGY>

The PPP basically faced two problems. One was an internal one, related to the construction process, and another was related to the political conditions.

## 6. Problems faced by the PPP

The PPP basically faced two problems. One was an internal one, related to the construction process, and another was related to the political conditions. The problem related to the construction process derived from the construction of the two-kilometre pipe. The issue started when, during the Commissioning Period (from May 2012 onwards), NUCA did not accept the New Cairo WWTP offloading partially or untreated water, despite this being a regular practice during the start-up period (nothing was mentioned in the contract about it). NUCA required Orasqualia to construct a pipe 1300mm in diameter and 2km long to the closest water treatment plant (Hassan Allam WWTP) at its own cost. The problem was solved through an amicable agreement on November 24<sup>th</sup> 2013. In the end, the construction process had cost overruns of only 10% of the initial cost related to the building costs.

The political problem was the one related to the Egyptian revolution that triggered the overthrow of the Egyptian government. The result was that from the signing of the contract (June 2009) to the start of the operation (October 2013) there were three presidents of Egypt (Mubarak, Morsi and Mansour) and four prime ministers (Nazif, Shafik, Sharaf and Qandil). These political movements could have posed a threat to the project, as the different governments could have decided to modify or cancel the project. None of these things happened. The stability of the PPP has to be found in three reasons:

- **The independence of the public officers managing the PPP contract:** the creation of an autonomous Central PPP Unit inside the Ministry of Finance allowed the project to be isolated from the political situation and allowed it to have a stable interlocutor with the contractor.
- **External advisors:** the participation of external and international advisors during the planning of the bidding process allowed a correct bidding process to be defined.
- **Correct selection of private partners:** the selection of multinational companies with complementary competitive advantages, and with deep experience in the construction process and management of water treatment plants. Those partners helped to reach the milestones of the project and also to face the economic difficulties of the contract payments related to the rising exchange rates.

## 7. Impacts of the project

New Cairo has successfully implemented new infrastructure with cutting-edge technology using private financing. This financial framework limited the pressure on public finances during the construction years.<sup>3</sup> That was challenging considering the political situation the country was going through. The administration benefited also from transferring the risk of certain parts of the project to the private operator, as previously stated. Additionally, with the new plant the country reduced the consumption of freshwater by using treated water for farming and green area irrigation.

Society, in a broad sense of the term, benefitted from the project, mainly through an increase in freshwater availability. The reduction in pollutants deposited into the river led to human public health improvement. Moreover, the better quality of water used for farming not only increased the quality

3. The Egyptian government should however add the financial commitments of the project during the whole period in the balance sheet.

of products with direct effects on human health but might have increased agriculture productivity, fostering economic growth in the region. In terms of employment, the plant provided regular jobs for 63 permanent skilled workers directly, 60 of them locals. During the construction period the company hired 1,500 workers and created 150 indirect jobs.

Lastly, there was also a design and construction operation know-how transfer from which local private firms could benefit. Egyptian citizens were additionally able to benefit from cutting edge technology and reliable operations to tackle the environmental and water availability problems without additional cost. The wastewater collection and treatment costs are already covered by the water tariff paid previously without suffering any increase. The side effects resulting from the plant construction were very limited due to the location of the plant outside urban areas.

With the new plant the country reduced the consumption of freshwater by using treated water for farming and green area irrigation.

## 8. Assessments of the project

### Assessments on the PPP methodology

Table 2. Conditions related to the selection and development of the Orasqualia project		
PPP Methodology	New Cairo Wastewater Treatment Plant	
	Existing	Details
<b>1. Procurement method &amp; Bidding process</b>		
1.1. Value for Money analysis or CBA*	No	
1.2. Real Competition for the Contract	Yes	5 Bidders
1.3. Tender evaluation committee	Yes	Internal
<b>2. Contractual issues &amp; incentives</b>		
2.1. Bundling	Yes	DBFOT
2.2. Quality verifiable	Yes	via outflow
2.3. Externalities	Yes	Positives
2.4. Duration		20 years
<b>3. Risk, finance &amp; payments</b>		
3.1. Construction & Operation Risk	Transferred	
3.2. Demand Risk	Not transferred	
3.3. Policy & Macroeconomic Risk	Partially transferred	ForEx
3.4. Payment Mechanism	Usage + Availability	Usage + Availability
3.5. Special Purpose Vehicle (SPV)s	Yes	Aqualia New Europe & Orascom (50%)
<b>4. Governance</b>		
4.1. Transparency	Yes	
4.2. Participatory decision-making process	Not observed	External monitoring during tender and awarding (IFC) and operation (experts)
4.3. International/External monitoring	Partially	
4.4. Legal framework	Not at the beginning	
4.5. Distribution of tasks	Contracting	
	Monitoring compliance	NUCA
	Renegotiation	NUCA
	Regulation	NUCA
	Operation & Quality	NUCA
<b>5. Building process</b>		
5.1. Cost Overrun	Yes	Pipe construction to nearest WWTP
5.2. Delayed deadlines	Not observed	
<b>6. Potential Benefits</b>		
6.1. Possible Price Certainty	Yes	Unquantified
6.2. Transfer of responsibilities to privates	Yes	
6.3. Scope & Incentives for innovation	Yes	
6.4. Savings in public payments	Yes	
6.5. Life-cycle approach	Yes	
6.6. Incentive to be on time	Yes	

(\*) Cost-Benefit Analysis.

Source: Salvador, et al. (2016).

Beside the summary of conditions related to the project transcribed in the previous table, New Cairo WWTP is a very interesting PPP that shows the importance of adaptation of governance to a very unstable political context.

Three features of a good PPP are clearly present in the project:

- Competitive bidding;
- Bundling of construction with operation;
- Importing efficiency through an experienced multinational enterprise in alliance with a local operator. This has benefits not only for efficiency in general but also for public finances.

According to the book by Engel et al. (2014), the public finance gains of a PPP do not come from the fact that private funds are initially invested (they have to be recouped later on), but from the fact that an efficient private operator can build and operate the project with lower costs, which reduces the tolls or public funds that are needed to cover them.

The governance of the project is not first-best, but the best possible given political circumstances. In a first-best governance model, we would have primary legislation protecting investors and introducing transparency before undertaking the project. And we would have a clear separation of powers between the contracting unit (NUCA) and supervising units. But in a second-best world, it seems hardly inevitable in a very volatile political context that the contractor would find protection for their investment in an “amicable” relationship with the contracting unit. Similarly, if the legislation protecting investment returns had been approved prior to the project’s start, perhaps the changes in regime would have quickly overturned that legislation. Passing the law “on the march”, the benefits of the project might have helped to secure the approval and stability of this legislation. From a theoretical point of view, when a complete written contract is not feasible, a more “relational contract” is inevitable and desirable if the project has a positive social value.

Risk sharing seems reasonable: many risks are borne by the operator, but demand and political risk are covered by the public sector, because there is nothing that the contractor could do to manage these risks. Possible improvement could be made with the introduction of international arbitration.

Finally, it has been observed that there was no cost-benefit analysis before the competitive bidding, which is necessary to make an objective and transparent assessment of the need for the project and the advantages of a PPP compared to traditional provision.

### **Assessments on achieving the UN SDGs**

The New Cairo WWTP was also aligned with the following Sustainable Development Goals (SDGs) of the United Nations (UN), as can be seen below:



Table 3. United Nations Sustainable Development Goals		
Sustainable Development Goals	High Impact	Moderate Impact
1. No Poverty		✓
2. Zero hunger		✓
3. Good Health & Well-being	✓	
4. Quality Education		
5. Gender Equality		
6. Clean water & Sanitation	✓	
7. Affordable & Clean Energy		
8. Decent work & Economic growth		✓
9. Industry, Innovation & Infrastructure		✓
10. Reduced inequalities		✓
11. Sustainable cities & communities		✓
12. Responsible consumption & production		
13. Climate action	✓	
14. Life below water	✓	
15. Life on land	✓	
16. Peace, Justice & Strong Institutions		
17. Partnership for the Goals	✓	

Source: Salvador, et al. (2016).

Of all the UN SDGs, numbers 3, 6, 14 and 17 look to be the ones with closest links to the New Cairo WWTP. As infrastructure aimed at ensuring the availability of freshwater and improvement of sanitation systems, it is possible to affirm that the New Cairo WWTP is aligned with the goal of clean water and sanitation.

When looked at in detail, the New Cairo WWTP can help achieve most of the different targets of Goal 6 (Clean water and sanitation). WWTP helps reach an adequate and equitable sanitation and hygiene system for all the citizens and improves water quality by reducing disposal of untreated wastewater into the river. Finally, WWTP seriously reduces the volume of polluted water disposed of.

Other UN SDGs can be reached, such as Goal 3 (Good health and well-being). In that sense mortality and diseases can be reduced as the water outflow after treatment in the New Cairo WWTP is of much better quality than that dumped into the River Nile before the existence of the infrastructure. Goals 13, 14 and 15 (Climate action and Life below water and on land), seem to benefit from the WWTP, as dumping less polluted water into the River Nile has direct consequences on the environment and the protection of ecosystems. Finally, among the attainable goals is Goal 17, because of the framework under which the infrastructure was designed, built and is operated, that is, through a PPP. A detailed look at some targets of Goal 17 show that the financial instruments used in this PPP helped to achieve the specific targets derived from this Goal.

Besides Goals 6, 3, 13, 14, 15 and 17, other UN SDGs are also impacted by this PPP, although in a weaker way. These are the cases of Goals 1 (No poverty), 2 (Zero hunger), 8 (Decent work and economic growth), 9 (Industry, innovation and infrastructure) 10 (Reduced inequality) and 11 (Sustainable cities and communities), which are partially achievable thanks to the WWT.

In summary, the New Cairo WWTP is a powerful tool for achieving some of the UN SDGs, especially the ones related to environment and economy, thanks to the increase in productivity expected in agricultural activities and the regular jobs created to build and operate the infrastructure.<sup>4</sup>

### Assessments of city development

To consider the impact of the project on city development we use the ten dimensions of the IESE Cities in Motion model and evaluate the impact of the project in each of these dimensions:

Table 4. Cities in Motion		
Smart City Evaluation	New Cairo Wastewater Treatment Plant	
	High Impact	Moderate Impact
1. Human capital	✓	
2. Social cohesion		✓
3. Economy	✓	
4. Public management		✓
5. Governance		✓
6. Mobility and transportation		
7. Environment	✓	
8. Urban planning	✓	
9. International impact		
10. Technology		✓

Source: Salvador, et al. (2016).

As can be seen in the table, the project will have a high impact on the human capital dimension. The project will create many jobs (1,500 direct, 150 indirect) during the construction period, jobs that will last for 2 years and will help develop the talent pool in the region. The number of jobs during the total life-cycle of the project would be much smaller but still significant, as they will be long-term jobs.

The project will help decrease inequalities in the region, which has a positive effect on social cohesion. In contrast, greater impact on the economy is expected. Such impact comes from different factors. First the transfer of cutting edge technology that increases the quality of the talent pool in Cairo; second it increases the efficiency in the treatment of water, provides more drinking water and decreases prices while improving the overall environment and in particular the fishing opportunities. All those factors may help attract new business, increase the efficiency of established ones and generate new business opportunities.

Two dimensions where highly impacted – environment and urban planning. The environmental impact was set out in the evaluation of the UN Sustainable Development Goals section and is the key reason for the whole project. There is great impact on urban planning as the project forces city officials to think long term in the infrastructure development of the city.

4. Not necessarily net jobs.

Finally, it can be considered to have a moderate impact on public management because of the increases in efficiency of the provision of a public service such as water, drinking and non-drinking water. However, the impact on governance will be much greater. The success of such complex projects in which governance issues are very important are significant learning experiences. Public and private partners should collaborate, develop a legal environment and a trusting context to make this feasible and the relations established and the trust developed are a key capability for facing similar projects in the future.

## 9. Conclusions

The case of the New Cairo Wastewater Treatment Plant is a very interesting PPP project as it brings qualitative and quantitative information on good practices on PPP to implement in future collaborations between public and private partners.

A first interesting element is the very fact that this project is the first successful PPP project in Egypt; and related to this, is the manner in which the legislation was adapted. The new Egyptian law on PPP was adopted by learning from the New Cairo projects. Several conditions help to explain why this PPP was successful, despite being the first PPP finished in Egypt, with only a delay of two months and a cost overrun of 10%:

- the participation of external and international advisors during the planning of the bidding process, to help to define a correct bidding process;
- the creation of an autonomous Central PPP Unit inside the Ministry of Finance, allowing the project to be isolated from the political situation;
- the selection of multinationals with competitive advantages that are complementary, and that have deep experience in the construction process and management of water treatment plants.

The creation of an autonomous Central PPP Unit inside the Ministry of Finance allowed the project to be isolated from the political situation and allowed it to have a stable interlocutor with the contractor.

**Table 5. Characteristics of the PPP contract**

<b>Project type:</b> Greenfield large-scale urban wastewater treatment plant.
<b>Project capacity:</b> Average daily flow 250,000 m <sup>3</sup> /day
<b>Delivery Mode:</b> Design - Build - Finance - Operate - Transfer (DBFOT)
<b>Private investment<sup>4</sup>:</b> \$140 million
<b>PPP contract value<sup>5</sup>:</b> \$482 million for 20-year concession
<b>Final cost:</b> No change compared to the bid price
<b>Expressions of interest request:</b> October 2007
<b>Bidding invitations:</b> December 1st 2008
<b>Final tender documents published:</b> February 15th 2009
<b>Bid submission deadline:</b> March 31st 2009
<b>Contract start:</b> June 29th, 2009 (financial closure: February 3rd 2010)
<b>Contract end:</b> June 28th 2029
<b>Payment method:</b> Payment based on a Sewage Treatment Charge, including a fixed payment plus variable operating charge based on volume of treated sewage (m <sup>3</sup> )
<b>Duration:</b> 20 years (construction 2 years and operation 18 years)
<b>Contracting Authorities:</b> New Urban Communities Authority (NUCA)

Source: Salvador, et al. (2016).

5. Investment for the infrastructure construction.
6. Total cost of the New Cairo WWTP including operation costs over 20-year period.

Bringing all stakeholders into the project is crucial for the development of successful public-private collaborations.

As a result, the project had several outcomes that benefit Egyptian society. The PPP guaranteed revenues for the public authorities, 63 permanent jobs were created, and experience from the building process was acquired by the 1,500 workers involved. Public health and the environment were clearly improved. Overall, the outcomes seen show that this PPP project helped to reach some of the United Nations Sustainable Development Goals.

### Beyond the Cairo case

Studying the PPP for the New Cairo wastewater treatment plant, but also several other PPP cases, has permitted us to observe that to achieve successful PPPs, they have to fulfil the following conditions:

- 1) **Value creation.** As with any public policy, a detailed analysis should be done by policymakers before the implementation of a PPP. Local authorities should put forward a cost-benefit analysis in order to see whether the project is worth doing. Also, in some cases, a value-for-money analysis can bring insight to local authorities to understand if the specific public-private arrangement chosen does indeed serve as the best model for the delivery of the public service.
- 2) **Governance and transparency.** PPPs require special attention to governance issues (tailored to local circumstances) and stakeholder engagement so that they can be part of a shared vision, as developed previously in the document. Transparency, openness and engagement between stakeholders are necessary conditions for a public-private collaboration to succeed. Additionally, governments should foster the creation of independent institutions that monitor all the collaboration process. This includes the tender process and the implementation of the project. In this way, an independent institution can ensure that the project will have as a goal to provide benefits for citizens, and not only private firms, governments or public officials.
- 3) **Innovation and contract flexibility.** Innovation is key to fostering a more efficient supply of public services. As we set out previously in the document, one of the key benefits collaboration brings is the know-how and innovation of the private sector that allow services to be supplied more efficiently. In order to obtain the maximum advantage from innovation, it is necessary to give contracts the necessary flexibility for the concessionaire to innovate. Otherwise the incentives for a better provision of the service will be driven out. For this, contracts should focus on (1) outcomes rather than a detailed definition of inputs, and (2) services rather than assets for the firm to innovate.
- 4) **Externalities and agglomeration effects.** The positive externalities that a public-private collaboration can cause can be spread widely among all agents involved. In this sense, authorities should investigate how implementing specific projects can have deeper and more complex effects in the economy when developing analyses of the benefits and costs of the project. However, sometimes infrastructure can also generate negative externalities. Governments should be aware of them and try to mitigate them.
- 5) **Participation.** Bringing all stakeholders into the project is crucial for the development of successful public-private collaborations.

Local authorities can benefit from the expertise of the private sector, as well as the knowledge of citizens' needs that citizens and communities have.

- 6) **Payment systems and new business models.** Especially in the urban context, local authorities should also evaluate the possibility of using new payment systems that go beyond subsidies and user fees when developing projects (using other systems such as advertising income or capturing land value surplus from infrastructure construction). Due to high population densities, city-based projects may allow local authorities to generate income from vending machines or restaurants in public facilities, as well as from solar panels, the energy from which can easily be sold due to economies of scale, for example.
- 7) **Data management.** The constant interaction and use of public and private services by individuals in urban areas creates a massive amount of information that can be of use both to the public and private sectors. The rise of the so-called big-data revolution can give insights to both public and private actors about citizens' behaviour, as well as about how to provide services in a more cost-efficient and effective way. Local governments should try, whenever possible, to foster private actors' access to public data in order to allow them to create new uses that can allow services to improve.

Together these conditions allow successful collaborations to be built. Indeed, even though choosing the right type of public-private collaboration is a crucial step in the process of improving services and fostering successful collaborations, making sure every collaboration satisfies a number of conditions will be crucial for collaboration to bring benefits to society at large.

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