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**The role of Public-Private Partnerships (PPPs) in the
global energy investments framework: A focus on the
experience of the MENA region countries**

Dimitrios Soumalevris

Supervisor:

Dr Anastasios Gourgourinis

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Abstract

The outbreak of Covid-19 pandemic, the Russian invasion into Ukraine, and the subsequent energy crisis, that skyrocketed fossil fuel prices has come up to add upon environmental challenges regarding human footprint on our planet and raising pleas to accelerate energy transition towards a more sustainable future growth model. Investments in adding power generation capacity from renewable sources, in expanding and modernizing transmission and distribution networks, and in promoting energy efficiency emerge as the only credible answer to these concerns. Developing countries face additional challenges in financing such capital-intensive projects due to less mature (financial) institutions and markets. Furthermore, and in particular regarding MENA region countries, energy demand is expected to continue to grow due to specific social and economic reasons.

PPPs are proposed to constitute a valuable and credible instrument for energy projects financing. They are characterized by long-term duration, the involvement of the private partner in the entire life cycle of the project, and risk allocation between public and private actors. The cases of the two most successful MENA countries – in terms of PPP investments - are an indicative example on how a set of specific policy, economic and regulatory factors directly correlate to attracting private funds into investing to the transition to a more secure, modern and environmentally-friendly energy paradigm, in which private and public actors harmoniously cooperate and actively support realization of green energy projects.

Keywords: Public Private Partnership, Private Participation in Infrastructure, Investment, Middle East and North Africa, Developing Countries, Economic Framework, Institutional Framework, Multilateral Institutions, Institutional Investors, Renewable Energy Sources

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List of Abbreviations

ACWA Saudi International Company for Water and Power Projects

CBO Community Based Organization

CCUS Carbon Capture Utilization & Storage

CSP Concentrated Solar Power

CTF Clean Technology Fund

EIB European Investment Bank

EMDEs Emerging Markets and Developing Economies

EU European Union

EV Electric Vehicle

FID Final Investment Decision

GDP Gross Domestic Product

GHG Green-House gas

IBRD International Bank for Reconstruction and Development

IEA International Energy Agency

IEG World Bank Independent Evaluation Group

IPP Independent Power Producer

IT Information Technology

KWH Kilowatt-hours

LCOE Levelized Cost Of Electricity

MB/D Million Barrels per Day

MDB Multilateral Development Bank

MENA Middle East and North Africa

MIGA Multilateral Investment Guarantee Agency

NECP National Energy and Climate Plan

NES National Energy Strategy

NGO Non-Governmental Organization

NHS National Health Service

NOC National Oil Company

PFI Private Finance Initiative
PPA Power Purchase Agreement
PPI Private Participation in Infrastructure
PPIAF Public-Private Infrastructure Advisory Facility
PPP Public-Private-Partnership
R&D Research and Development
RES Renewable Energy Source
SDG Sustainable Development Goals
SEM South East Mediterranean SOE State-Owned enterprises
SPV Special Purpose Vehicle
SUV Sports Utility Vehicle
TSO Transmission System Operator
UK United Kingdom
UN United Nations
VfM Value for Money
WGI Worldwide Governance Indicators

Introduction

The global energy framework has fundamentally and irrevocably altered during the last three years; the outbreak of Covid-19 pandemic, the Russian invasion into Ukraine, and the subsequent energy crisis, that skyrocketed fossil fuel prices has come up to add upon environmental challenges regarding human footprint on our planet and raising pleas to accelerate energy transition towards a more sustainable future growth model. Energy has been at the epicenter of analyses, debates and confrontations, as the era of harmonious energy cooperation seems to have expired and conflicting geopolitical pursuits and strategies appear to compete against valid environmental concerns.

Earlier during this period, energy demand and subsequently fuel prices plummeted due to restrictions imposed as an antidote to high contagiousness and mortality rates of the Covid-19 virus; however, recent events pushed the pendulum to the opposite side and distressing concerns regarding not only affordability of energy sources, but also accessibility and security of supply, were brought to surface. Investments in adding power generation capacity from renewable sources, in expanding and modernizing transmission and distribution networks, and in promoting energy efficiency emerge as the only credible answer to these concerns. Realizing such ambitious targets requires tremendous funds, that public budgets seem unable to provide for, after a long period of expansive monetary policies.

Developing countries face additional challenges in financing such capital-intensive projects due to less mature (financial) institutions and markets. Furthermore, and in particular regarding MENA region countries, energy demand, and consequently supply is expected to increase rapidly due to bottom-heavy population pyramid, growing GDP rates, and rapid urbanization. It has been suggested that in total 313 GW¹ of new power generation capacity will be added to the system in SEM countries by 2040, and the World Bank² in 2010 estimated that SEM region needs investments that will amount to up to €27 billion a year (US\$ 30 billion) by 2040 in strategies and policies, such as minimizing subsidies in fossil fuel consumption, advancing environmental protection, adding generation capacity and promoting intra-regional cross-border energy trade. In this framework, despite that state-level energy policies are still dominant in the energy sector, it is highly doubtful that developing countries, such as MENA ones, will be able to deliver investment of this variety and size only via public budget.

¹ Observatoire Méditerranéen de l'Énergie, 'Mediterranean Energy Perspective' 2015, Paris: OME, Retrieved from <https://www.ome.org/mep-2015-2/>

² These reference figures are highly cited. It comes from a background document accessible via the following link: <http://go.worldbank.org/88TPPX6OF0> (the entire document is not accessible anymore).

Public-Private Partnerships are proposed to constitute a valuable and credible instrument for energy projects financing, as they enable local governments to overcome possible public budget stringencies and make it possible for the development of innovative and complex energy infrastructure projects. PPP agreements are characterized by long-term duration, the involvement of the private partner in the funding, as well as in the designing, constructing and operating of the project, and risk allocation between public and private actors, which facilitates the commitment of the former, and at the same time the attractiveness of investment for the latter.

Furthermore, the fact that developing of energy projects is considered an illiquid and longer-term investment choice in comparison to other types of investment strategies, supports the argument that private equity and venture capital funds are not optimal to provide for the needed funds, whereas institutional investors are suggested that they could play a far more active role in financially supporting such projects³. In their effort to fund energy projects, predominantly in developing countries, investors could significantly be facilitated by multilateral institutions, the operational assistance of which can actively mitigate the negative ramifications of potential institutional deficiencies, while providing for competent credit enhancement and risk-reducing mechanisms.

Finally, it has been mentioned that all possible factors, which can directly influence the level and the magnitude of private participation in funding major infrastructure assets can be grouped in three main categories and can be related to host governments' strategies, private investors' incentives and overall macroeconomic environment⁴. The cases of the two most successful MENA countries are an indicative example on how these factors directly correlate to attracting private funds into investing to the transition to a more secure, modern and environmentally-friendly energy paradigm, in which private and public actors harmoniously cooperate and actively support realization of green energy projects.

The objective of this thesis is to examine the role of PPPs in the global energy framework, to investigate all potential risks and opportunities regarding funding of energy projects, which present a plethora of unique characteristics, and to draw useful conclusions on how private funds would be attracted in constructing new or modernizing already existing infrastructural assets, with a special focus on the experience of developing countries. In the following chapter, the contemporary trends regarding global energy investments, as they have been recorded in the most recent publicly available -during the time of writing- World Energy Investment report delivered by IEA, are presented per sector. In the second chapter, the thesis examines different definitions of the notion PPP and the history of cooperation between public

³ Isabella Alloisio and Carlo Carraro, 'Public-Private Partnerships For Energy Infrastructure: A Focus On The MENA Region' in Stephano Caselli, Guido Corbetta and Veronica Vecchi, (eds), *Public Private Partnerships for Infrastructure and Business Development* (2015).

⁴ Tewodaj Mengistu, 'Emerging Infrastructure Financing Mechanism in Sub-Saharan Africa' (2013), Pardee RAND Graduate School, Santa Monica: RAND Corporation.

and private actors, as well as the importance of infrastructure in the economic growth and the welfare of a state. In the third chapter, advantages and disadvantages of PPP procurement method are thoroughly explained in order for the reader to gain useful insights regarding this unfamiliar type of public contracting. In the fourth chapter, the thesis exhaustively presents all possible risks, that could arise from negotiating to implementing PPP agreements, and provides for meaningful hints as to which of the parties involved is anticipated to bear each risk. In the fifth chapter, the special characteristics of long-term investments are designated in terms of possible liquidity constraints, as well as the role of institutional investors and multilateral institutions in financing energy projects in developing countries that face a plethora of challenges, is carefully studied. Furthermore, in the same chapter a statistical study, based on data retrieved from the World Bank PPI project database, regarding private participation in energy projects both at a global scale and at MENA region specifically, is conducted and valuable conclusions are suggested; in this framework, the different regulatory strategies followed by the two most successful MENA countries, as well as two mega energy projects developed in these countries are presented and compared in order to rightfully comprehend the reasons behind their success. Finally, in the final chapter, some concluding remarks are suggested, as well as thesis' limitations and avenues for future research are proposed.

In order to achieve these goals, the methodology used is linguistic, systematic, historic, statistical, comparative and inductive. The linguistic method is used in order to comprehend the different aspects of PPP agreements regarding possible advantages and disadvantages comparing to traditional public procurement method, as well as all the possible risks, which may deter both public and private actor from actively involving in such contracts. The systematic method is utilized to draw the correlation between possible risks on the one hand, and governmental policy strategies and the involvement of particular investors and institutions on the other. The historical method sheds useful light onto the evolution of cooperation between public authorities and private sector companies. The statistical analysis presents both the most recent data regarding global energy investments, and an in-depth overview of private participation in energy projects in developing countries. The comparative approach pinpoints to the different policy initiatives followed by the two MENA countries, which have been able to attract considerable private investments in their energy sectors. Finally, inductive method is used to draw valuable conclusions and provide for practical insights as regards the potential role of PPPs in the future energy global framework.

Chapter 1: Recent Trends in Global Energy Investments

Introduction

The past two years have been a period during which, modern civilization faced serious and prolonged turbulences mostly due to the outbreak of the Covid-19 pandemic; the kind of turbulences that the global community hasn't addressed since World War II. The unprecedented rates of contagiousness and fatality of the new virus forced governments around the world to take immediate measures that profoundly altered human's life in numerous ways, i.e., socially, economically, professionally, etc. Thus, it is only logical that investments both by private firms and the public sector in the energy sector at a global level were severely impacted by this new reality.

Global energy investment, 2017-2021

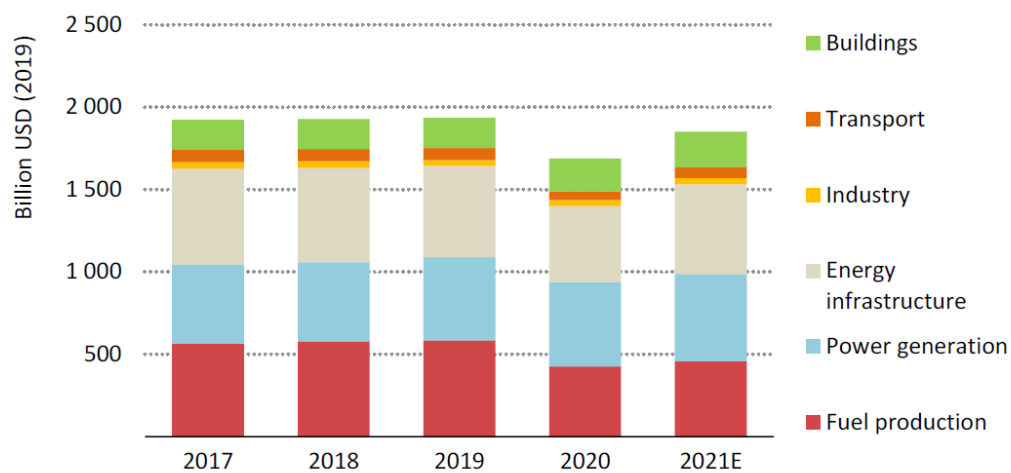


Figure 1: Global Energy Investment, 2017-2021

source: IEA 'World Energy Investment 2021' Report

It is worth mentioning that according to the most recent published report⁵ prepared by IEA, global energy investments in 2021 are expected to have rebounded by 10% comparing to 2020, reaching USD 1.9 trillion, after a year when they had plummeted due to restrictions and uncertainties posed by the outbreak of the pandemic. The stigma of the consequences caused by the spread of the new virus is vividly illustrated by the fact that in 2020, the year of the first outbreak of the pandemic, global energy demand fell by 4%, whereas in 2021 when effective vaccines were successfully developed and a large part of the population across the (mostly economically advanced) countries have been vaccinated, the same figure is expected to have risen by 4.6%, thus offsetting previous year's contraction.

Furthermore, the expected boost in energy investments is considered to have been actively supported by expansive monetary policies followed by central banks and

⁵ IEA, 'World Energy Investment 2021' (2021), IEA, Paris, Retrieved from <https://www.iea.org/reports/world-energy-investment-2021>

governmental authorities, as well as by considerable increase of public spending mainly in the sectors of infrastructure, clean energy and digital economy aiming to boost consumers' income and to secure jobs. Additionally, as the number of states committed to sustainable climate targets of reducing GHG emissions or even net-zero emissions targets steadily grows globally, it is noticed that capital flows are systematically redirected towards cleaner technologies.

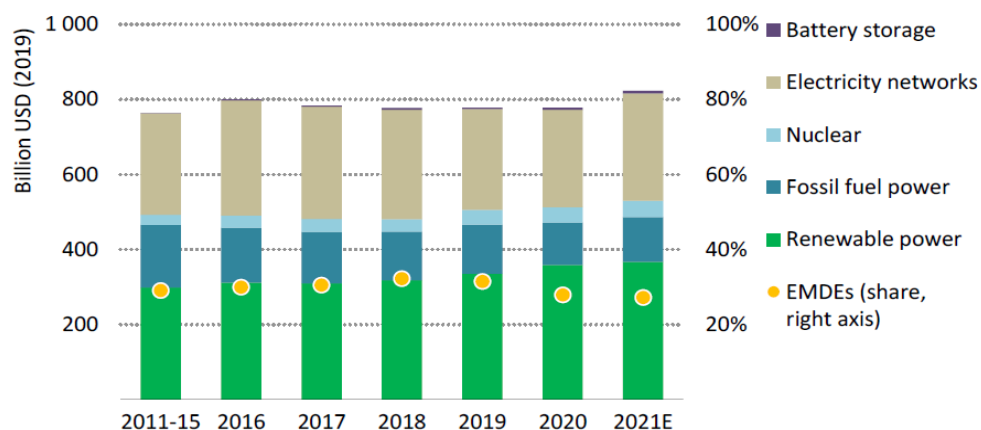
On the other hand, the reappearance of inflation in most developed countries in the final quarter of 2021 and more recently the Russian invasion into Ukraine that drove most fossil fuels' prices to historically high levels have casted credible doubts regarding growth rates resilience of the advanced economies mainly due to significantly elevated cost of energy and energy-related products. It is strongly argued that high inflation rates and increased prices of energy might severely impact investors' willingness to actively be involved in funding projects in the energy sector until a clear picture is formed, while numerous state governments face significant budgetary constraints mainly due to large supportive packages issued during the pandemic period and the recent rise of interest rates of state bonds.

Ultimately, the purpose of this chapter is to present the contemporary trends regarding global energy investments, as they have been recorded in the most recent publicly available -during the time of writing- World Energy Investment report delivered by IEA. It is author's legitimate belief that PPP's value can only be understood under the prism of the global energy investments framework. Besides, PPPs should be viewed only as one of a plethora of financial tools to fulfill global energy investment needs. Thus, the following paragraphs are focused on four major and separate sectors of energy investment, namely, electricity, fuel supply, energy end-use and efficiency, and finally R&D and technology innovation, in which different schemes of PPP procurement method can rightfully have an active role.

Electricity

Overview

Global investment in the power sector by technology, 2011-2021E



IEA. All rights reserved.

Note: EMDEs = Emerging Market and Developing Economies, excluding China.

Figure 2: Global Investment in the Power Sector by Technology, 2011-2021E
source: IEA, 'World Energy Investment 2021' Report

Modern civilization is heavily dependent on a uninterrupted and reliable supply of electricity; that is absolutely necessary not only for everyday living but also for every single business activity. Furthermore, as the number of states worldwide, that commit themselves into a sustainable future, grows, inevitably the importance of electricity as source of power in a net-zero-emissions scenario is bolstered as well. Thus, it makes no surprise that during 2020, a year that was stigmatized by the outbreak of Covid-19, investments in the power sector weren't affected as much as other energy sectors; simultaneously in 2021 relevant investments are expected to have risen by around 5% comparing to the previous year.

Generally, it was noticed that while investments in electricity grids and power generation from fossil fuels have dropped, investments in renewable sources have showed remarkable resilience mainly due to transition policies implemented by national governments attempting to promote their clean energy agendas. Geographically, United States and China have remained leaders in this sector receiving almost half of global power sector investment; Europe also showed resiliency in investments regarding electric power system during the outbreak of the virus, while in 2021 it is expected that relevant investments have continued to grow as a result of strong support through EU Green Recovery package. On the other side, the picture in EMDEs (excluding China) is eminently different; it has been noticed that in these countries in 2020 power sector investments dropped by 10% comparing to the previous year. It is worth mentioning that the importance of EMDEs is profound, as they account for nearly two-thirds of the global population but for less than one-third of power sector spending. EMDEs while facing market uncertainty, lockdowns and reduced state revenues due to Covid-19 restrictions, are supposed to enter into multi-billion worth of investments in order to meet sustainable development goals.

Finally, it must be mentioned that the recent Russian invasion into Ukraine has irrevocably changed the balance in the EU energy market; European power generation scheme is heavily dependent on Russian natural gas exports. Due to restrictions imposed against major Russian energy companies – among others – prices of natural gas and consequently electricity have skyrocketed, driving EU member states to re-evaluate their national energy mixture and forcing them to take immediate measures in an attempt to ensure the supply of secure, reliable and affordable electricity; in this framework, it is extremely interesting to see how the European investments in the power sector will be affected by these recent events in the foreseeable future.

Investment in solar PV and wind power and its expected generation output, 2010-2020

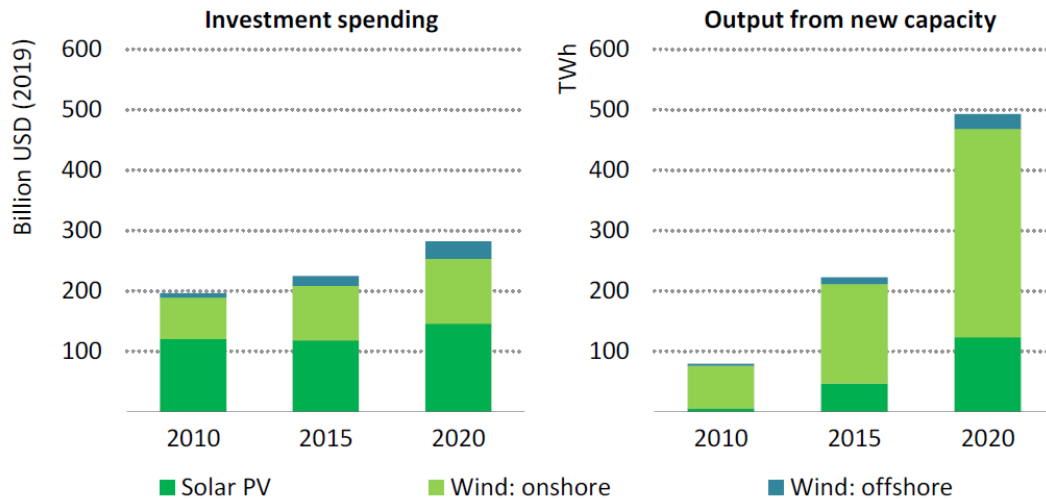


Figure 3: Investment in Solar PV and Wind Power and its Expected Generation Output, 2010-2020

source: IEA, 'World Energy Investment 2021' Report

New power generation capacity was mainly funded via investments in renewables even in 2020, when these investments showed remarkable resiliency in a global economic environment, which was far from ideal. It is worth mentioning that in total power sector spending (including network infrastructure), renewables held the lion's share of above 45%, while at the same year capital expenditures for renewables increased by around 7%, despite the fact that capital costs continued to come down, as relevant technologies become more and more mature and thus cost-efficient. It is even argued that a dollar spent on wind and solar PV deployment in 2020 is associated with four times more output than a dollar spent on the same technologies ten years earlier⁶.

At the forefront of new renewable deployment in 2020 was wind power installation; it has to be mentioned that wind capacity almost doubled in a single year reaching a new record-breaking high of 114 GW in one year, while solar PV also expanded by almost a quarter reaching 135 GW. Power investment leader has undisputably been China, which commissioned in one year 70 GW of new wind power capacity, followed in second place by the United States. On the other hand, most EMDEs faced significant reductions in renewable investments with few bright exceptions, most notably Vietnam, in which distributed PV investments continued on an upward trend in 2020, with over 9 GW of rooftop solar installed.

The positive trends regarding renewable energy investments are expected to have continued throughout 2021 consolidating the record growth of 2020, albeit at a slightly slower rate. The importance of renewables will continue to surge, due to three main

⁶ IEA (n 5).

factors: more players, i.e. states and companies around the globe commit themselves into net-zero pledges and into more sustainable development plans. Secondly, major renewable technologies have come up to a maturity stage, where capital expenditures, that were previously a major disadvantage comparing to common power generation sources, have diminished over the years; finally, additional funds are now channeled towards this kind of investments due to expansive monetary policy and positive sentiment towards low-carbon assets. In 2021 renewables spending is expected to mainly have been driven by investments in solar PV -rather than wind- as commissioning of new utility-scale solar PV projects is going to be closely followed by a rise in investments in distributed solar PV.

Although renewable power generation prospects are expected to continue to follow positive trends - mainly in advanced economies-, the cases of delays or even annullments of needed permits and licences regarding predominantly on-shore wind farms might cast doubts in the development of the relevant sector. In Europe in particular, where permits take long to obtain and decisions are at times challenged in court, there are fears that a bottleneck may occur⁷. The same considerations could rise regarding EMDEs, which additionally face land- and grid-related issues. On the other hand, off-shore wind farm projects are viewed as better insulated against these constraints and are expected to grow in a steadily positive rate given rising policy support in Europe and around the world.

Nuclear power representing 5% of total global investment showed remarkable resiliency during 2020 mainly due to the fact major economies such as Russia, China and India continued to heavily rely on it for inexpensively meeting their energy demand. Most notably, China in order to meet its 2060 target for carbon neutrality have expressed its intention to build more nuclear power plants in the near future to cover its growing energy needs.

Investments in fossil-fuel power generation was severely hampered during the year of outbreak of Covid-19, as they dropped by more than 10% given lower demand and electricity prices. This pattern wasn't uniform across all countries and regions; this trend was mainly driven by the situation in China and India, two countries which in the last decades have been the leaders regarding investments in coal-fired power plants, which were now put on reserve due to lower energy demand and subsequently lower electricity prices. This trend might mislead someone into thinking that coal is irrevocably phased-out even by countries that have not until now shared and engaged into following a sustainable future vision; this couldn't be further from the truth. Only in 2020 FIDs for coal-fired power plants reached 20 GW, largely due to the fact that China added 13 GW of coal-fired capacity -a 45% increase comparing to 2019- while Cambodia, Indonesia and Pakistan approved almost 5 GW in total in coal-fired FIDs.

⁷ Wind Europe, 'Wind Europe' (2021), Retrieved from: [Wind is not growing fast enough for EU economy to go climate-neutral: windeurope.org/newsroom/press-releases/wind-is-notgrowing-fast-enough-for-eu-economy-to-go-climate-neutral/](https://windeurope.org/newsroom/press-releases/wind-is-not-growing-fast-enough-for-eu-economy-to-go-climate-neutral/)

Nevertheless, it has to be mentioned that despite this temporary increase, coal-fired FIDs are now 80% below where they were five years ago, while China's FIDs in 2020 were a quarter of where they were in 2010, India's less than 5%.

Grids & Storage

Investments in energy grids followed a negative path for the fourth consecutive year in 2020, mainly due to under-investment trends in China where, after power grid expansion goals in rural districts having been met, focus shifted towards transmission, which represents a smaller share of grid investments and in other EMDEs, which overshadowed relevant positive investment trends in Europe and United States. In 2021 investments on power grids is expected to have been boosted mainly attributed to the support provided for by different recovery plans in advanced economies and China's plans to refocus on expanding and strengthening its grids. It comes as no surprise that network investments are contingent on a fostering policy and regulatory framework that would actively incentivise connections to the grids, as more renewable projects enter into each state's power production mixture, simplify authorisation procedures and speed up response times.

Given the severity of the pandemic, investments in battery storage surprisingly surged during 2020 by almost 40%, reaching a total of USD 5 billion. Battery storage is divided into grid-scale batteries and behind-the-meter storage, each of which presented different trends, opportunities and difficulties. Major grid-scale batteries investments showed a considerable increase by 60%, while average costs continue to follow a downward slope reducing by an average of 20% due to the development of the relevant technology. Reduced cost alongside growing penetration of renewables, which are characterised by intermittency, and auctioning of hybrid projects -i.e. power generation from renewables or reduced-carbon-emissions sources together with storage capacity- spurred the interest in investing in large grid-scale battery storage capacity. Behind-the-meter storage which is mainly financed by households and small and medium companies followed a negative path reducing by 12% in 2020, as it was affected by the ramifications of the Covid-19 outbreak.

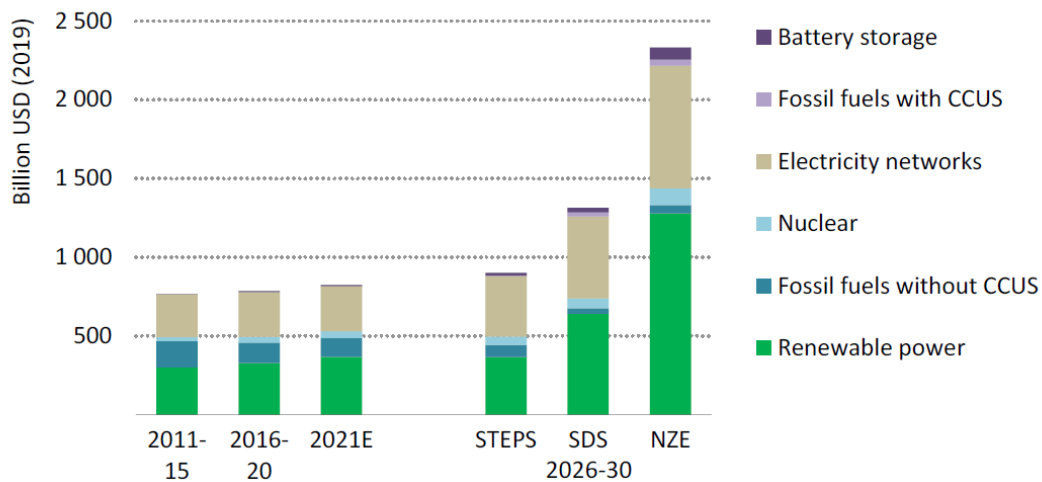
Global investment in the electricity sector compared with annual average investment needs, 2025-2030, by scenario


Figure 4: Global investment in the electricity sector compared with annual average investment needs, 2025-2030, by scenario

source: IEA, 'World Energy Investment 2021' Report⁸

The fact that investments in electricity sector showed noteworthy resiliency during the darkest hours regarding sanitary conditions since 1918 and the Spanish Flu pandemic, is certainly a positive sign and is encouraging for the anticipated trends in 2021, although not without shortcomings. The entire world is supposed to be committed into achieving specific targets regarding sustainable development, lowering GHG emissions and limiting rise of earth's temperature by 1.5° C by 2050. For these targets to be fulfilled, a long distance has to be travelled regarding additional investments in cleaner power producing sources. In advanced economies and the China it is strongly argued that more competitive interest rates and institutional focus on clean energy investment opportunities would make available the necessary funds to be channeled towards that sustainable targets, alongside accommodating regulatory frameworks that would loosen administrative and permitting constraints and would foster investment in robust energy grids and storage facilities; on the other hand, the picture in the rest of EMDEs is a source of much more concern. These countries are facing the ramifications of the Covid-19 pandemic, which heavily impacted their state budgets and thus their investment plans, while simultaneously their power generation and network infrastructure often lags behind and sources of finance are more constrained.

⁸ The terms: STEPS refer to Stated Policies Scenario, SDS refer to Sustainable Development Scenario, and NZE refer to Net Zero Emissions by 2050.

Fuel Supply

Overview

Fossil fuels have been the backbone of the contemporary energy system since the Industrial Revolution and have undisputably contributed to the elevation of the living standards for the most part of the world's population. However, fossil fuel companies are now facing significant constraints as they are pressurized to deliver solutions regarding climate change mitigation measures. Additionally, it has been argued that 2020 has been a year that can only be compared with 1970's regarding fossil fuels global market, when the two severe oil crises occurred. Contrary to what happened back in 1970's, in 2020 oil prices dropped at record-breaking levels, reaching even negative prices, due to a steep fall in demand as a result of restrictions imposed on the outbreak of Covid-19 pandemic. Total fuel supply investment shrank in 2020 by more than 25% reaching just over USD 620 billion. It is expected that in 2021, when most restrictions were lifted, fuel supply investment will have rebounded by about 14% reaching USD 710 billion. Finally, it must not be overlooked that 2022 has been stigmatized by the Russian invasion into Ukraine; as a result, mainly oil and natural gas prices have skyrocketed, as most developed countries have imposed severe sanctions against world's major oil and natural gas producer country, Russia, and major energy consumers, mainly in EU, have been left stranded due to Russian counter-measures and are eagerly exploring their alternatives regarding hydrocarbon fuels consumption.

Oil & Gas Upstream

Oil and natural gas sectors saw an unprecedented fall in spending during 2020, but it is expected to have rebounded by 8% in 2021 reaching a total investment amount of over USD 350 billion, which still lags significantly behind relevant 2019 levels. Despite higher prices and revenues during first quarter of 2021, companies are not expected to increase their total spending due to uncertainties regarding the trajectory of covid-19 pandemic and the speed of energy transition strategies, alongside uncertainties related to future decisions made by OPEC+ countries, which continue to hold the majority of oil and gas reserves, thus actively affecting relevant markets worldwide. Different companies follow different strategies; Majors⁹ are expected to follow a conservative policy regarding upstream capital spending due to the fact that on the one hand, they face intense pressure to commit themselves into minimizing their climate impact by diversifying into low-carbon energy investments, while at the same time they have to continue facilitating their debt and supporting dividend payments. On the other hand, NOCs – not withstanding some of which are facing severe revenue and spending constraints - are anticipated to lead the way regarding upstream investment by increasing their relevant spendings by around 10%, most of which will come from NOCs from China -PetroChina, China National Offshore Oil Corporation (CNOOC) and Sinopec-

⁹ Majors oil companies that IEA report refers to are: ExxonMobil, Shell, Chevron, Total, BP, Eni and ConocoPhillips

and Middle East – mainly Saudi Aramco and Abu Dhabi National Oil Company (ADNOC).

Shale gas, sector which was also greatly affected during 2020 outbreak of covid-19 pandemic, is expected to make use of the cash flow generated due to 2021 recovery in order to satisfy debt and return dividend to shareholders rather than boost its overall spending towards maximizing output. Exploration sector, which has already been facing an downward slope since 2010's, when the point of interest turned towards shale, which doesn't require exploration in the usual sense, continued to play a trivial role in the overall upstream investment level during 2020, as exploration activity outside of the Middle East is mainly concentrated in offshore Brazil, Guyana and Suriname.

Refining

The outbreak of Covid-19 pandemic in 2020 has unprecedentedly challenged refining industry as a result of the sharp fall in energy consumption. This market climate put severe pressure regarding refining investment (both greenfield and brownfield), which dropped by more than a quarter reaching just under USD 38 billion, while refinery runs fell to 74.4 mb/d, a number that hasn't been seen since 2010. In addition, these conditions alongside overall considerations regarding viability of these projects in a net-zero emission future scenario has triggered a waive of announcements of closures for the period 2020-26, mostly in advanced economies, amounting to 3.6 mb/d in total. However, capacity under closure is far outweighed by 8.5 mb/d of new refining capacity, which is expected to come online until 2026, resulting in 4.9 mb/d of net capacity additions. These additions most notably come from regions with access to cheap feedstock and growing markets, mainly developing economies in Middle East and Asia, which accounted for more than 80% of refining investment during 2020 and anticipated to lead the growth in the sector in 2021. Structural demand shifts and acceleration towards clean energy transition pose significant challenges for the already existing and future refiners; some are investing on more resilient part of the demand, such as petrochemicals, while others are targeting towards low-carbon technologies such as advanced biofuels, chemical recycling and low-carbon hydrogen.

Liquified Natural Gas (LNG) & Pipelines

During 2020 it was recorded for the first time a drop by 1.9% in natural gas consumption as a whole, while simultaneously at the same year global LNG demand grew by 1%. The manifestations of Covid-19 pandemic regarding lower total energy demand, excess of supply of natural gas and lower gas prices alongside general uncertainties related to global economic recovery drove LNG liquefaction investment down more than a third during 2020, with countries such as Qatar, Russia and United States to be expected to boost construction project activity during the following period.

United States continue to hold dominant role regarding global LNG exports during 2020 and was significantly benefited partly by competitive chartering rates; Qatar, another major player in LNG export sector announced in February 2021 an FID

for the largest single LNG project by capacity ever¹⁰, which is planned to include carbon capture technology, demonstrating its intention to solidify its position as a global leader even amongst those LNG buyers who have made net-zero commitments and are very conscious regarding emission footprint of their contracted cargoes.

Finally, as regards to natural gas import, it was noted that nearly 200 bcm of regasification capacity was under construction worldwide in 2020, mainly in Asia aiming to be prepared to counterbalance anticipated growth in energy demand by developing economies. In late 2021 and most certainly in 2022, while tensions between Russia and EU have been surging regarding constant supply of natural gas, it is expected that interest towards new regasification capacity in the European continent will be highly bolstered in an attempt for the EU to follow a more autonomous energy route. Lastly, the role of natural gas in the future energy mixture of each country and the emerging role of hydrogen lead into puzzling natural gas operators in their strategies to develop new natural gas pipelines.

Biofuels

Investments in biofuels, both liquid and gaseous, had already followed a downward slope in 2019, the last normal year before the outbreak of Covid-19 pandemic, and this trend continued during 2020 with relevant spending reaching just over USD 8 billion. It has been observed that the point of interest in liquid biofuels is changing from ethanol – in which China and Brazil continue to dominate representing almost half of global investments- to hydro-treated vegetable oil (HVO), also known as renewable diesel, for which global production capacity is expected to triple by 2025. Regarding gaseous biofuels, the current market of biomethane, which is about 8 bcm and is mainly used in the transport sector in Europe, North America as well as Brazil, China and India, might not be representative of the prospects as a low-carbon alternative to natural gas. It becomes evident that development in biofuels sector is closely interlinked to government policies that would make biofuels economically sustainable in an environment with low fuel prices and squeezed operating margins such as the one during 2020.

Hydrogen

Hydrogen demonstrated remarkable resilience comparing to all other fuels during the outbreak of Covid-19 pandemic; it is estimated that electrolyser commissioned during 2020 represented nearly USD 70 million-worth of investments and it is projected that during 2021 relevant spending will have increased exponentially as a result of robust government support in the scheme of generous governmental grant funding being part of economic recovery plans around the world. It is argued that low-carbon hydrogen produced by these new electrolyser projects is going to be used in transport and industrial applications. Europe, which is at the forefront of developing new hydrogen capacity implementing its Green Deal agenda, has focused at promoting

¹⁰ IEA's 'World Energy Investment 2021' report is referring to Qatar Petroleum's decision to sign an FID for the 33 Mtpa North Field East expansion.

industrial applications, including the steel and refining sectors, while Japan trying to replace natural gas and coal power generation capacity is turning towards hydrogen as a means of electricity storage electricity produced by renewables, and lastly, China is heavily investing in electrolysers for transport applications.

Carbon-Capture Technologies

Despite the fact that CCUS technologies are yet immature and thus, extremely expensive and risky for public and private investors to spend on, it is reported that in a period of almost seventeen months - January 2020 to May 2021 - different actors have pledged more than USD 12 billion to relevant projects and programmes, mainly as a result of growing policy support and increased interest to reduce emissions footprint of fuel supply; though, there is noticeable inconsistency between announced CCUS projects and final commissioning, with the latter remaining fairly low. Planned CCUS projects include a wide range from facilities that will capture and store CO₂ emissions from nearby industrial facilities in Europe, all the way to an announced CCU facility to North Field East expansion planned by Qatar Petroleum in order to succeed in reducing emission intensity of its exported LNG cargoes.

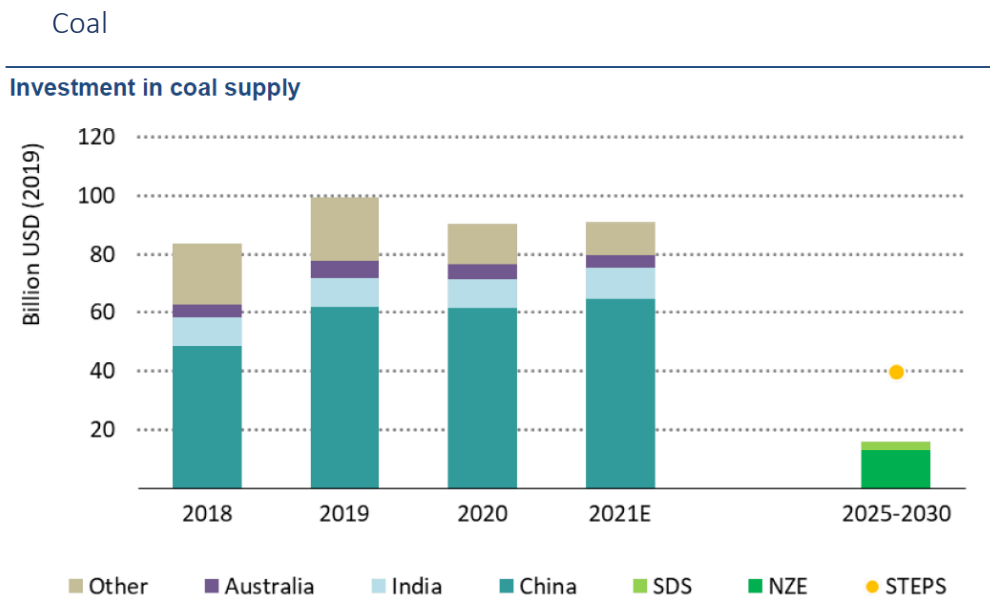


Figure 5: Investment in Coal Supply

source: IEA, 'World Energy Investment 2021' Report

Coal has been at the epicentre of criticism for the carbon footprint it produces, and thus the risks and threats its extensive use may pose to sustainable development targets are perceived as economically prohibitive. Yet, it remains a crucial fuel for many industrial sectors, most notably power production, and it is still widely used in countries in Asia, most notably China and India, where it is mostly produced as well. Hence, it comes as no surprise that these two countries held during 2020 similar levels regarding investments in coal production and consumption, while at the same time in the rest of the world, relevant indices fell by almost one quarter. As a result coal supply levels

shrank in 2020 by only 9% and is expected to have demonstrated marginal rebound during 2021, mainly due to dynamics witnessed in the two major developing economies of Asia.

In China, serious and coordinated efforts are made towards modernisation of the coal sector by shutting down smaller and less efficient mines and investing in fully mechanised ones, while simultaneously, central government is actively promoting the consolidation of the relevant market through a series of mergers and acquisitions between coal-related companies creating a smaller number of businesses that will be more efficient and will achieve economies of scale. In India, central government is taking measures in the direction of reducing coal imports and increasing domestic production, while it actively encourages commercial mining via a series of auctions. Yet, despite the fact that in these two major developing economies coal still holds a weighty role in their total energy system, investors are concerned about demand uncertainty regarding new coal mining projects, as China on the one hand has officially committed itself into achieving carbon neutrality by 2060, while on the other hand renewables are increasingly penetrating India's energy mixture. Furthermore, the fact that the number of advanced economies adopting ever-increasingly ambitious climate targets is growing, and the role of environmental, social and governance (ESG) requirements regarding carbon footprint of any commodity is becoming increasingly important, cast serious doubt regarding future viability of new or even existing and dated mining projects.

The Transformation of a Sector

Undoubtedly, the oil and gas sector has been undergoing a complete transformation during the last decade. As we are heading towards the target of net-zero emissions by the middle of this century, the once mighty sector of traditional fossil fuels is expected to re-birth. Contemporary investment conditions mandate that market opportunities are closely interlinked with strong and substantiate environmental sensitivity on behalf of every company willing to operate in the energy sector. Thus, it is often noticed that well established upstream oil and gas companies are make use of financial inflows generated from brownfield oil and gas projects to fund new and immature low-carbon technologies like offshore wind farms, hydrogen and CCUS, while at the same time they retreat from exploration gradually narrowing their pipeline of new traditional fossil-fueled projects. On the opposite side, as world's major oil and gas upstream companies retreat from new exploration plans and other independent companies face difficulties to access necessary capital to develop new projects, developing economies with significant resources in their territories are straggling to entice potential investors and operators, and as a result, they are rushing to review upstream terms in order to retain interest.

Breakdown of oil and natural gas upstream spending

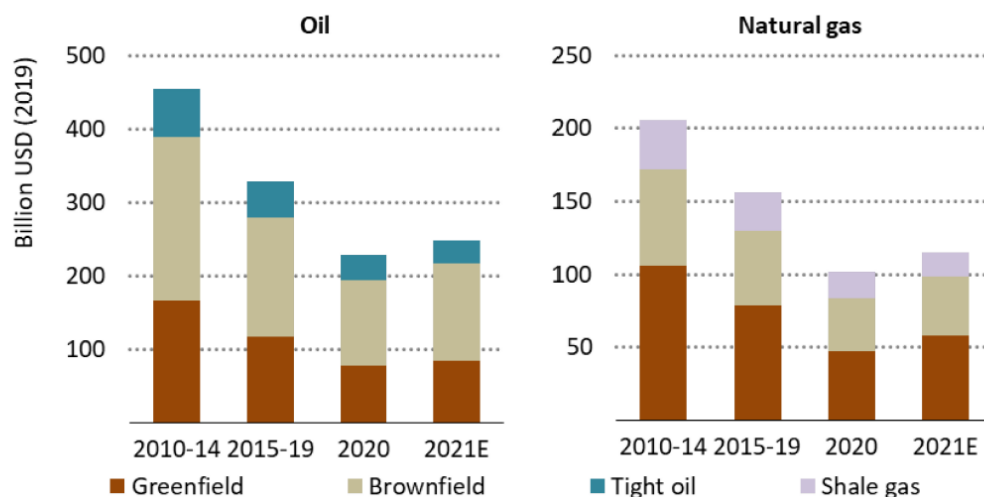


Figure 6: Breakdown of Oil and Natural Gas Upstream Spending
 source: IEA, 'World Energy Investment 2021' Report

Relevant data show that upstream oil and natural gas investment levels in 2020 were half of what it had been in 2014, while oil and gas demand – taking under consideration recent turbulences caused by the outbreak of covid-19 pandemic – hasn't drastically fluctuated over the same time period. It is unanimously accepted that upstream oil and gas sector has achieved admirable efficiency reducing prices and rationalising project designs and plans. Furthermore, a strategic shift towards smaller and more modular investments, that limit initial capital spending, speed up paybacks and reduce exposure to long-term risks, has been detected. Trends show that upstream oil and gas sector is moving towards becoming an 'opex' rather than a 'capex' industry by harvesting already existing – "brownfield" – projects, rather than developing and exploring new areas. What is often argued by experts is that traditional fossil fuels supply is transitioning away from hydrocarbons in a faster rate than consumers do. This could explain the recent record-breaking rise of prices of these fuels that had begun in the third semester of 2021 and became more than obvious to any consumer and business in 2022 after Russian invasion into Ukraine. Energy analysts predict that recent events are expected to accelerate implementation of governmental decarbonisation policies, mainly of European countries, which happen to consume large quantities of imported oil and natural gas; reduced fossil fuel demand in the long term alongside significant spare capacity held notably by countries in the Middle East, which at the moment seem reluctant to ramp-up global production, advocate for high fossil fuel prices in the foreseeable future.

Global investment in fuel supply compared with annual average investment needs, 2025-2030, by scenario

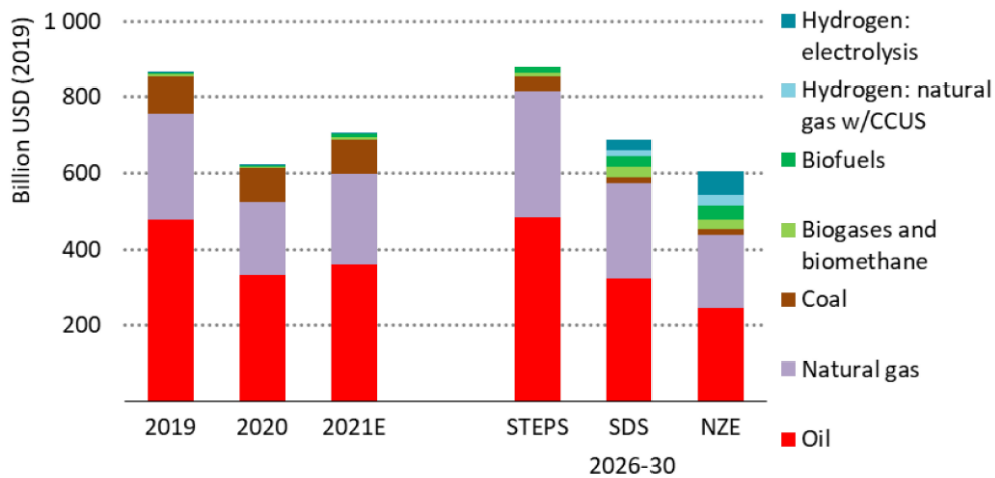


Figure 7: Global Investment in Fuel Supply Compared with Annual Average Investment Needs, 2025-2030, by scenario
source: IEA, 'World Energy Investment 2021' Report

Gradually, it becomes evident that global energy demand has to be met in a way that will decisively minimize emission footprint and ultimately eliminate it. Despite the fact that fossil fuels like oil and natural gas still remain the bedrock of the global energy system, investments in low-carbon technologies like hydrogen, biofuels and CCUS follow an ever increasing path, but still relevant spending lags significantly behind comparing to what is required in climate-driven scenarios. Fundamentally, the production, handling and distribution of fuels continues to be a pivotal element of a well-functioning energy system.

Energy end-use and efficiency

Overview

Energy efficiency is often considered as the fifth fuel in the energy mixture, after coal, hydrocarbons, nuclear and renewable energy. Yet, it has only been recently that energy experts, policy makers and academia have focused their attention and efforts on promoting energy efficiency as a more effective and inclusive way to meet climate-friendly targets of sustainable development. Despite the fact that energy efficiency is not a resource endowment like other fuels, but instead is available globally and across a wide array of sectors, it has not yet received the necessary attention by neither relevant public institutions nor investors who hold in their diversified portfolios energy products, according to the writer's opinion.

Global investment in energy efficiency by sector

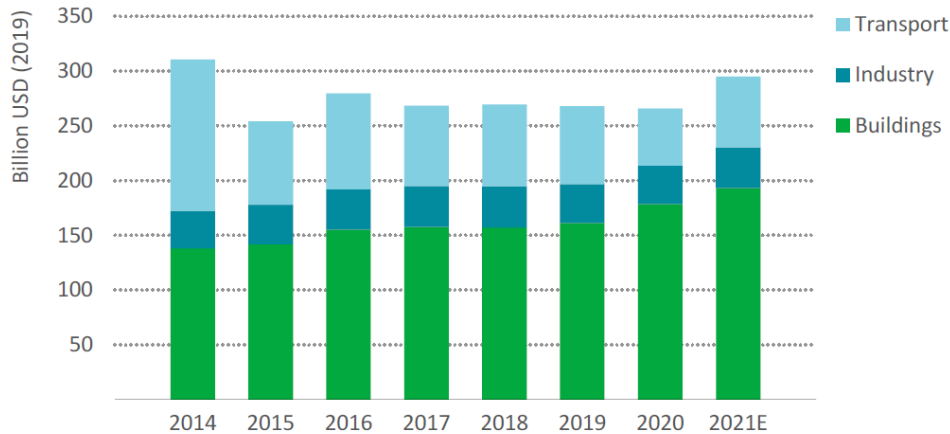


Figure 8: Global Investment in Energy Efficiency by Sector
source: IEA 'World Energy Investment 2021' Report

Under the aforementioned circumstances, investment levels in energy efficiency¹¹ have also been affected by the outbreak of the Covid-19 pandemic in 2020. The repercussions of the pandemic on corporate and household budgets, the growing uncertainty regarding the potentials of economic recovery and the ephemeral lower fuel prices created an environment not characterized as hospitable to this kind of energy investments. Furthermore, energy efficiency spending is heavily depended on incentives provided by either relevant governmental policies, or stimulus economic packages, or a combination of those two; thus, it comes as no surprise that in Europe, where stringent emission-reduction policies have been adopted and elaborating stimulative government programmes have been initiated, investment in advancing energy efficiency of buildings followed a moderately positive path, whereas in the rest of the world relevant spending has decreased following the downturn of the global construction activity.

In 2021, the pace of economic recovery, alongside allocation of funds through different recovery packages and the increase of traditional fuel prices, are all expected to affect global investments in energy efficiency projects in a positive way. Finally, we ought to underline the impact of the recent Russian invasion in Ukraine: as prices of natural gas predominantly, but also oil, have been skyrocketing throughout the first half of 2022 due to growing competition for accessing reliable power sources, it is the writer's belief that energy efficiency will be at the epicentre of strategies and measures taken to effectively cope with the looming world energy crisis.

¹¹ In IEA's annual report energy efficiency investment is defined as the incremental spending on new energy-efficient equipment or the full cost of refurbishments that reduce energy use. The intention is to capture spending that leads to reduced energy consumption. Under conventional accounting, part of this is categorised as consumption rather than investment.

Buildings

The resiliency of energy efficiency investments in buildings against the outbreak of covid-19 pandemic is remarkable; although global building construction activity shrunk by 2% during 2020 to USD 6 trillion, spending on energy efficiency measures taken in the construction sector reached the amount of USD 180 billion outpacing by an unprecedented 11% previous year's levels (USD 160 billion), with the Europe being accountable for the lion's share of this growth in investments. This positive trend has resulted due to EUR 30-billion program of efficient construction and renovation designed in Germany prior to Covid-19 pandemic and implemented in 2020, alongside an array of stimulus spending programs implemented in Italy and France in the form of tax deduction schemes and direct funding, incorporated in the recovery plans of these countries. These programs aimed at promoting energy efficiency renovation and improvement of households, office buildings and public buildings such as schools and town halls.

It has to be mentioned that energy efficiency in buildings can be achieved following two different strategies: either by renovating and retrofitting already existing buildings with new more energy-efficient tools such as replacing old electrical appliances with new, more efficient ones, which can deliver the same services consuming less energy and by improving thermal insulation of older buildings; this path was mostly followed in Europe and North America. Alternatively, energy efficiency can be achieved by promoting new construction industry activity and setting some kind of quotas in delivering low-energy or sustainable-rated buildings. Energy efficiency through new construction is mostly noticed in EMDEs such as China, India and Southeast Asia.

Transport

Investment trends regarding efficiency in the transport sector were mixed during 2020. On the one hand, restrictions posed by central governments as a measure to combat virus proliferation and general economic uncertainty that put under pressure corporate and household budgets, led global car sales figures to follow a downward path, while most consumers and businesses were hesitant to bear the extra cost of upgrading to more energy efficient means of transport. On the other hand though, global EV car sales continue to grow and its total market share witnessed a significant uptick. Thus, overall, it is estimated that during 2020 transport efficiency investments fell to USD 50 billion, a drop of 26% comparing to 2019, while it is expected that in 2021 this downward trend will be reversed and relevant spending is going to have reached the amount of around USD 65 billion.

The lion's share in efficiency investments in the transport sector clearly is correlated with the increasingly growing number of EVs in the global car sales market. Though, this trend is not universal; Europe and China, by offering stimulus spending schemes and by adopting conducive policy instruments, such as mandatory emissions reduction targets for new cars in Europe and mandatory new EV quotas in China, are leading the way. Conversely, the rest of EMDEs lagged significantly behind and EV

sales dropped by around 8% following the negative pattern of total passenger car sales figures in 2020. Furthermore, while passenger EV sales demonstrated positive global growth rates, companies and municipalities were extremely reluctant to bear the additional upfront cost of replacing their old fleet of fossil-fueled buses and commercial vehicles with new EV, plunging the total sales volume of electric buses and commercial vehicles.

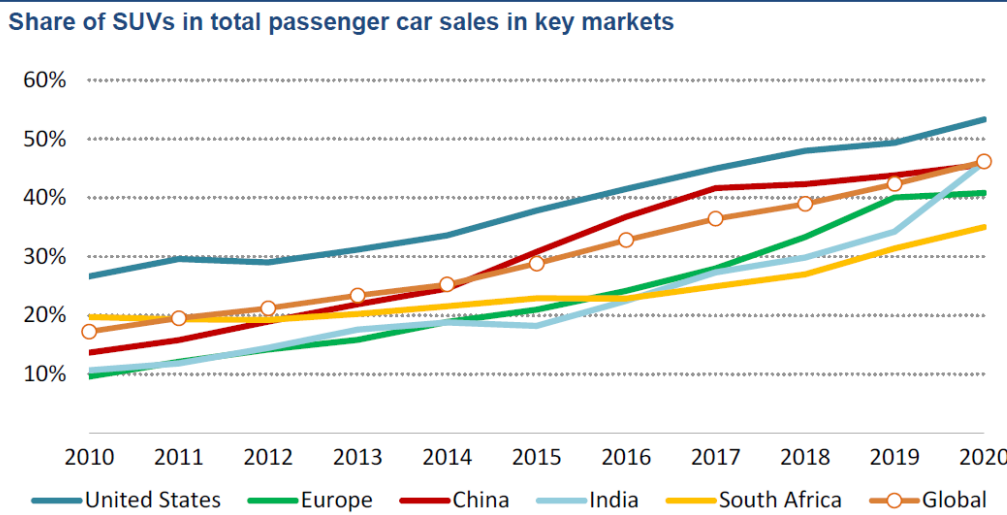


Figure 9: Share of SUVs in Total Passenger Car Sales in Key Markets
source: IEA, 'World Energy Investment 2021' Report

Finally, it has to be mentioned that passenger car trends are dominated by the popularity of SUVs. This kind of vehicles are attributed to consume around 20% more energy compared to an equivalent medium-size car¹². Thus, despite the growing penetration of EVs in urban transportation and the overall better fuel efficiency of new car models, including internal combustion ones, some efficiency gains are offset due to growing market shares of SUVs worldwide; it is indicative that more than half of new cars sold in the United States and 46% of cars sold in China are SUVs, while the relevant share in Europe reached 40%. Only United States and China are accountable for more than half of global SUV sales.

Industry

Heavy industrial companies that operate in steel, chemical, cement, paper and aluminium sectors are considered extremely energy intensive, and its operation has significant footprint in global carbon emissions. Thus, their participation in the effort of achieving sustainable development future targets by maximizing its energy efficiency performance is more than crucial.

¹² IEA, 'Carbon emissions fell across all sectors in 2020 except for one – SUVs' (2021), IEA, Paris,
 Retrieved from www.iea.org/commentaries/carbon-emissions-fell-across-all-sectors-in-2020-except-for-one-suv

In 2020, the imposed restrictions, turbulences regarding global supply chain and overall economic uncertainty affected global industrial output of energy-intensive industries, which fell by around 4%. This general economic climate disincentivized investments in upgrading less energy-efficient industrial equipment and bearing new energy-efficient capital expenditures. China, which was one of the few global economies with positive industrial growth rates, remained the leader in terms of industry energy efficiency being accountable for over 40% of total funds invested, followed by India (9%) and Southeast Asia (8%), whereas relevant spending in advanced economies such as United States and Europe presented considerable reduction due to measures against spread of Covid-19 pandemic.

It becomes evident that investments enhancing efficiency in the industrial sector are of paramount importance if we were to commit into following climate-driven scenarios; furthermore, this kind of investments are only to be materialized if supported by a carefully planned set of policies that would set energy performance standards and would establish mechanisms that - financially - incetivise energy savings and emissions reductions. Given that only China and India have set policies that mandate energy saving targets in the industrial sector and that most of the global industrial output is produced in developing and emerging countries, it is necessary for the net of energy efficiency policies to be widened to cover all of these countries.

Renewables for end-use

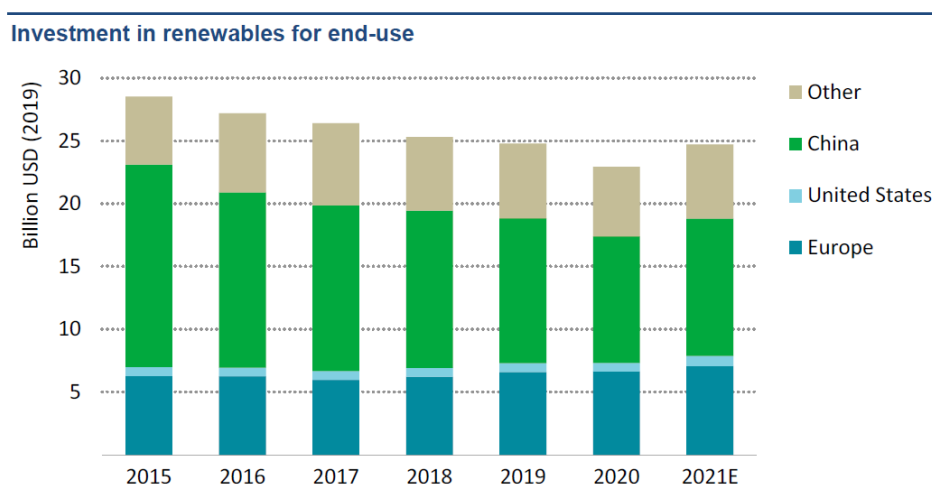


Figure 10: Investment in Renewables for End-Use
source: IEA, 'World Energy Investment 2021' Report

Except for energy saving in the construction, transportation and industrial sector, considerable energy efficiency can be achieved by investing in renewables for end-use, such as solar thermal applications (for district, space and water heating), bioenergy and geothermal. Although relevant spending dropped in 2020 by around 10% compared with 2019 to USD 23 billion, it is expected to have followed a positive path in 2021. This positive trend will mostly depend on general economic conditions and favourable policy instruments on behalf of central governments. China and Europe continue to lead

the way regarding investments in end-use renewables, with the cost of heating with heat pumps for example, becoming even more competitive due to economies of scale and maturity of the technology.

Repercussions

Global energy efficiency, as measured by the energy intensity of the global economy has only recently received the attention much needed in order for the contemporary human industrial civilization to achieve the targets of sustainable and climate-friendly development that will not hinder future generations' prosperity on this planet. Under these circumstances, the fact that the number of states – and predominantly the industrial states which are responsible for much of global pollution-that commit in a net-zero-carbon-emission scenario by 2050 is rapidly growing is extremely encouraging. Though, in a net-zero emission scenario by 2050, it is estimated that global energy efficiency has to improve in a rate of 4% annually, whereas the relevant rate in 2020 a year that undoubtedly was stigmatized by the outbreak of Covid-19 pandemic plunged to only 0.8%

Thus, as the global economy slowly has started to recover during 2021 but simultaneously new threats are emerging due to the looming global energy crisis in 2022, the significance of energy efficient improvements is becoming more than critical. The increase of investments in energy efficiency projects should not only be supported by stimulus spending as part of recovery packages – which are of course more than necessary- but also has to be vigorously underpinned by a net of policy measures that would promote electrification of urban transportation and generally maximization of efficiency in the transport sector, would boost spending on efficient new buildings and retrofits, and would set energy performance standards in industrial sector.

R&D and technology innovation

Overview

Each and every breakthrough that humans have achieved has resulted from a long and strenuous period of R&D and innovation attempts, that weren't always successful. As a result, governments are called to provide for stimulus public funding, that will counter-balance the risks assumed by innovators in their first attempts to make basic research and develop first-of-a-kind demonstration projects, and to set appropriate policy guidelines that will leverage the all important private funds into R&D. It is no surprise that this basic rule applies also in the case of new, expensive and relative immature -for now- low-carbon energy technologies, such as CCUS, hydrogen, battery storage facilities, e.t.c.

In 2020, the outbreak of pandemic hampered investments in energy innovation, albeit to different degrees as regards governmental and corporate spending; public funds were steered towards low-carbon energy R&D which showed remarkable resilience and even some major countries increased their invested funds. On the contrary, private sector being affected by market uncertainties and reduced sales

revenues significantly compressed its funds intended to be invested in energy related innovative projects.

The expected rebound of global economy in 2021 is anticipated to have positively affected investments in low-carbon energy innovations both from public and corporate funds. It must be highlighted that major economies such as United States, China, Japan and European Union, which are committed into transitioning to a net-zero-carbon-emitting future, are leading the way regarding funding innovative energy technologies in their attempt not only to achieve their climate-friendly targets, but also to achieve energy security and ultimately to safeguard their sovereignty. It is estimated that overall in the period up until 2030 the amount of USD 50 billion of public funds could be available for major demonstration projects of large-scale low-carbon energy technologies.

Another promising factor regarding future investment trends in innovative clean power energy projects lies in the fact that although 2020 was characterised by pressures in the most prominent financial markets, investors renewed their trust in financial vehicles that innovate in the energy sector. It is mentioned that during 2020 early stage venture capital received USD 3.5 billion, which clearly depicts an emerging trend regarding capitals invested in sustainable energy.

Government Spending on Energy R&D

Public funds allocated towards financing energy related R&D projects were proven astonishingly resilient during 2020 reaching USD 32 billion – an increase of 2% - albeit they followed a downward trend comparing to 2017 and 2018 when relevant indices had risen by 7-10% annually. An element of optimism is that the percentage of funds invested in low-carbon energy R&D projects steadily grew reaching 83% in 2020, when back in 2015 it was around 77%. While fossil fuel energy investments are continuously shrinking, China seems to pursue its own way representing more than half of the global total for fossil energy public R&D.

Canada, Denmark and Sweden seemed to pave the way regarding public energy R&D investment reporting double-digit growth rates, followed by United States which increased its public energy R&D budget by 7% and Germany by 2%; EU as a whole and Japan exhibited negative growth rates. At the epicentre of the growth of public energy R&D spending were investments in energy efficiency R&D projects – on which spending grew by more than 90% - nuclear energy R&D projects – which grew by more than 45% - as well as public funds were allocated towards hydrogen and fuel cells projects.

Although the trajectory of global economic recovery seems to cast doubts regarding the persistence of growth of public investments in energy R&D, it is absolutely necessary that stimulus public spending should be accompanied by strong and diversified policy support in the scheme of inspiring public procurement methods, incubation and prizes for entrepreneurs and researchers. Such policy instruments along

side impartial evaluation, good-practice sharing and international co-operation would crucially supplement government spending programs.

Corporate Energy R&D Spending

While public spending on energy R&D grew by 2%, as already mentioned, corporate investments in the same sector fell by the same rate in 2020 reaching around USD 89 billion. This phenomenon was attributed to the impact of Covid-19 pandemic, which had severe impact on market demand, reduced revenues and shrank corporate budgets, alongside general economic uncertainty. Astonishingly, the observed fall of corporate research spending in energy-related fields is far more modest than anticipated, mainly due to determination on behalf of major private energy players to adhere to R&D projects retaining experienced staff and strategic capabilities.

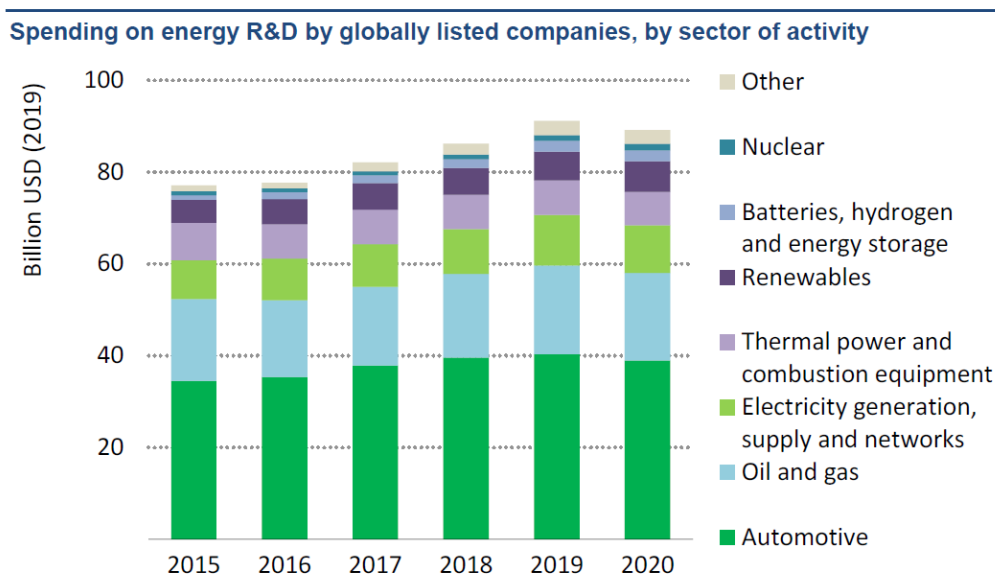


Figure 11: Spending on Energy R&D by Globally Listed Companies, by Sector of Activity

source: IEA, 'World Energy Investment 2021' Report

Regarding distribution of spending in different energy-related R&D sectors, investments in electricity generation and networks fell in 2020 by 6%, automotive -3%, thermal power and combustion equipment -3% and oil and gas sector -2%, whereas private companies continued to allocate funds in R&D projects relating to renewables and nuclear equipment being harmonised with the governmental pledges of a near future scenario characterised by drastically reduced greenhouse gas emissions. On a country and regional basis, it has to be mentioned that at the forefront of energy R&D investment in 2020 were companies listed from China, which increased their invested funds by almost 3% during a year with unprecedented economic hardships, followed by Japanese companies which are renowned for heavily investing in research projects; on the contrary, energy related R&D funds invested by US-based companies plummeted by around 10%, followed by the respective figures of European companies

that fell by 7%, mainly due to the severity of economic ramifications of the pandemic outbreak.

Venture Capital Funding of Energy Start-Ups

Venture-capital (VC) funding energy start-ups contributes, alongside public and corporate R&D investment, to bolstering the introduction and development of new technology propositions that represent potential near-term investment opportunities, and especially those that do not require high levels of upfront development and capital. Hence, the significance of VC funding towards new technologies intended to be commercialized.

Early-stage VC investments followed a downward trend in 2020 comparing to 2019 reaching USD 3.5 billion in an aggregated level, mainly due to an adverse first half of 2020 and despite the fact that clean-energy start-ups continued to draw the attention of investors. During the second half, VC investments rebounded, but this trend wasn't enough to alter the dynamics shaped by the slower start. Furthermore, it is noticed that although the number of disclosed deals increased by 10% in 2020, the average value of each deal was around USD 7 million dropping by 17% compared to 2019; this means that investors hesitated to put capital at risk or they took the opportunity to invest in lower valuations. In any case, Europe reasserted its dominant position regarding global energy investment in early-stage energy start-ups almost doubling its total deal value in 2020 and offset declining trends coming from the two other major markets, China and the United States.

Positive perspectives of VC funding towards energy start-ups recorded in the second half of 2020 is expected to have continued in 2021 as well, mainly driven by energy storage and hydrogen start-ups in Europe and United States and battery developing and electric vehicle companies in China. This recovery can be explained by the fact that investors were lured into investing in tech stocks, such as Tesla, as they were considered as a more sound investment comparing to more traditional sectors including oil and gas which were facing extreme turbulences. Furthermore, this positive trend clearly illustrates that investors are convinced that in the near term governments are going to proactively support energy transition with favorable policies and robust corporate demand, as more countries commit themselves to more stringent environmental rules. As a result, the number of investors, even risk-averse ones, such as institutional ones, willing to include clean energy VC exposure in their portfolios is expected to steadily grow, hence resulting to more investing opportunities for more energy start-up companies.

Another crucial factor when considering the perspectives of clean energy technology innovation is corporate VC investment, which shrank in 2020 by 10% reaching USD 5.2 billion, following the path of corporate R&D index as already mentioned. The interest element of corporate investing to clean-energy start-ups comes from the fact that companies in the transport and in the information and communication sectors dominated relevant investments representing 80% in total, while the share of traditional energy players, such as fossil fuel companies, utilities, energy equipment

and services companies, dropped below 15% in 2020. Likewise corporate R&D spending, it stands that large corporations pursue directly investing into new, innovative technology cells intending to leverage latter's cutting-edge knowledge basis in the short term and possibly acquire them in the future.

Repercussions

Acceleration of energy transition towards a more sustainable future can only be achieved through the introduction, development and commercialization of new innovative energy-related technologies which are suggested to fundamentally alter and transform the competitive positions that different fuels and energy sources held for decades. Co-operation between companies from the energy sector intending to invest in innovation and ones from other sectors, motivational funding for entrepreneurs and R&D projects and targeted investment in upgrading infrastructure and fixed assets will determine the success of this inspiring project.

It is promising that clean energy innovation is currently attracting the highest levels of investments ever recorded; albeit, closer cooperation among universities, research institutions, companies, governments and the finance sector, as well as the contribution of stimulus public and private spending on R&D and proactive support for early-stage scale-up will be essential for accelerating innovation circles and ultimately achieving the so wanted net-zero carbon-emission target.

Chapter 2: The essence of PPPs

Introduction

As already mentioned, although Covid-19 pandemic had a measurable negative impact on global investments in the energy sector, the growing number of countries, which have already committed themselves into significantly reducing or mitigating their environmental impact, can only be supported by increasing investments in renewable energy sources, energy-efficiency measures, battery storage facilities, and modernization of the transmission and distribution networks. The amount of energy investments needed to fulfill the aforementioned targets is overwhelming, and simultaneously most national governments are currently facing significant budgetary constraints, which in turn are shrinking public investment programs. A solution to cope with this problem often proposed is the participation of the private sector in the provision of infrastructural assets or services.

In this framework, this chapter is intending to present the notion of Public-Private Partnerships (PPPs) as a form of private participation in energy infrastructure. Different definitions of PPP notion will be quoted as proposed by different institutions; furthermore, the basic characteristics of PPPs will be presented, as well as an intuitive antithesis between, on the one hand PPPs and the traditional procurement method, and on the other hand between PPPs and full privatization. Additionally, the notion that infrastructure is ‘the wheels of the economy’¹³ will be analyzed in order to explain the pivotal role that infrastructure plays in development and growth of each country. Finally, the historical course of cooperation between public and private actors in the provision of assets and services will be examined from the ancient years of the Roman Empire, all the way to the “New Public Management” liberal theory developed during 1980-1990’s and to the growing appeal of PPP agreements after the turn of the millennium.

The Definition of Public Private Partnerships

Public-Private-Partnerships (PPPs) as a financial scheme providing infrastructure projects and/or public services is not a recent breakthrough; on the contrary, it has been a long and turbulent history in almost every continent of the world. Advocates and critics have been debating on whether PPPs, when implemented, have had a positive or a negative aftermath.

There is no broad international consensus on what constitutes a PPP. The World Bank has proposed the following definition: ‘a long-term contract between a private party and a government agency, for providing a public asset or service, in which the

¹³ World Bank, ‘World Development Report 1994: Infrastructure for Development’ (1994) New York: Oxford University Press, World Bank, Retrieved from <https://openknowledge.worldbank.org/handle/10986/5977>

private party bears significant risk and management responsibility'¹⁴. European Commission in their Green Paper have proposed the following definition; PPPs constitute 'forms of cooperation between public authorities and the world of business which aim to ensure the funding, construction, renovation, management or maintenance of an infrastructure or the provision of a service'¹⁵.

Academia has over the years tried to further elaborate the definition of PPPs, each time underlying a single different characteristic of the partnership; thus, it has been suggested that any 'long-term association between distinct legal and administrative entities in the public and the private sector for the pursuit of ends they would not be able to attain efficiently, effectively, economically, or equitably on an individual basis'¹⁶ is eligible as a PPP. Regarding the infrastructure sector, PPPs have been presented as a form of cooperation between public and private entities for the development of such facilities, where the governing contract covers the allocation of resources, risks and rewards among partners¹⁷. Furthermore, it has been proposed that PPP constitutes a model in which a private company takes responsibility of designing, constructing new or refurbishing and expanding already existing infrastructure, providing project financing, managing the asset and operating the service¹⁸ and the private company is compensated either by the end users of the infrastructure, or directly by the public partner, or a combination of the two. It has been emphasized that a PPP is an agreement where the public sector enters into a long-term contractual arrangement with the private sector for the construction or operation of public infrastructure or the provision of services using public infrastructure to the community on behalf of the public sector entity¹⁹. Additionally, it has been argued that PPP must be viewed as an institutionalized arrangement between public and private sector actors, in which they share a responsibility for a product, risk, benefit and costs with reference to the unique

¹⁴ World Bank Institute, 'Public-Private Partnerships: Reference Guide Version 1.0' (2012) World Bank PPIAF, Washington, DC, Retrieved from <https://openknowledge.worldbank.org/handle/10986/16055>

¹⁵ European Commission, 'Green paper on public private partnerships and community law on public contracts and concessions', 2004, European Commission, Retrieved from <https://op.europa.eu/en/publication-detail/-/publication/94a3f02f-ab6a-47ed-b6b2-7de60830625e/language-en>

¹⁶ Bachir Mazouz, Joseph Facal and Jean-Michel Viola, 'Public-Private Partnership: Elements For A Project-Based Management Typology' (2008) 39 Project Management Journal.

¹⁷ Huanming Wang, Bin Chen, Wei Xiong, and Guangdong Wu, 'Commercial Investment in Public-Private Partnerships: The Impact of Contract Characteristics' (2018) Policy & Politics vol 46 no 4, 589–606.

¹⁸ Michael Trebilcock and Michael Rosenstock, 'Infrastructure Public–Private Partnerships In The Developing World: Lessons From Recent Experience' (2015) 51 The Journal of Development Studies.

¹⁹ Darrin Grimsey and Mervyn K. Lewis, 'Evaluating The Risks Of Public Private Partnerships For Infrastructure Projects' (2002) 20 International Journal of Project Management.

feature of PPP²⁰, although it has been pointed out that this definition lacks explanation of what exactly a PPP will provide and how²¹. Finally, it has been purported that PPPs incarnate government's willingness to address financial constraints when providing public services and public infrastructure assets by inviting private investors to increase efficiency and effectiveness of public facilities and services²².

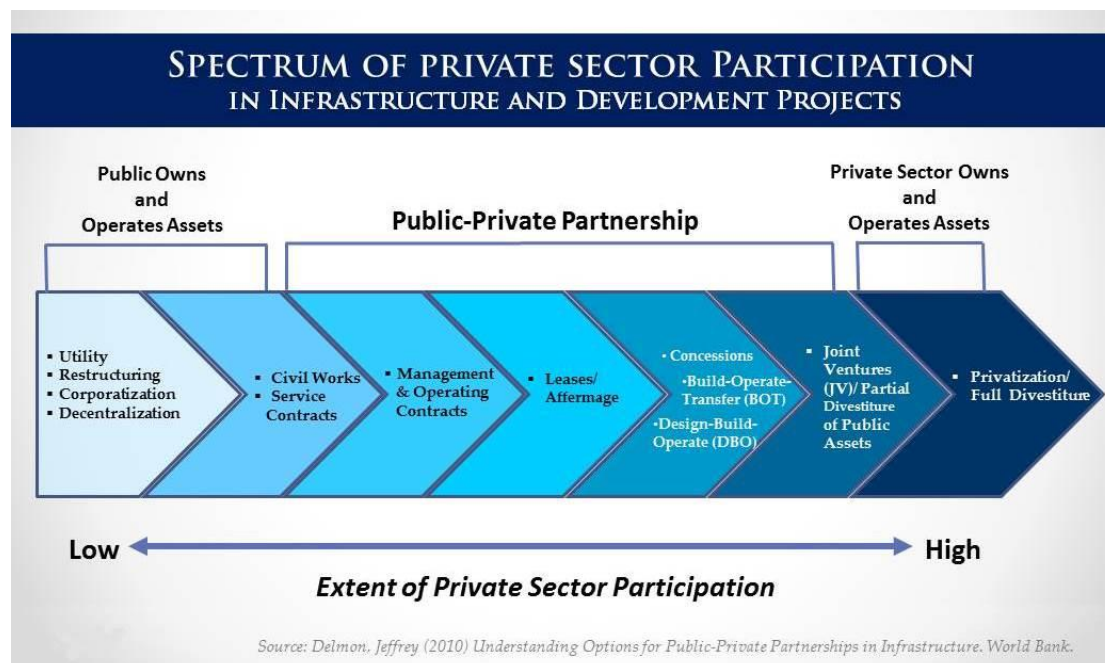


Figure 12: Spectrum of Private Sector Participation in Infrastructure and Development Projects

source: Jeffrey Delmon, 'Understanding Options for Public-Private Partnerships in Infrastructure' (2010) World Bank

The confusion in what exactly constitutes a PPP lies in the fact that private participation in providing public infrastructure assets (e.g., roads, schools, prisons, power plants) and public services (healthcare, education) is common place in the course of human civilization. At the one side of the spectrum, the standard procurement method, also known as 'design-bid-built' method, mainly focuses on input specifications. The public sector is responsible for designing and procuring a project, that will ultimately meet the needs of the society, while private companies compete each other by offering reductions in the total construction cost of the relevant project; once the project has been commissioned, public sector is solely responsible for operating it or providing the relevant service. The pivotal role of public sector as the

²⁰ Erik-Hans Klijn and Geert R. Teisman, 'Institutional And Strategic Barriers To Public—Private Partnership: An Analysis Of Dutch Cases' (2003) 23 Public Money and Management.

²¹ Nikolai Mouraviev and Nada K. Kakabadse, 'Conceptualising Public-Private Partnerships' (2016) 11 Society and Business Review.

²² Khalid Almarri and Bassam Abuhijleh, 'A Qualitative Study For Developing A Framework For Implementing Public–Private Partnerships In Developing Countries' (2017) 15 Journal of Facilities Management.

main provider of infrastructure is mainly attributed to the mere uniqueness of infrastructure's characteristics, namely large sunk capital costs, that can only be amortized in a long-term horizon, economies of scale and network features, that limit the potential for competition and create the conditions towards natural monopolies²³, while competitive provision may not be a financially rational decision. Furthermore, infrastructure is also generally considered to be an imperfect private good in the sense that it may not be entirely excludable or rival²⁴, and private sector cannot take account of 'externalities' and thus, ultimately, it will not be built, unless public sector assumes credible commitment towards constructing new or expanding already existing assets.

At the other side of the spectrum lies full privatization (divestiture), where private sector takes fully charge of the asset and operates it. A clear line between PPPs and full privatization must be drawn; although it could be suggested that both PPP scheme and divestiture aim at alleviating possible budgetary and fiscal deficits of a government, the ultimate objective of each method is radically different. Through full privatization, it is intended for government to increase its revenues aiming to balance possible deficits and be consistent to debt payments, whereas PPPs have been considered as a tool to expand or improve public infrastructure by sharing costs and risks between a public and a private partner. Secondly, in divestiture, the state is awarded with the role of regulating and distantly overseeing the sector or the asset privatized, while under the PPP method, state actor has a more vibrant interest in the successful implementation of the agreement between themselves and the private investor, and hence, as a key stakeholder maintains a more assertive role.²⁵ Lastly, another difference between PPP scheme and divestiture lies in a more implicit level; when an asset or a service is fully privatized, state is alienated from the provision of it, and hence, it cannot be held responsible for the quality (or the price), at which the infrastructure service is provided, with the exception of not executing the aforementioned regulatory competencies; on the contrary, regarding a PPP project, accountability for the quality (or price) of the infrastructure service largely remains with the public sector, thus posing profound social and political challenges during PPP's lifespan.²⁶

Hence, PPP can be viewed as a continuum ranging from traditional procurement to full privatization²⁷. PPP is built upon a long-term relationship, usually 20-30 years, and is founded on an extensive series of agreements between the public and the private sector with the aim of realizing a project of common interest²⁸. PPP's definition

²³ World Bank (n 13).

²⁴ *ibid*

²⁵ Darrin Grimsey and Mervyn Lewis, *Public Private Partnerships* (Edward Elgar 2007).

²⁶ Edward Farquharson, Clemencia Torres de Mästle, and E R Yescombe, *How To Engage With The Private Sector In Public-Private Partnerships In Emerging Markets* (World Bank 2011).

²⁷ Trebilcock and Rosenstock (n 18).

²⁸ Isabella Alloisio, 'Public-Private Partnerships: A Focus On Energy Infrastructures And Green Investments' (April 2014) International Center for Climate Governance Reflection No. 22 Retrieved from https://www.pppcouncil.ca/web/P3_Knowledge_Centre/Research/Public-

includes both the construction of a new asset and the provision of a service (greenfield), as well as the operation of already existing assets or services (brownfield). Furthermore, private investor would be reimbursed either entirely by the service users, or by the public partner, who will be responsible to make some or all the agreed payments. Finally, PPP contracts can be utilized for many sectors and for many services, provided that there is a public interest in the provision of the service, and that significant risk and management responsibility have been transferred to a private party²⁹.

Due to their complex and long-term nature, it is only reasonable that a plethora of stakeholders, related both to the public and the private sector, is interested when drafting, negotiating, signing and implementing PPP contracts. On the one hand, on behalf of the public sector, various forms of government entities, including relevant ministries, municipalities, administrative bodies, such as general secretariats, and state-owned enterprises (SOEs) would participate in one or multiple stages of a PPP contract. On the other hand, private participation can take the form of actors from different levels, namely local, regional, national and international, including enterprises or investors with technical or financial expertise relevant to the project. Furthermore, non-governmental organizations (NGOs) and community-based organizations (CBOs), that represent the stakeholders directly affected by the project, can take a seat in the negotiation table, when a PPP project is evaluated³⁰. On a broader level, the government is expected to provide social responsibility, local knowledge, political influence and the ability to mobilize political support, while, private partner is intended to make use of its expertise regarding technical, managerial and/or financial aspects of the project³¹.

PPP as project financing scheme has been utilized both in constructing new or refurbishing already existing infrastructure assets and in providing services, that have inherent the element of public interest. This thesis mainly focuses on public private partnership cases in infrastructure, and more specifically in energy projects, but whenever it is deemed necessary, reference to ‘policy-based’ or ‘programme-based’ PPPs³² will be made in order to clarify rising issues.

The Role of Infrastructure

Infrastructure has been described as the ‘wheels of the economy’³³. It has been suggested that the term ‘infrastructure’ is linked both to economic and social

Private_Partnerships__A_Focus_On_Energy_Infrastructures_and_Green_Investments.aspx?WebsiteKey=712ad751-6689-4d4a-aa17-e9f993740a89

²⁹ ibid

³⁰ ACP-EU Energy Facility, ‘Experiences on Setting up Public Private Partnerships for Energy Services’ (Thematic Fiche no. 6).

³¹ Klaus Felsing, *Public-Private Partnership (PPP) Handbook* (Asian Development Bank Sept 2008).

³² See further in E. R Yescombe, *Public-Private Partnerships: Principles Of Policy And Finance* (Elsevier Finance) (Elsevier Science 2007).

³³ World Bank (n 13).

dimensions³⁴; the social dimension of the term encompasses social services such as education, health services, information and town and country planning, while economic infrastructure contains the hardcore economic activities which relates to the provision of electricity supply, water supply, gas supply, sewerage, storm water drainage and telephone services, which are referred to as utilities³⁵. It is worth mentioning that private participation in the telecommunications and energy sectors has decisively expanded since 1990's due to technological breakthroughs in these sectors, that have reduced sunk costs, allowed major reforms in market structure and facilitated competition; on the contrary, sectors such as transportation and water management³⁶, on which technological advancement has been less pronounced and intense political pressure has been exercised against private participation, have significantly lagged during the same time period³⁷. This is evident, as during the period 1990-2005 the sectors of information and communication technology, as well as electricity have received over that 70% of the total private investment, whereas a percentage of just 3% has been invested in the same period in water management and sewerage sectors.³⁸

It is universally accepted that infrastructural facilities play a pivotal role in the development of a nation, hence the term “wheels of economic activity”³⁹ vividly associated to infrastructure. Most economic activities cannot function unless, businesses are provided with reliable and resilient energy -mainly electrical power-, telecommunication and water supply services. The production and distribution of goods and services are profoundly dependable on the adequate and effective provision of such basic to any economic growth infrastructural facilities; therefore, the provision of these services is central to the growth of the economy and the improvement of public welfare of every nation⁴⁰ by contributing to poverty reduction among the populace and the fight

³⁴ Sesan Ayodele, *Development And Management Of Utilities In Nigeria* (Malthouse Press 1996).

³⁵ Sam Animola, 'Infrastructure And Economic Growth' (2010) 2 *Journal of Infrastructure Development*.

³⁶ A noteworthy exemption is France, where almost 80 percent of inhabitants receive their water supply under public-private partnership contracts, and about half the sewage treatment plants in France are operated by private firms. See further: Liana Moraru-de Loë and Bruce Mitchell, 'Public-Private Partnerships: Water And Wastewater Services In France' (1993) 18 *Water International*.

³⁷ Neil Roger, 'Recent Trends in Private Participation in Infrastructure' (Viewpoint, World Bank, Washington, DC 1999), Retrieved from <https://openknowledge.worldbank.org/handle/10986/11460>

³⁸ Kate Bayliss and Elisa Van Waeyenberge, 'Unpacking The Public Private Partnership Revival' (2017) 54 *The Journal of Development Studies* 577.

³⁹ World Bank (n 13).

⁴⁰ United Nations Economic and Social Council Economic Commission for Africa 'Public-Private Partnerships For Service Delivery: Water And Sanitation' (May 2005 Addis Ababa Ethiopia) UN ECA Committee on Human Development and Civil Society Retrieved from <https://hdl.handle.net/10855/14326>

against income inequality⁴¹, while protecting environment by promoting sustainability. Furthermore, it has been proposed by a vast majority of a pool of 64 scientific paper authors that a positive, statistically significant correlation between infrastructure investment and economic growth or some other measure of economic development (for example, productivity) can be traced⁴².

Greece is a country that heavily suffered in the aftermath of global financial crisis of 2008; it faced high budgetary deficits, severe fiscal constraints, record-high unemployment rates and GDP reduction that ultimately lead infrastructural investments to plummet. Yet, Greece, as a member state of European Union has committed itself in meeting UN's Sustainable Development Goals (SDGs), the 13th of which states the need to "take urgent action to combat climate change and its impacts". In view of meeting these strategic goals, Hellenic Government has issued the National Energy and Climate Plan (NECP)⁴³, which among other issues focuses on the reduction of greenhouse gas emissions and the decarbonization of Greek economy, the proliferation of renewable energy and the significant growth of energy production from a mix of renewable energy sources, development of energy storage projects and improvement of energy efficiency indices. It has been estimated that for the implementation of these targets, funds of up to forty billion euros have to be mobilized and invested in green energy investments and digital economy; it is evident that Greek State cannot bear the weight of such ambitious investment plans. Private actors are expected to be encouraged and to be systematically motivated to take the lion's share in energy investments in the near future. It is the author's genuine belief the collaboration between private companies and public sector in the form of PPP could play a pivotal role in this endeavor.

The History of PPPs

Greece may have utilized the scheme of PPPs for the first time in the dawn of the new millennium for the construction of some of the most emblematic infrastructure projects in its contemporary history, namely the new Athens International Airport in Spata Attiki, the Athens Ring Road and the Rio-Antirio Bridge, but private participation in public provision of infrastructure and services hasn't been a recent phenomenon at least under a global point of view; it dates back to the Roman Empire period.

⁴¹ A study of 100 countries between 1960 and 1995 revealed that growth in infrastructure stock and improved service quality was associated with a 3 per cent reduction in the standard measure of income inequality. See further in Cesar Calderón & Luis Servén, 'Infrastructure in Latin America' (World Bank Policy Research Working Paper 5317, Washington, DC: World Bank, 2010), Retrieved from <https://documents1.worldbank.org/curated/pt/206841468263714529/pdf/WPS5317.pdf>

⁴² Stephane Straub, 'Infrastructure and Growth in Developing Countries: Recent Advances and Research Challenges' (Policy Research Working Paper No. 4460, World Bank, Washington, DC, 2008) Retrieved from <https://openknowledge.worldbank.org/handle/10986/6458>

⁴³ NECP has been ratified with No 4/23.12.2019 Decision of the Governmental Board of Economic Policy (No B 4893 of Governmental Gazette).

In Continental Europe two thousand years ago, the unprecedented expansion of highway system under Roman legions was accompanied by the development of an extensive network of postal services under the notion of ‘manceps’⁴⁴. This kind of contract provided for the construction and management of postal stations by private partners for a five-year period and often included the maintenance of the associated highway; they were awarded under competitive bidding.

With the fall of the Roman Empire, the participation of public actors in public provision of infrastructure assets and services was only reappeared during the Middle Ages for the construction of new fortified towns and the occupation of new lands in the south western region of France during the 12th and 13th centuries. Furthermore, some public services of that time (mill, press, baker, bridges, highways) were assigned to individuals (concessionaires), who received a remuneration for providing such services in the form of charging tolls and were obligated to reimburse some of their profits to community so as new works to be funded. The dawn of Renaissance found Europe lacking significantly in terms of public investment in infrastructure assets of major importance for the economic growth of the European continent of that era, mainly canal construction, road paving, waste collection, public lighting, mail distribution and public transportation. To address this issue, extensive concession contracts were signed by European sovereigns, and mainly France, with private participants, who were eager to provide such services establishing a stable stream of revenue for them.

Meanwhile in the United States, involvement of private entities in the construction of highways dates back to 1700’s; but it was a contract that granted the construction and -most importantly- the operation of a bridge in the Charles River between Boston and Charlestown, that spurred a conflict ultimately raised before the Supreme Court⁴⁵. In that case, by 1785, the Charles River Bridge Company was granted a contract for the construction of a bridge, that would connect the two cities, and the collection of relevant tolls for a period of 40 years; in 1792, the contract was extended for an extra period of 30 years, when ultimately, the ownership of the bridge would return back to the public, the state of Massachusetts. The project had tremendous success and the original investors having been recovered initial capital expenditures sold their shares in the company operating the bridge making significant profits. In 1828, the state of Massachusetts signed another contract for the construction and operation of a new bridge, the Warren Bridge. The second contract provided that the Warren Bridge operator would be entitled to collect tolls until it had covered all its construction costs, or for a period of six years since commissioning. After that period,

⁴⁴ Public Private Infrastructure Advisory Facility, ‘Overview of PPP experience’ (Toolkit for Public-Private Partnerships in Roads and Highways, Module 1 Overview and Diagnosis, 2009) Retrieved from <https://ppiaf.org/sites/ppiaf.org/files/documents/toolkits/highwaystoolkit/6/pdf-version/1-21.pdf>

⁴⁵ *The Proprietors of Charles River Bridge v. The Proprietors of Warren Bridge*, et al. [1837] 36 U.S. 420

public would freely use the Warren Bridge to traverse Charles River. The Charles River Bridge Company's new investors argued that their investment's value would significantly decrease once the Warren Bridge would be utilized without charging tolls and accused the state of Massachusetts, that upon the signing of the second contract with the aforementioned terms as outlined, had expropriated their property rights by significantly devaluating their asset, the Charles River Bridge. The Supreme Court concluded that a state law could be retroactive in character and not violate the U.S. Constitution, unless the original obligation was rooted in contract. Ultimately, the Court found that the Charles River Bridge Company's right to use the water was not exclusive, and was not impeded by the competing bridge.

The period after Industrial Revolution, when Europe faced unprecedented industrialization of its economy, rapid urbanization and growing need for expansion of public networks in transport, water supply and sewerage and energy, has been described as the golden age of concessions in Europe. Private participation was determinant in the construction of all European emblematic rail works, that spurred economic growth in the continent, while liberal ideas emphasizing the principle of free enterprise gained recognition and political acceptance and administrative capabilities were weak and immature.

This trend of private participation in major infrastructure assets' construction and provision of relevant public services was reversed in the aftermath of the two World Wars in the middle of the 20th century. Europe exited Second World War with devastated infrastructure, education and health facilities were shuttered and European society was facing extreme poverty. Moreover, the Great Depression of 1929 had vividly illustrated that markets could be manipulated by speculators, who were only motivated by their own personal interest, ignoring the consequences of their actions in the society; simultaneously, the creation, development and ultimately the prevalence of the notion of state welfare, formed as an implicit ramification of the Communist Revolution in Russia, greatly influenced the economic and socio-political landscape, under which European economy resurrection took place. Thus, the vast majority of infrastructure needed for Europe's recovery was constructed and financed either directly by states' budgets or by the newly-then created SOEs in order to address the inherent financial vulnerability that such very long-term contracts traditionally enclose. Despite that the trend of publicly financed and constructed infrastructure assets was dominant in the post WWII period, there was a major exception in the case of France and Spain, which already from the 1960's had implemented tolled motorway construction programs financed by private consortia, mainly contractors and banks; however, the economic shock and the prolonged stagflation period, subsequent to 1970's oil crises, challenged the majority of the concession contracts with many often being ultimately nationalized. Unlikely, in the United States, private participation in transport infrastructure development was limited because of both the federal Highway Aid Acts, which required each individual state to hire engineers to manage, design, and build highways using federal funds, and the creation in 1950's of the national Highway Trust Fund, funded by a national fuel tax of four cents per gallon, which led to the

development of a dense network of interstate highways funded by the federal states without private sector endorsement.

In the 1980's, when liberal economic views thrived and the domination of market-focused economic principles was clear, under Reagan administration in the United States and Thatcher administration in the United Kingdom, there was a political shift towards more active private participation and even privatization of infrastructure assets and services, that used to be provided by the public sector⁴⁶. This has clearly been illustrated by the strong support of institutional donors, such as the World Bank⁴⁷. That new political movement also known as "New Public Management" (NPM) argued in favor of fundamentally reforming the provision of services by the state and promoted decentralization of government, separation of responsibility between public services being purchased and being provided; it also focused on output or performance-based evaluation for the provision of public services and encouraged the outsourcing and privatization of public services⁴⁸. Hence, the wave of privatizations was backed by a 'roll-back of the state' belief that underlined possible efficiency achieved in the provision of services by private sector and the gains by competing in the form of better-quality services offered in more competitive prices for the citizens. Although privatizations are generally believed to have failed to fulfill the expectations in providing better and more affordable services to a greater portion of world population, private sector involvement, in the form of partnerships, significantly surged during the 1990's especially in emerging economies and developing countries, in South America and South East Asia, until the turn of the millennium, when slowed down mainly due as a result of the Asian financial crisis⁴⁹.

In 1992, British Government initiated the Private Finance Initiative (PFI) with the aim of attracting private capitals into provision of public infrastructure; it was mainly utilized in the construction of road networks and introduced the concept of payment from the Public Authority -in the form of "Shadow Tolls"⁵⁰- instead of the "user-pays" principle previously found in concession contracts⁵¹. Since mid-2000's, private participation and partnerships between public and private sector have followed

⁴⁶ David Parker & Catarina Figuerira, 'PPPs in developed and developing economies: What lessons can be learned?' In Graeme Hodge, Carsten Greve, & Anthony Boardman, (eds.), *International handbook on public-private partnerships* (Northampton, MA: Edward Elgar 2010): 526-547.

⁴⁷ Elliot Berg, K.Y. Amoako, Rolf Gusten, Jacob Meerman and Gene Tidrick, 'Accelerated development in Sub-Saharan Africa' (World Bank, Washington, DC, 1981) Retrieved from <https://documents1.worldbank.org/curated/en/702471468768312009/pdf/multi-page.pdf>

⁴⁸ E. R Yescombe, *Public-Private Partnerships: Principles Of Policy And Finance* (Elsevier Science 2007).

⁴⁹ Trebilcock and Rosenstock (n 18).

⁵⁰ "Shadow Tolls" consisted of a fixed schedule of payments by the Public Authority per driver/km. See further in Yescombe (n 48).

⁵¹ Yescombe (n 48) 9.

a steadily expanding trajectory not only in developing countries but also in developed ones, with the exception of the years immediately after the Global Financial Crisis, when capitals were restricted and most of the investment funds had to temporarily reevaluate their exposure to major capital-intensive infrastructure projects.

Chapter 3: Advantages and Disadvantages of PPP Scheme

Introduction

PPPs as an alternative to traditional public procurement method of ‘design-bid-build’ differ regarding infrastructure service delivery by focusing on output rather than input specifications⁵². Advocates of PPPs have long argued that this alternative procurement method can provide substantial Value for Money (VfM) in the construction of a new infrastructure project or the provision of a public service, can boost efficiency as a result of the extensive experience of private companies in these sectors and can alleviate national budgets facing severe fiscal constraints regarding public spendings on public services. On the other hand, critics have vigorously supported that the inherent complexity of PPP contracts as well as their inflated costs can outrun the proposed advantages while the recent revival of PPP is due to worldwide quest of investment funds for stable long-run yields. Hence, the scope of this chapter is to intuitively present both the advantages and the disadvantages of PPP agreements, as proposed by the academia, the private and public actors, as well as the rest of the stakeholders often involved in such agreements.

Budgetary Benefit – Additionality

A major advantage when selecting to procure an infrastructure project, which tends to be most of the times capital intensive, by signing a PPP contract is that the national state isn’t required to finance the total cost of the project upfront, but instead it can either participate by funding a small portion of the capitals needed or commit itself to reimburse private partner, who will fund the project, by paying availability fees or by granting the right to charge the end users a fee for providing the relevant service. Ultimately, the ability of a government to finance public investment depends on its fiscal space⁵³; this is framed by its annual budget, which officially records the rate between on the one hand government revenues, as a result of collecting taxes, and public borrowing, by issuing governmental bonds, and on the other hand the sum of expenditures incurred by the government. Hence, PPP advocates argue that PPPs can enable a government to take on a new infrastructure project, even though they may temporarily face public investment spending constraints as a result of reduced tax revenues and/or public borrowing limitations due to high credit risk⁵⁴.

Under the PPP procuring method, the total cost of the project is spread out in the entire life of the construction and operation of the asset, and hence, state’s cashflows are significantly improved. PPPs are viewed as a tool by which governments meet

⁵² IEG, ‘World Bank group support to public private partnerships: Lessons from experience in client countries’ (2014) World Bank Independent Evaluation Group, Washington, DC: World Bank.

⁵³ Peter S. Heller ‘Understanding fiscal space’ (IMF Discussion Paper PDP/05/4, Washington, DC: IMF, 2005) Retrieved from <https://www.imf.org/external/pubs/ft/pdp/2005/pdp04.pdf>.

⁵⁴ Yescombe (n 48) 17.

infrastructure needs without compromising budget constraints⁵⁵. Under Maastricht Treaty, which poses certain fiscal and budgetary targets, that all EU member states have to meet, capitals invested by state governments in PPP projects are not considered as state expenditure, and thus, PPPs have been described as ‘off-balance sheet borrowing’ by governments⁵⁶. However, critics have argued that PPPs being especially long-term in their duration, tie governments with payment obligations that absorb public funds for an extended time period, instead of leveraging private capitals to finance these projects⁵⁷. Additionally, it has been suggested that, when a government procures a project by signing a PPP contract, it foregoes the future revenue stream, that is channeled towards the private investor in the form of paid user fees⁵⁸. Some members of the academia have also proposed that in the case that a government isn’t able to finance a specific project by procuring it in the traditional way of ‘design-bid-build’, then it probably won’t be able to support it financially in case it undertook a PPP; and conversely, if the government can afford to undertake the project as a PPP, it is also able to finance it in the traditional way⁵⁹.

Another advantage that PPP advocates have suggested is a logical follow up to the aforementioned: since expenditures, that support the financing of projects procured under a PPP method, are not listed in governments’ budgets, then state governments are eligible to spend more money supporting those less privileged in the form of public health and education, social benefit paychecks, or to take on more, ambitious and socially constructive infrastructure projects; via leveraging infrastructure investments through private funds, PPPs can free resources that the government would have used to fund its public investment program and can now use for other priorities⁶⁰. The state, PPP advocates argue, by procuring an infrastructure project or the provision of a public service and by signing the relevant PPP contract, can spare the necessary funds, to finance additional projects, that would have been canceled or delayed in view of unmeasurable expenditures which would threaten the fiscal stability of the relevant budget. Thus, the realistic choice, given budgetary constraints, is generally not between a PPP and public-sector procurement, but between a PPP and no investment at all⁶¹.

⁵⁵ Trebilcock and Rosenstock (n 18).

⁵⁶ Yescombe (n 48) 17.

⁵⁷ Kate Bayliss and Elisa Van Waeyenberge, Bayliss and Waeyenberge (n 38).

⁵⁸ Ronald J. Daniels and Michael J. Trebilcock, ‘Private Provision Of Public Infrastructure: An Organizational Analysis Of The Next Privatization Frontier’ (1996) 46 *The University of Toronto Law Journal* 375.

⁵⁹ Katja Funke, Tim Irwin, Isabel Rial, ‘Budgeting and reporting for public-private partnerships’ (International Transport Forum Discussion Paper, Joint OECD/ITF Transport Research Centre, 2013), Retrieved from <https://www.itf-oecd.org/sites/default/files/docs/dp201307.pdf>.

⁶⁰ IEG (n 52).

⁶¹ Yescombe (n 48) 17.

Value for Money

It has been strongly advised that a PPP approach be pursued if the involvement of the private sector allows an infrastructure project to generate greater VFM, than if the project were to be procured via a conventional approach. Definitions of VFM vary depending on the jurisdiction. The United Kingdom's HM Treasury, defines VFM as 'the optimum combination of whole-of-life costs and quality (or fitness for purpose) of the good or service to meet the user's requirements'⁶². The European Investment Bank states that 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'⁶³

The most prominent, innovative and distinctive feature of PPP contracts is 'bundling'⁶⁴ – or vertical integration. It means that a project is undertaken by a consortium of enterprises that takes on the design, construction, management, operation and maintenance of the asset before -in most of the cases of PPP contracts- returning it to the public, when the PPP contract duration expires. It is the same entity, the consortium of private companies, that will be responsible both for the construction and the whole-life operation of the project. Furthermore, it has been argued that coordination costs, incurred if the different departments or agencies of the government would have participated, are minimized⁶⁵. Hence, private partner is incentivized to take all the necessary measures during the construction so as to reduce the costs incurred by themselves under the operation phase, because it will ultimately boost project's profitability, and mitigate cost overruns and 'appraisal optimism' that has plagued traditional procurement⁶⁶.

The private investor is thus motivated to spend more on the initial capital cost in view of reducing the future costs of operating and maintaining the project over its whole life cycle, thus 'bundling' can lead the private partner to internalize the operation costs of the facility⁶⁷. Whereas, in the traditional procurement method, there is no such stimulus, because the private company selected to construct the project is often selected only on the basis of the lower bidding price; consequently, in the traditional procurement method of 'design-bid-built' private firms are expected to provide the

⁶² HM Treasury, 'Value for Money assessment guidance' (2006) Retrieved from [www.gov.uk/government/uploads/system/uploads/attachment_data/file/252858/VFM _assessmentguidance061006opt.pdf](http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/252858/VFM_assessmentguidance061006opt.pdf)

⁶³ European Investment Bank, 'VFM analysis' (2015) Retrieved from <http://www.eib.org/epec/g2g/iproject-identification/12/124/>

⁶⁴ Daniels and Trebilcock (n 58).

⁶⁵ Jeffrey Delmon, *Private Sector Investment In Infrastructure* (Kluwer Law International 2009).

⁶⁶ Darren Grimsey and Mervin K. Lewis, *Public Private Partnerships* (Northampton, MA: Edward Elgar, 2004) 72.

⁶⁷ Oliver Hart, 'Incomplete Contracts And Public Ownership: Remarks, And An Application To Public-Private Partnerships' (2003) 113 *The Economic Journal*.

lowest possible bid and don't take under serious consideration possible future implications when choosing lower quality building materials or less expensive techniques⁶⁸. It is only logical that, in the case of PPPs, the relevant contracts include specific terms and conditions that provide pre-determined standards of operation and maintenance throughout the whole project's life cycle and that the counter party to PPP contract -the private party, which is responsible for operating and maintaining it-consistently meet them. Finally public sector is expected to bear the burden of regulating and supervising the private investor regarding the latter's obligations.

Another prominent feature of PPPs that further supports the argument of better VfM compared to projects undergone with the traditional procurement method is that multiple risks inherent to any long-term, capital-intensive project are transferred to private sector⁶⁹, or are shared between the public sector and the private investor⁷⁰. Each large-scale infrastructure project bears a series of risks both during the construction period, but also during the operating period. The different kinds of risks will be discussed below in this thesis, but as described above, the construction under both the PPP procurement scheme and the traditional method is responsibility of the private constructing firm, whereas the operating phase significantly differentiates between the two cases: according to traditional procuring method of 'design-bid-build' it is the public sector and the relevant public utility who are responsible for operating and providing the necessary periodic or extraordinary maintenance needed; on the other hand, in a PPP contract, this responsibility alongside the corresponding risk are both transferred to the private investor, who is only then compensated by the state or the end-users. It is generally argued that the cost of operation and maintenance in most of the cases of large-scale infrastructure projects exceeds that of construction. Hence, the transfer to or sharing with the private consortium of this significant cost and risk indisputably improves the overall VfM of the project constructed under a PPP agreement in comparison to a traditionally procured one. Furthermore, it has been claimed that private sector companies with their expertise are able to better address the risks inherent to a long-term capital-intensive project as opposed to public incumbents, which have been accused to not efficiently deliver services to the general public and to not follow the principles of open market, which can guarantee the production and the distribution of a good or a service to the lowest possible price and at the highest possible quality through competition.

Of course, the quantification of the risk transfer between public sector and private consortium is not an easy task, while it has been argued that the public sector never truly alienates from the risks transferred to the private sector as the government is

⁶⁸ Yescombe (n 48) 21.

⁶⁹ Ibid 18.

⁷⁰ Alloisio and Carraro, (n 3).

always the residual risk holder should the consortium somehow fail⁷¹. This can lead to a ‘privatize-gains-socialize-losses’ situation, where such contracts would be regarded as win-win for private investors and lose-lose to rest of the society.

It has also been rightfully so suggested that the involvement of private sector companies not only in the construction of a multi-billion-dollar worth of infrastructure project, but also in the operation stage, add to the VfM argument compared to a traditionally procured publicly operated project, as a result of the special experience, that the private sector would infuse. Private firms are thought to be better equipped to address the plethora of risks and challenges associated with the construction and appropriate operation of complex infrastructure assets, as they can have access to contemporary and innovative methods and can employ the elite of employees, who are trained to meet the needs of such demanding projects.

Moreover, it has been suggested that due to the character of the PPPs, private components can push the limits by proposing an innovative solution whether in design of the facility or the method delivering the service, and thus enhancing the VfM element of the project procured⁷². As already mentioned, PPP contracts focus not on the input specifications, but rather public authority, when procuring a PPP agreement, is responsible to specify the needed output of the project; this permits the private counterpart to come up with new and innovative solutions that will meet the standards set by the public partner, but also yield a reasonable return for the capitals invested. On the other hand, though, it is well known that major private sector bidders are mostly staffed by people, who had already followed a career in the public sector; thus, it would be contestable to argue that, as soon as the same employees leave public sector, they become innovative and many have suggested that it is the system to be blamed rather than the people. It can also be supported that employees in the private sector are incentivized to be more innovative by taking more risks in comparison to their public sector counterparts, despite that it is generally accepted that a Public Authority, which already operates similar Facilities, is likely to have the best detailed knowledge of what can (and cannot) be done to make them better. It has to be mentioned that several types of PPP contracts, which exhaustively list their specifications and details, may ultimately discourage innovation.

A major advantage of PPPs, that advocates have always presented, is that this collaboration between public and private sector provides for significant efficiency in the construction of an asset or the delivery of a service. Private sector, which is profit-motivated, is incentivized to exploit the profit margins by increasing its efficiency, whereas public sector, and more specifically SOEs have been notorious, as being inefficient in delivering public services; SOEs, particularly in developing countries,

⁷¹ Anthony Boardman and Mark Hellowell, 'A Comparative Analysis And Evaluation Of Specialist PPP Units' Methodologies For Conducting Value For Money Appraisals' (2016) 19 *Journal of Comparative Policy Analysis: Research and Practice*.

⁷² Yescombe (n 48) 23.

have historically been linked to redirecting funds away from more productive and welfare-enhancing uses⁷³. Assessing the performance of PPP agreements in the Latin American energy, telecommunications and water sectors, it has been argued that service quality rose across all three sectors, measured by frequency and length of service interruptions (energy), quality of telephone calls (telecommunications) and potability and service interruptions (water)⁷⁴. Furthermore, it has been suggested that efficiency gains in PPP procured projects is directly linked to considerable rise in employment productivity rates, as a result of substantial reduction in employment⁷⁵. Esteemed researchers though, have seriously doubted that efficiency gains from PPPs can be of significant importance and even suggested that they could possibly be offset by the typically higher borrowing costs faced by the private sector, as well as the significantly higher transaction costs of PPPs⁷⁶.

Other Advantages

Economies of Scale

A well-structured PPP framework, that encourages private participation, can boost investments in public infrastructure. Larger, technically complex and capital-intensive infrastructure projects can be designed, constructed and operated by a consortium of private companies, that may include civil works design offices, construction firms, banks, management experts, consultants and accountants. In the absence of these private investors, a complex project may not be able to be executed in one stage, and thus a number of different smaller projects would have to be procured by the government. By successfully procuring larger scale infrastructure projects, economies of scale can be achieved resulting in savings in the initial capital cost; also, in some cases speeding up construction can result avoiding construction-cost inflation, which might otherwise push up costs over a more prolonged construction period⁷⁷. On the other hand, it is arguable that a significant rise in the demand in the construction sector can legitimately challenge relevant capacity, while simultaneously it may lead to an increase in prices, and thus, offsetting any possible benefits relevant to increased VfM. Furthermore, smaller size construction companies might be discouraged to take part in signing a PPP contract due to the complexity or size of the project under procurement, thus reducing competition and ultimately having negative impact on the final cost.

⁷³ Michael J Trebilcock and Mariana Mota Prado, *What Makes Poor Countries Poor?* (Edward Elgar Publishing 2011).

⁷⁴ Luis Andrés, *The Impact Of Private Sector Participation In Infrastructure* (World Bank 2008).

⁷⁵ Trebilcock and Rosenstock (n 18).

⁷⁶ Hui Jin, and Isabel Rial, 'Regulating local government financing vehicles and public-private partnerships in China' (2016) IMF Working Paper WP/16/187, Washington, DC: IMF.

⁷⁷ Yescombe (n 48) 20.

Transparency – Accountability

Public sector accounting has failed to record the true costs of infrastructure, which is operated under public control. On the contrary, a PPP contract, which is legally binding for both the public and the private sector, lists in detail the cost for constructing and for operating and maintaining the asset. The total real cost for the facility becomes clear and the public sector is forced to make choices about how services are to be delivered and paid for⁷⁸. It is to each party's interest to correctly calculate the total cost of the project, because only then, they can decide whether the risk transfer agreed is adequately compensated by the fees agreed and in reverse, whether the fees paid correspond to the risks taken by the counter party. When transparency is promoted, accountability of the public servants can also be achieved; in light of the true costs of different options for the construction of an asset or the provision of a service, public sector officials can be held responsible for their choices and hence, they are motivated to justify them, however uncomfortable this may be.

When comparing the costs between a PPP agreement and a traditional public-sector procurement method, it is important to ensure that like is being compared with like. A PPP agreement most often includes the cost of operating and maintaining, which under no circumstances can be deemed trivial. These costs may represent the lion's share of the total value of that contract. Thus, when comparing the cost of a traditional procurement contract, which only includes the initial cost of constructing to the overall cost of a PPP contract, we ought to have in mind that the latter includes services that are not part of the traditional contract and not to draw oversimplified conclusions.

On the other hand, it is arguable that, due to commercial confidentiality issues raised by the private firms involved in PPP contracts, the aforementioned transparency remains only on the level of the public authority responsible for constructing this asset or providing these services, and unfortunately doesn't include the general public. In this point, a distinct line must be drawn between on the one hand, the legitimate right of private firms' valuable commercial secrets not to be revealed to their competitors, and on the other, the constitutional right of providing to general public the necessary information, so as anyone interested can evaluate and conclude on whether the standard of general public good has been met.

PPP's Costs

In the literature, it is quite often to be suggested that the financing cost of a PPP exceeds that of a comparable standard public procurement contract⁷⁹.

The private consortium, that undertakes a PPP, establishes a special purpose vehicle (SPV) that signs the relevant contracts with the government and other private suppliers and external partners; according to researchers a SPV is legal entity created for narrow, specific, or temporary objectives, in which private-owned percentage is a

⁷⁸ Ibid 24.

⁷⁹ Jesse Griffiths and others, *Financing For Development Post-2015* (Publications Office 2014).

good proxy to measure private investment⁸⁰. This legal entity is responsible to agree the terms and sign loan agreements with major capital lenders, such as international funds, institutional investors and development banks. Financing projects under PPP procurement method often involves high leverage with debt making up between 70 and 90% of the relevant requirements⁸¹. The cost of capital, though, of a private sector company, even if it is a multi-national consortium of numerous well-established private firms, will be higher than the cost incurred by the public sector borrowing the same amount of money by issuing state bonds. A study that focused on PPP projects undertaken in the EU market found that the interest spread between private and public debt offering ranged in the 100–160 basis point range, depending on the risk profile of the project⁸². This is due to the perception that those lending money to a government are facing minimum danger, as national states hold generally sound credit rates and sparsely go bankrupt, whereas lenders to a PPP project are taking greater risk by investing in companies delivering a complicated project, that may end up as a financial disaster. Though, it has been suggested that the inherent risks of a project don't just disappear just because public sector decides to procure and fund it in a traditional way, and thus, these risks are ultimately retained by the public sector and constitute a concealed cost that only if it is added up to the public sector's lower financing cost, a fair comparison can be made with the raised financing costs of a PPP contract⁸³.

PPP advocates have suggested that increased financing costs would be offset by the gains resulted from risk transfer and better risk management that a PPP contract could achieve⁸⁴. Regarding developing economies, the issue of increased financing costs of a PPP comparing to public-sector financing rates is more complicated because governments of the relevant countries may face borrowing rates that could be less favorable than those of the private sector firms. Some Latin-American states, that have flirted with bankruptcy, addressed high private sector borrowing costs driven by the threat of non-payment by the state, by providing a form of insurance⁸⁵. They established a 'guarantee fund' through which the revenues and cash flows of the private partner, which are comprised both by user fees and direct government payments, remain unharmed in case the state is in default⁸⁶. These schemes aim at encouraging greater

⁸⁰ Huanming Wang, Yuhai Liu, Wei Xiong, and Jinbo Song, 'The moderating role of governance environment on the relationship between risk allocation and private investment in PPP markets: Evidence from developing countries' (2019) *International Journal of Project Management*, 37 117.

⁸¹ Frederic Blanc-Brude and Roger Strange, 'How Banks Price Loans To Public-Private Partnerships: Evidence From The European Markets' (2007) 19 *Journal of Applied Corporate Finance* 94.

⁸² Trebilcock and Rosenstock (n 18).

⁸³ Yescombe (n 48) 18.

⁸⁴ Blanc-Brude and Strange (n 81).

⁸⁵ Trebilcock and Rosenstock (n 18).

⁸⁶ This is particularly the case of 'sponsored concession' which has been utilized in Brazil. See further in: Mauritio Portugal Ribeiro and Amo Meyer, 'Private Participation In Infrastructure –

private participation and competition from market participants, but special consideration must be taken regarding the cost of establishing and administering such guarantee funds and the impact on the final total cost of a PPP contract.

Furthermore, total costs can be increased not only by government guarantees schemes, but also when governments decide to provide for various forms of subsidies to private investors in order to attract foreign direct investment or to stimulate private investment in specific market sectors⁸⁷. Finally, as PPP contracts are often especially complex and with a significant number of stakeholders, it has been calculated that, costs incurred for legal, technical and financial advice can reach up to 10 per cent of the total cost of the project⁸⁸, while others have suggested that only monitoring of such contract can range between 3-5 per cent of projects costs for typical projects and can climb up to 10-12 per cent for new, untested projects⁸⁹.

Complexity

Public procurement of major projects is already a difficult multi-stage procedure; but it is evident that PPP procurement method adds an extra layer of complexity in terms of more complex contractual terms and the establishment of a different relationship between the government and the private partner, who will also operate the project in the future⁹⁰. As already mentioned, PPP contracts provide for output criteria regarding performance of the private partner rather than assessing the fulfillment of the necessary works by the private contractor under traditional public procurement methods based on input specifications; but PPPs may include more elaborated terms and performance criteria of properly operating an infrastructure asset of major importance, such as an airport, that the public partner is required to specify⁹¹. Hence, PPP contracts most often end up as agreements containing a plethora of contractual provisions that are expected to be as clear and transparent as possible in order to specify each other's responsibilities and enforceable outcomes and to efficiently allocate risks between

The Legal And Regulatory Frameworks In The Case Of Brazil' (2007) OECD Global Forum on Governance: Strategies and Tools for Change, Rio de Janeiro, Brazil.

⁸⁷ Elva Bova, Marta Ruiz-Arranz, Frederik Tascani, and Elif Ture, 'The Fiscal Costs Of Contingent Liabilities: A New Dataset' (2016) IMF Working Paper Washington, DC: IMF.

⁸⁸ Enduado Engel, Ronald Fischer and Alexander Galetovic, 'The Economics Of Infrastructure Finance: Public-Private Partnerships Versus Private Provision' (2010) Documentos de Trabajo No 276 Santiago de Chile: Centro de Economía Aplicada, Universidad de Chile.

⁸⁹ Rajeev J Sawant, *Infrastructure Investing: Managing Risks & Rewards For Pensions, Insurance* (John Wiley & Sons 2010).

⁹⁰ Jean-Etienne de Bettignies, and Thomas Ross, 'The economics of PPPs' In Graeme Hodge, Carsten Greve, and Anthony Boardman, (eds.), *International handbook on public-private partnerships* (Northampton, MA: Edward Elgar 2010) 132–158.

⁹¹ Daniels and Trebilcock (n 58).

partners, but also to retain flexibility so as to allow and encourage private sector innovation and to promote good faith between the parties⁹².

At the bid evaluation stage, under the traditional public procurement method the government is expected to decide based only on the lowest price offered by the private contractors; whereas in a PPP procurement method, the government has to take under consideration which option proposed by the private partner is viable and non-viable, and which proposition adds more VfM to the project, as discussed above⁹³. The complexity regarding drafting contractual provisions and evaluating bid offers translates into longer procurement period, which effectively may lead into erosion of the additionality advantage, because government is not able to process and sign contracts concerning the construction of added infrastructure assets or the provision of additional services. Furthermore, the government in view of attempting to address this extra complexity has to employ specialized external legal, financial and technical advisors, who also increase the total cost of a PPP contract. As the total procurement costs of a PPP contract can reach between 5-10% of the total 'hard' capital cost, this procurement method is not eligible for very small projects⁹⁴.

On the opposite side, regarding very large projects, PPP method is not a recommended either, because the addition of an extra layer of complexity may project's likelihood to fail. It is often suggested that the size of a PPP project is a good proxy of the complexity of the project⁹⁵. More complex projects are often related to higher transaction costs⁹⁶, which could prevent private investors from engaging in PPP projects; relative surveys have shown that the size of the project could prevent private investors from being involved in renewable energy PPPs, in particular, mainly due to complexity considerations and expected higher transaction costs⁹⁷.

Specifically, it is often suggested that the expected efficiency gains as a result of private investors' involvement, could potentially be significantly diminished by the

⁹² Darrin Grimsey and Mervyn K. Lewis, 'The Governance Of Contractual Relationships In Public Private Partnerships' (2004) *Journal of Corporate Citizenship*.

⁹³ Trebilcock and Rosenstock (n 18).

⁹⁴ Yescombe (n 48) 26.

⁹⁵ Alfredo Jiménez, Marcello Russo, Johannes Marcelus Kraak, and Guoliang Frank Jiang, 'Corruption and Private Participation Projects in Central and Eastern Europe', (2017) 57 *Management International Review* 775-792 ; Huanming Wang, Bin Chen, Wei Xiong, and Wu Guangdong, 'Commercial Investment in Public Private Partnerships-The Impact of Contract Characteristics', (2018) 46 *Policy & Politics* 589-606.

⁹⁶ Oliver Williamson, 'Transaction-cost economics: The governance of contractual relations' (1979) *The Journal of Law and Economics* 22 233.

⁹⁷ Jorge Fleta-Asín, and Fernando Muñoz, 'Renewable Energy Public-Private Partnerships In Developing Countries: Determinants Of Private Investment' (2021) *Sustainable Development*, John Wiley & Sons Ltd 29 653-670.

transaction costs induced by both partners to a PPP agreement⁹⁸. Furthermore, the fact that the major comparative advantage of PPP procurement method, namely the increased VfM, could be hindered due to inflated costs and added complexity, would explain why governments often refrain from actively involving private investors to already highly complex infrastructure projects and why they tend to choose to deliver such infrastructural services by their own means instead of partnering with private companies⁹⁹. Furthermore, the complexity of a PPP project is often directly correlated to the performance of the project itself; thus, it has been stated that larger and -by virtue- more complex projects present a greater likelihood of failure¹⁰⁰. The managerial complexity, which can lead to the failure of a PPP project, has been attributed to the different -and often contradictory- interests and strategies of the multiple stakeholders, the harder and longer negotiations, or the longer contract periods, which can be more likely to lead to the materialization of unforeseen issues¹⁰¹; it has been underlined that larger PPP's development and realization process often suffer more due to unforeseen events¹⁰². Empirical data have shown that 90% of projects costing over 1 billion dollars suffer cost overruns and delays, hence, it has been suggested that private capital cannot be perceived as panacea for the ills in megaproject management¹⁰³. Thus, it is strongly advised that the size of PPP projects in the renewable energy sector be carefully defined in order to attract private investors¹⁰⁴.

⁹⁸ Daniel Albalade, Germa Bel, and Richard Geddes, 'The Determinants Of Contractual Choice For Private Involvement In Infrastructure Projects', (2015) *Public Money & Management* 35 87–94.

⁹⁹ Trevor Brown, and Matthew Potoski, 'Transaction costs and institutional explanations for government service production decisions' (2003) *Journal of Public Administration Research and Theory* 13 441–468.

¹⁰⁰ Jiménez, Russo, Kraak, and Jiang (n 95).

¹⁰¹ James Leigland, 'Public-private partnerships in developing countries: The merging evidence-based critique', (2018) *The World Bank Research Observer* 33 103–134.

¹⁰² Atif Ansar, Bent Flyvbjerg, Alexander Budzier, and Daniel Lunn, 'Big is fragile: An attempt at theorizing scale' In Bent Flyvbjerg (eds.), *The Oxford handbook of megaproject management* (Oxford University Press 2016) 60-95

¹⁰³ Bent Flyvbjerg, 'What you should know about megaprojects and why: An overview' (2014) *Project Management Journal* 45 6–19.

¹⁰⁴ Fleta-Asín and Muñoz 2021 (n 97).

Chapter 4: Risks in PPPs

Introduction

Each and every entrepreneurial effort or project is attributed by risks taken by those who bear the responsibility to provide for a good or a service and expect to receive adequate compensation for that reason. In general, risk is defined by the International Organization for Standardization as the ‘effect of uncertainty on objectives’¹⁰⁵. It has been suggested that risks are uncertain (expected or unexpected) possibilities, opportunities or threats that might happen in the future¹⁰⁶. A risk occurs when either the outcome or consequence of an activity or a decision is less than certain¹⁰⁷. Both the outcome and consequence of a decision could simultaneously be uncertain. Risks are most often scrutinized because they concern potential problems, such as a project parameter going wrong that can result in increased cost or cause delay. It could be something that wasn’t taken under consideration and could happen during the implementation period of the project, or something that had been foreseen, but unclear *ab initio*¹⁰⁸.

Hence, in this chapter, the characteristic element of PPP contracts, that differs them from the traditional procurement procedure, the allocation of risks between the public and the private partner, is going to be presented and evaluated. Additionally, we are going to refer to the typical risk management procedure and necessary steps undertaken in the development of any new project, including those developed under a PPP agreement. Finally, the scope of this chapter will be to exhaustively present all potential risks throughout the entire life-cycle of a project developed under a PPP financial scheme, and to attempt to point out which of the two partners would be better off bearing each risk.

Risk Allocation & Risk Management in PPPs

PPP contracts are considered to be of a more complicated nature due to the involvement of a large number of stakeholders, complex project arrangements and elaborate terms and provisions regarding financing, documentation and taxation¹⁰⁹.

¹⁰⁵ International Organization for Standardization, ‘ISO 31000: Risk management – Guidelines’ (2018). <https://www.iso.org/obp/ui/#iso:std:iso:31000:ed-2:v1:en>

¹⁰⁶ Huanming Wang, Wei Xiong, Guangdong Wu and Dajian Zhu, ‘Public–Private Partnership In Public Administration Discipline: A Literature Review’ (2017) 20 *Public Management Review*.

¹⁰⁷ Catherine Boothroyd, and Jeremy Emmett, *Risk Management: A Practical Guide for Construction Professionals*, (Wetherby & Co Ltd 1996).

¹⁰⁸ Cliff Hardcastle, and Kate Boothroyd, ‘Risk Overview in Public-Private Partnership’ In Akintola Akintoye, Matthias Beck, and Cliff Hardcastle, (eds.), *Public-Private Partnership: Managing Risk and Opportunities* (Blackwell Science 2003) 53-79.

¹⁰⁹ Grimsey and Lewis (n 19); Pamela Bloomfield, ‘The Challenging Business of Long-Term Public-Private Partnerships: Reflections on Local Experience’ (2006) *Public Administration Review* 400–411; Nunzia Carbonara and others, ‘Risk Management In Motorway PPP Projects: Empirical-Based Guidelines’ (2015) 35 *Transport Reviews* 162–182.

Hence, the element of risk is inherent to PPP contracts as it is the case to any long-term contract between two different parties; the innovative element of PPPs mainly comparing to regular procurement procedure is that different risks are distributed to each contracting party. The basic principle of risk allocation during the implementation of a PPP contract suggests that different risks should be allocated in a way that maximizes project value, taking account of moral hazard, adverse selection and risk-bearing preferences¹¹⁰. Thus, it has been implied that risks, which could be controlled -even partially- by one party, should be borne by the partner best equipped to control them; when a party is responsible to address a risk, over which it has some degree of control, only then this party will be adequately incentivized to be efficient at dealing with that risk. On the other hand, regarding exogenous risks, meaning those risks that cannot be efficiently controlled by either party to a PPP contract, they should be shifted to the party best able to bear or diversify it. Risk allocation procedure needs to seriously consider the nature and size of the risk and the impact of each risk on each participant of the project¹¹¹.

Risk management is officially defined as a formal process of ‘coordinated activities to direct and control an organization with regard to risk’¹¹² and is considered as an iterative process¹¹³. The risk management process in PPP projects differs radically comparing to conventional public projects where the public agencies come to an agreement with a bidder (i.e., a private contractor firm) who is solely responsible to construct and develop the project agreed, and where financial and operational risks remain with the public sector¹¹⁴. Concerning traditional procurement method, taxpayers, through the procuring agency, are ultimately responsible for most of the risks during the construction of an infrastructure asset or the provision of a service, perhaps with the exception of availability and service quality risk, which are borne by the end-

¹¹⁰ Timothy Irwin, *Government Guarantees: Allocating and Valuing Risk in Privately Financed Infrastructure Projects* (Directions in Development Infrastructure Washington, DC: World Bank 2007).

¹¹¹ Bing Li, Akintola Akintoye and Cliff Hardcastle (2001) ‘Risk analysis and allocation in public private partnership projects’ In Akintola Akintoye (eds), *17th Annual ARCOM Conference*, (University of Salford, Association of Researchers in Construction Management 1 Sept 2001) 895-904.

¹¹² International Organization for Standardization (n 105).

¹¹³ Ezekiel Chinyio, and Alasdair Fergusson, ‘A construction perspective on risk management in public-private partnership’ In Akintola Akintoye, Matthias Beck, and Cliff Hardcastle, (eds.), *Public-Private Partnership: Managing Risk and Opportunities* (Blackwell Science 2003) 53-79.

¹¹⁴ Xiao-Hua Jin and Guomin Zhang, 'Modelling Optimal Risk Allocation In PPP Projects Using Artificial Neural Networks' (2011) 29 *International Journal of Project Management*; Fida Siddiqui and others, 'Barriers In Adoption Of Building Information Modeling In Pakistan's Construction Industry' (2019) 12 *Indian Journal of Science and Technology*.

users¹¹⁵. Risk management is of significance importance both to the public agency and the private partner in their mutual attempt to agree on the terms and provisions of a PPP contract, especially in the sector of technological infrastructure projects¹¹⁶.

A number of authors have established different risk management frameworks in the context of PPPs¹¹⁷. The majority of the academia agrees that risk management process is often divided into three separate stages:

1) Risk identification of the relevant and potential risks: the initial stage is to trace and identify all possible risks that can arise during the implementation of a complex and long-term project, as is mostly the case with PPP-procured projects. There have been proposed a number of different methods and strategies for risk identification; it can be based on personal and corporate experience, intuitive insights, brainstorming, research, interviews and surveys, or through consultation with experts.

2) Risk evaluation of potential risks: the following step is equally important as the first one; evaluation of the potential consequences has to be conducted should any of the already identified risks materializes. This stage of the risk management process is two-fold; it is anticipated to attempt both to estimate the probability by which a risk might occur during the PPP implementation period and to assess to what extent it may impact the anticipated and agreed results of a PPP contract, because it has already been mentioned that this procurement method is based on output or performance criteria. There are several strategies on how to assess risks. A common one is by evaluating every risk via its probability, while others focus on assessing only the main risks and concentrate on key issues.

3) Risk mitigation: the final step is about figuring out methods by which the probability of these risks occurring is reduced and risk impact is decisively eliminated. A plethora of methods can be utilized, such as risk elimination, which refers to actions taken to avoid risks, risk reduction, which is about the minimization of risks, risk transfer which means transferring risks to insurance companies or specialists and risk retention which is about risks being absorbed by the organization.

Hence, a comprehensive risk management method is required for successfully implementing a PPP agreement; a number of theoretical frameworks have been

¹¹⁵ Eduardo Engel, Ronald Fischer, and Alexander Galetovic, 'Public-Private Partnerships: Risk And Public-Private Partnerships' CESifo DICE Report 3 3 /2014.

¹¹⁶ Shabir Hussain Khahro, Thauha Hussain Ali, Shafiqul Hassan , Noor Yasmin Zainun, Yasir Javed, Shahbaz Aziz Memon, 'Risk Severity Matrix for Sustainable Public-Private Partnership Projects in Developing Countries'

¹¹⁷ Robert Rybnicek, Julia Plakolm and Lisa Baumgartner, 'Risks In Public-Private Partnerships: A Systematic Literature Review Of Risk Factors, Their Impact And Risk Mitigation Strategies' (2020) 43 Public Performance & Management Review.

proposed for conducting such analysis. Those different frameworks have in common the following: the public sector is anticipated to cooperate with the private sector participants in outlining the full spectrum of potential risks that may appear throughout the life of a PPP project. Specifically, it has been suggested that the source of the risk must be identified firstly and then its effects must be assessed or analyzed¹¹⁸.

Furthermore, each PPP participant has to establish the capability of dividing identified risks into those best managed by the public agency, those best managed by the private participant and those best managed by a third party, such as an insurance company. In contrast to what is usually happening, public sector is strongly advised to be able to assess its own risk exposure¹¹⁹. Additionally, private player should be in a position to accurately model the risk, that is expected to bear, and exhaustively evaluate its own ability to deal with these risks, using a two-dimensional risk impact measurement framework regarding severity and frequency. It is expected that the private firm will put a price to the risk that will bear and subsequently pass this cost to the public sector through its bidding offer. The relevant contract will easily be awarded, unless the cost of risks is deemed by the public agency as unacceptable. Should private sector's tariff be considered higher than calculated and anticipated, public sector may proceed by negotiating the final terms of the contract with the private bidder, and consider whether to accept the higher cost of risk proposed, or to alter the final risk distribution scheme under the PPP contract, or to abandon the PPP method by retaining itself all relevant risks¹²⁰. The need to conduct the negotiation between public and private sector in a way that will prohibit or practically discourage corruption so as to extract the best value for money for the general public, has been repeatedly outlined¹²¹. It must not be dismissed that increased cost may put off the public sector from ultimately signing a PPP agreement and encourage to follow a traditional public procurement method¹²².

Thus, it is only logical that both public agencies and private bidders in a PPP procurement scheme should step in and actively participate in the process of analyzing and managing risks separately since they have different objectives and interests and almost every other party involved in a project should analyze and manage the risks

¹¹⁸ Peter Thompson and J. G Perry, *Engineering Construction Risks* (Thomas Telford 1998).

¹¹⁹ Christopher Lewis, and Ashoka Mody, 'The Management of Contingent Liabilities: A Risk Management Framework for National Governments' In Timothy Irwin et al., (eds.), *World Bank Latin American and Caribbean Studies Viewpoints: Dealing with Public Risk in Private Infrastructure* (Washington) 131-153.

¹²⁰ Li, Akintoye and Hardcastle (n 111).

¹²¹ E Bennett, 'Public-private cooperation in the delivery of urban infrastructure services (water and waste)', (1998) PPPUE Background Paper, UNDP/Yale Collaborative Programme.

¹²² SG Hambros, 'Public-Private Partnerships for Highways: Experience, Structure, Financing, Applicability and Comparative Assessment' (1999).

relevant to its participation¹²³. The successful execution of the overall project risk analysis and management is heavily dependable on sharing each party's input with the rest of the project participants, and subsequently, cooperative strategies in procurement are eagerly bolstered¹²⁴. Once the risk allocation is agreed, both parties (public and private sectors) can go to risk mitigation and treatment stage.

This thesis will focus on presenting the most common risks, that appear during the implementation of a PPP agreement; the ways by which these risks are to be mitigated or even eliminated are out of the scope of this thesis, but can be the subject of a future research.

Technical & Technological Risks

As it is already mentioned, complex projects are most often procured under the PPP procurement method. Thus, this complexity is only logical to pose a series of threats and risks during the implementation of a PPP agreement regarding the technical requirements and standards that each such project needs to meet during the construction and operation phase.

First of all, it is well anticipated that during the construction phase of a complex project, such as a nuclear power plant, a highway, or a rail network, completion times and final cost may considerably exceed initial projections. It is often suggested that large construction companies are liable to bear this risk and pursue diversifying it over a pool of different projects and charging the risk premium to concessionaires¹²⁵. By contrast, under public provision procurement method, relevant construction risks are usually borne by contractors, but the repeated occurrence of renegotiation may imply that those risks are ultimately shifted back to taxpayers¹²⁶.

But even before the construction of a project, the stage when it is designed is equally important and can also lead to significant cost overruns and time delivery delays. Usually design risk is borne by the private partner too; the private firm is responsible to design the facility in such a way as to deliver the services anticipated by the public and to fulfill the output or performance-based criteria set by a PPP agreement. The difficulty lies in the fact that the public sector or the general public may be unable to fully understand the design concepts and how these will ultimately be implemented; for example, the quality, size, aesthetics etc. of facilities are usually not fully

¹²³ Ali Touran, Paul Bolster, Scott Thayer, 'Risk Assessment In Fixed Guideway Construction' (1994) Publication/ Report Number DOT-I-85-26, Federal Transit Administration, US Department of Administration, Washington.

¹²⁴ Chris Chapman, 'Project Risk Analysis And Management—PRAM The Generic Process' (1997) 15 International Journal of Project Management.

¹²⁵ Frederic Blanc-Brude, and Dejan Makovsek, 'Construction Risk in Infrastructure Project Finance' (2013), EDHEC-Risk Institute Working Paper.

¹²⁶ Engel, Fischer and Galetovic (n 115).

comprehended by the clients until after construction, when it is impossible or expensive to change.

Furthermore, the stage of commissioning a project, which pertains to the transition from the construction phase to operation, is a key one and is often associated with a lot of risks and dangers. In case that the private firm is unable to timely commission a project due to either substantial or minor reason, it is highly expected to be held responsible and pay penalties provided for by the PPP agreement for such defaults. Additionally, failure in commissioning a project on time could trigger-off protests from concerned organizations and members of the public, a risk often described as social risk. Since the facility is commissioned, private partner is responsible to operate it under the terms and conditions set under the PPP contract and simultaneously within initial cost forecasts and not at a loss that would threaten the viability of the project over the long-term horizon of the agreement. Thus, operation risk is an important risk that private partner is expected to bear and subsumes miniature risks like security, energy consumption, welfare, communications, etc.

Relevant to operational risk is performance risk and availability. The concessionaire is bound to provide for the services agreed on the PPP contract and is liable in case it is unable to fulfill this obligation due to technical reasons. Availability provisions are related to facilities being on hand for use by the ultimate end-users and are especially common in PPP agreements concerning the operation and maintenance of highways, where special and specific terms are provided for in case of road closures. Finally, technical concerns regarding the effective and efficient functioning of equipment, materials, processes may ultimately affect the residual value of the facility; in most of the cases under the PPP scheme, private firm is granted a period to operate and exploit a facility by receiving the relevant revenues in order to cover its initial expenditure for constructing it. After that period, private firm is often obligated to return the facility at an already agreed specification. Thus, private partner has to balance on the one hand, the need to be compensated for the initial capital invested in the construction, and on the other hand the obligation to maintain the facility at a pre-agreed condition, when it hands over to the public sector. Residual values are critical to public agencies that will inherit many of the facilities which are used to deliver services. Under some PPP contracts, though, the facilities do not revert back to the public sector, but remain with the private partner, who will continue to maintain and use them for service delivery.

Technological risk lies at the fact that the technology underpinning a certain service can become obsolete; this is mostly the case with the IT sector. Most of the PPP agreements aim at upgrading the services once been provided for by the public sector and at keeping pace with technological advancement in the global market. Thus, it is only logical that, unless specific terms and conditions in PPP contracts arrange for addressing permanent and continuous technological advances, general public may become disenchanted with the PPP procuring scheme.

However, technological risk might be viewed by a different perspective as well; it is expected that private investors will not be keen on investing a project concerning the development, operation and maintenance of an infrastructure asset that adopts a new and thus, relatively immature technology. As this technology steadily gets more advanced and mature, thus the relevant technological risks are gradually diminishing, the appeal of that technology steadily will grow among potential private investors. The evolution of the renewable energy technology is a prominent example of that argument; during the last two decades, the leap in the technology development has impressively reduced electricity generation cost from renewable energies, making them direct competitors to carbon-intensive sources, and thus boosting private investors' interest to fund such projects¹²⁷. Especially during the time of writing, the continuous escalation of the fossil fuel prices, and predominantly natural gas prices, has set energy generation from renewables to be considerably more affordable and competitive than from traditional fossil fuels sources. It has been pointed out that in UK the costs for future offshore wind capacity reduced by 47.2% between the 2015 and 2017 auction rounds, the costs of onshore wind by 50% since 2009 and those of solar cells by 80% since 2008¹²⁸. Furthermore, it has been mentioned that the improved competitiveness and capabilities of the manufacturers of renewable energy equipment, components and parts result in price reduction of wind turbines that leads in turn to lower costs for the installation and generation of wind power¹²⁹. Finally, as it will be presented in the following MENA region case studies, most developing countries have gradually adopted new legislative frameworks that are dominated by more ambitious GHG emission-reduction targets, policy and tax incentives, which prioritize power generation from renewable energies, and more pollution-related taxes; these measures could partly constitute a useful tool to mitigate the increasing impact of global warming in these areas¹³⁰. Ultimately, this progressive environmental legislation alongside developing maturing of the relevant technologies can be perceived as key drivers of renewable energy profitability, thus boosting private investment over time¹³¹. Thus, it has been

¹²⁷ Yu Sun and others, 'Low-Carbon Financial Risk Factor Correlation In The Belt And Road PPP Project', (2020) 35 Finance Research Letters.

¹²⁸ Giulia Ragosa and Peter Warren, 'Unpacking the determinants of cross-border private investment in renewable energy in developing countries' (2019) 235 Journal of Cleaner Production 854-865.

¹²⁹ Sufang Zhang, Philip Andrews-Speed, Xiaoli Zhao, and Yongxiu He, 'Interactions Between Renewable Energy Policy And Renewable Energy Industrial Policy: A Critical Analysis Of China's Policy Approach To Renewable Energies' (2013) 62 Energy Policy 342-353.

¹³⁰ Jacqueline Cottrell, and Tatiana Falcao, 'A Climate of Fairness-Environmental Taxation and Tax Justice in Developing Countries' (2018) Vienna Institute for International Dialogue and Cooperation Discussion Papers

¹³¹ Diego Lopez Talavera, Emilio Muñoz-Cerón, Juan Pablo Ferrer-Rodríguez, and Gustavo Nofuentes, 'Evolution of the cost and economic profitability of gridconnected PV investments in Spain: Long-term review according to the different regulatory frameworks approved' (2016) 66 Renewable and Sustainable Energy Reviews 233-247.

mentioned that the interest of private investors in engaging in renewable energy PPP projects in developing countries has increased over time¹³².

Political & Social Risks

Political risk can be defined as action of a government that serves as a threat to the profitability of a project¹³³. It fundamentally involves the political regime and the general political atmosphere in the country, where the PPP project is located, and is a variable of a considerable importance for any potential private firm, being foreign or domestic. Every investment, and especially those worth hundreds of millions of dollars, needs to be based on a solid and stable political and social environment. Thus, incidents of political turbulence or social unrest may significantly impede a PPP project's success and profitability.

Mostly in developing economies and third world countries, it has been witnessed that the outbreak of (civil) war, strife or coup d' etat can seriously endanger host government's support to the project. The new government or regime may come into power proclaiming their intention to renegotiate or unilaterally change the terms of PPP contract (obsolescing bargain)¹³⁴, or even annul the agreement, as a response to general public's frustration and dissatisfaction. They can even initiate a program of expropriating foreign companies that operate in the host country or seriously restricting currency transfers, which aim at fulfilling host government's political objectives. Furthermore, incidents of domestic political violence or inability to form a stable and long-term government and repeated elections may hinder general political stability and thus discourage investors to negotiate and sign a PPP agreement with the relevant public procuring agency in the first place.

It has often been suggested that the political and social dimensions of PPPs constitute a source for critical consideration¹³⁵. In most cases, PPP agreements concern large and complex infrastructure assets, the development of which via this relatively new procuring method, could provoke public sentiment, because it has been noticed that relevant employment rates haven't reduced and user fees have increased, but also that responsibility over assets, which deliver essential social services, has been shifted to private entities. The example of the water treatment sector in South America is only indicative; it is considered that the Limeira, Brazil water service PPP failure was attributed to criticisms about high fees and the failure to deal with workers, who were not transferred to the concessionaire¹³⁶. Similarly, the water service PPP in La Paz-El

¹³² Fleta-Asín and Muñoz 2021 (n 97).

¹³³ Kirt Butler, and Domingo Castelo Joaquin, 'A note on political risk and the required return on foreign direct investment' (1998) 29 *Journal of International Business Studies* 599-607.

¹³⁴ Henrik M Inadomi, *Independent Power Projects In Developing Countries* (Wolters Kluwer 2010).

¹³⁵ Trebilcock and Rosenstock (n 18).

¹³⁶ Luis J Guasch, *Granting and Renegotiating Infrastructure Concessions: Doing it Right*, (WBI Development Studies, Washington, DC: World Bank, 2004).

Alto, Bolivia, has been characterized as a failure as a result of public outcry from members of the community, that were excluded from service expansion – even though, researchers have argued that the performance under private operation scheme was rather successful¹³⁷.

Social issues during negotiation and implementation period of a PPP contract are often equated with protester risk, where some section of the community is actively against of a project or an aspect of it. A dimension of protester risk is that of vandalism. Thus, many observers and institutions, such as the World Bank, have stressed out that gradually building stakeholder and public support for projects through broader and more systematic consultations before the implementation of the projects is of paramount importance¹³⁸. Furthermore, it has been suggested that the state has to remain responsible for expanding access over crucial social services, rather than leaving it to the discretion of the private operator¹³⁹. It is obviously important that the project should be socially acceptable and that there should not be any adverse consequences as a result of the project. Both the private and the public sector would not wish to be pursuing a project that was going to be deemed to be unpopular with the electorate or have an adverse impact on society.

Legal, Legislative & Regulatory Risks

Legislative and regulatory risks are closely associated to political risk and the general institutional level of the host country, because changes in rules, laws and regulations are made as a result to changing social, political, economic and environmental circumstances and relevant pressure from those affected by them. It is not uncommon that a host government aiming to attract foreign direct investment and trying to upgrade its current infrastructure portfolio, passes on some favorable laws and regulations, by which it provides for tax incentives and/or price subsidies. But PPP contracts, as already mentioned, concern long-term projects and during their implementation period changes in the legislative and regulatory framework may occur, that can affect the profitability element of the relevant project. A sound, stable and coherent institutional environment has been reported to be positively affecting the likely of PPP's success¹⁴⁰. For example, in 1997 Sri Lanka passed on a regulation regarding Independent Power Producer (IPP) in third party mini-hydro developers and provided for standardized non-negotiable power purchase tariffs and contracts. However, in a period of two years purchase tariffs decreased from 5 cents/KWH to 3.5 cents. This

¹³⁷ Philippe Marin, *Public-Private Partnerships For Urban Water Utilities*, (Washington, DC: The World Bank, 2009).

¹³⁸ Daniele Calabrese, *Strategic Communication For Privatization, Public-Private Partnerships, And Private Participation In Infrastructure Projects*, (World Bank Working Paper No 139 Washington, DC: World Bank 2008).

¹³⁹ Marin (n 137).

¹⁴⁰ Jorge Fleta-Asín, and Fernando Fleta-Asín, and, 'How does risk transference to private partner impact on public-private partnerships' success? Empirical evidence from developing economies' (2020) 72 Socio-Economic Planning Sciences.

development seriously impeded financial viability of mini-hydro developers, stalled the market and ultimately discouraged further investments in this sector¹⁴¹. Another example of regulatory framework inconsistency can be seen in Tamil Nadu Electricity Utility Saga in India. India's IPP regulatory framework provided for long term tariffs, transmission wheeling and power banking. But in 2001, a national public company, Tamil Nadu Electric Utility, refused power wheeling and banking for new wind power generation. Additionally, it did not provide automatic annual increases in rates to adjust inflation¹⁴². Ultimately, this seriously tarnished investor's trust regarding India's governmental objectives on green power generation and hindered investments on wind power production.

Empirical evidence has shown that a better institutional environment can be a significant stimulus in attracting private funds to invest both in the renewable power generation¹⁴³ and other infrastructural sectors, such as the transportation¹⁴⁴, or the port services¹⁴⁵. In particular, regarding developing countries a sound institutional and regulatory framework can have a special impact in attracting foreign private investments, since public sector exerts a greater influence on market transactions in these countries than in the developed ones¹⁴⁶. Nonetheless, the importance of a clear, steady and stable regulatory and legislative environment is crucial even in cases, where large investments are planned to take place in the developed countries, as well. The case of Spain, where sudden and unexpected regulatory changes caused solar photovoltaic to turn very rapidly from a prosperous business into an unstable sector, is only indicative¹⁴⁷.

Changes in laws and regulations can come into effect by a local or a central government, or either on a regional level, such in the EU. It is common ground that regulatory changes implemented by the state, that affect only one PPP project and little else, such as measures that expressly aim at expropriating one concessionaire, should

¹⁴¹ Eric Martinot and others, 'Renewable Energy Markets In Developing Countries' (2002) 27 Annual Review of Energy and the Environment.

¹⁴² Ibid.

¹⁴³ Fleta-Asín and Muñoz 2021 (n 97).

¹⁴⁴ Marco Percoco, 'Quality of institutions and private participation in transport infrastructure investment: Evidence from developing countries' (2014) 70 Transportation Research Part A: Policy and Practice 50–58.

¹⁴⁵ Photis Panayides, Francesco Parola, and Jasmine Siu Lee Lam, 'The effect of institutional factors on public–private partnership success in ports' (2015) 71 Transportation Research Part A: Policy and Practice 110–127.

¹⁴⁶ Richard Hoffman, Jonathan Munemo, and Sharon Watson, 'International franchise expansion: The role of institutions and transaction costs' (2016) 22 Journal of International Management 101–114.

¹⁴⁷ Diego Lopez Talavera, Emilio Muñoz-Cerón, Juan Pablo Ferrer-Rodríguez, and Gustavo Nofuentes, 'Evolution of the cost and economic profitability of grid connected PV investments in Spain: Long-term review according to the different regulatory frameworks approved' (2016) 66 Renewable and Sustainable Energy Reviews 233–247

be borne by the government in order to prevent opportunism and moral hazard. On the other hand, actions taken by the government that can unintentionally affect a PPP contract among other sectors or the economy of the host state as a whole, such as a devaluation of the domestic currency rate, or a change in environmental standards that require additional investments in fitting more advanced filters, in principle are not to be borne by the government; in such case governmental authorities do not act opportunistically and a private partner in a PPP contract is in the same position as every other private firm in the economy. This principle is routinely overlooked¹⁴⁸.

Different to legislative and regulatory changes risk is legal risk. This refers to whether the public agency procuring a project via the PPP scheme is actually empowered to enter into this particular contract. There were incidents, where local authorities had signed contracts, and subsequently were found not to be empowered to do so. Legal risks mostly occurred during the initial period of PFI in the UK, and led private firms' certainty and trust towards public procuring agencies to be tarnished. For example, at that time it was not certain that an NHS trust was a legal entity entitled to sign a contract¹⁴⁹.

Financial & Economic Risks

PPP projects are mostly financed by the private partner and only rarely governmental aid is contributed during implementation period of the contract. Thus, all related risks are undertaken by the concessionaire and its financing partners, such as sponsors, insurers and lenders. Financiers are predominantly risk averse, and by scrutinizing all relevant risks and potential consequences aim to balance all possible benefits with the attendant risks. The general economic environment of the host country could be an important source of relevant risk factors hindering the involvement of private investors with PPPs; hence it has been identified by practitioners and academics that poor financial markets, inflation rate volatility, interest rate volatility or influential economic events constitute significant risk factors that can directly hinder the deployment of PPPs¹⁵⁰.

Different definitions concerning the term financial risks have been proposed. Schaufelberger and Wipadapisut suggest that currency exchange rates, inflation and cost of capital (interest rates) be included in the term of financial risk, while they consider as a different class of risks (operational) the unanticipated overruns in construction and operation costs¹⁵¹; Xenidis and Angelides define financial risks as

¹⁴⁸ Engel, Fischer and Galetovic (n 115).

¹⁴⁹ Hardcastle and Boothroyd (n 108).

¹⁵⁰ Li Bing, Akintola Akintoye, Peter Edwards, and Cliff Hardcastle, 'The allocation of risk in PPP/PFI construction projects in the UK' (2005) 23 *International Journal of Project Management* 25–35.

¹⁵¹ John E. Schaufelberger and Isr Wipadapisut, 'Alternate Financing Strategies For Build-Operate-Transfer Projects' (2003) 129 *Journal of Construction Engineering and Management*.

those that can 'have a negative impact on the cash flows of the financial plan in a way that endangers project's viability or limits profitability'¹⁵².

The concessionaire bears the responsibility to form an inclusive and comprehensive financing plan that will serve two objectives: the viability and profitability of the project. Thus, it must be structured in a way that will ensure the amount of necessary funds to develop and operate the facility and simultaneously that each party involved in the project will be adequately compensated for the capital invested and the risk undertaken. The necessary funds are raised either by the concessionaire's own funds or through loans from large financial institutions, banks or bondholders.

An interesting taxonomy of the different financial risks has been made based on the source of origin of each risk¹⁵³; the risks are categorized according to the generator of events or relationships that could jeopardize the viability and profitability of a PPP project into three main factors: the state (government, procuring public services, host society) as a client, the concessionaire (including all project participants from the private sector) and the market as a general economic framework, where the PPP project is expected to operate.

State-rooted risks

A prolonged negotiation period, which corresponds to higher legal and consulting fees and uncertainty about success of negotiations may put off private firms from bidding in the procurement procedure in the first place. Moreover, each and every private investor is highly concerned about the general economic stability and perspective of the host economy; an unstable economy, without positive perspectives, with underdeveloped stock market and structural deficiencies can jeopardize the viability of the project. Furthermore, a country that faces severe and structural economic problems, might be led to impose restrictions concerning imports or exports, in the form of increased tariffs, control imports permissions and restriction of allowance of foreign exchange or repatriation of profits. These policies not only increase the prices of goods and services but also seriously discourage foreign investors to come and invest in the host country. It has been suggested that stable macroeconomic conditions can reduce the likelihood of large changes in exchange and interest rates, thus reducing the need for governments to provide exchange rate guarantees or to discontinue currency convertibility or transferability¹⁵⁴. Furthermore, it has proposed that since currency inconvertibility and non-transferability, alongside expropriation measures, are under the direct control of the government, it is only logical that the latter will assume these

¹⁵² Yiannis Xenidis and Demos Angelides, 'The Financial Risks In Build-Operate-Transfer Projects' (2005) 23 *Construction Management and Economics*.

¹⁵³ *Ibid.*

¹⁵⁴ Mateen Thobani, 'Private Infrastructure, Public Risk' (1999) *The Newsletter of the International Project Finance Association*.

risks as well¹⁵⁵. Similarly, imposing restrictions on the rate of return of the PPP project's investment based on a plausible or fictional perception, that the concessionaire's activity is disproportionately profitable against the public interest, may discourage private partner from achieving best value-for-money objectives.

Concessionaire-rooted risks

Besides bearing the cost of designing, constructing and operating the facility under the PPP agreement and their possible overruns, as mentioned previously, private partner is also responsible to accurately forecast the future demand for the service provided or product produced. Accuracy in such predictions is the only tool that can ensure viability of the project and profitability for the concessionaire. An accurate forecast of the demand is expected to be based on proper use of reliable data through appropriate forecasting method -such as questionnaire surveys, performance of experiments, correlation of economic parameters, experience- and the right inference process that produces trust-worthy results that help the bidder to decide and submit a competitive tender¹⁵⁶. In different case, potential bidders could be misled and discouraged from participating in the relevant tender. Though, it has been supported that the concessionaire assumes the demand risk, but taxpayers are in fact purchasing an insurance contract, and ultimately, this option may not be cost-effective, as the private partner can never be completely sure about future policies, that can impact demand¹⁵⁷. In these cases, it has been suggested that either a present-value-of-revenue contract or availability payments could be the appropriate compensation schemes¹⁵⁸. An exception to the principle of transferring demand risk to the government has to be made: when the PPP is fully sustained by user fees and the private firms are eager to bid for the contract; this signals that bidders predict there is sufficient demand for that project. Closely interrelated to the demand/revenue risk is the risk regarding pricing of the product. Accurate pricing is heavily dependable on accurate estimate of the demand/revenue ratio in the lifecycle of the project, which further determines the product's future value. This process is based either on data provided by the government or the concessionaire's knowledge about the host country's market. These data and knowledge are acquired through market research and analysis. An unsuccessful pricing appraisal can cultivate false expectations, regarding the project's commercial success, and lead into insufficient revenue streams that can jeopardize project's viability.

The demand risk and overall pricing policy can explicitly affect the anticipated stream of revenues for the project procured under a PPP funding mechanism. It has suggested that the profitability of PPP projects is a relevant factor for attracting private sector partners, and infrastructure projects are generally characterized by high up-front costs and often need significant time to generate revenues, thus the underlying

¹⁵⁵ Li, Akintoye and Hardcastle (n 111).

¹⁵⁶ Xenidis and Angelides (n 152).

¹⁵⁷ John Hall, 'Private Opportunity, Public Benefit?' (1998) 19 *Fiscal Studies*.

¹⁵⁸ Engel, Fischer and Galetovic (n 115).

commercial risk is always present and crucial for the private investor's decisions¹⁵⁹. This means that demand for the services delivered and the size of the market constitute key drivers of private sector participation in PPPs¹⁶⁰. Hence, should private investors forecast that the realization of profit will be difficult, they might be extremely hesitant to be involved in such PPP agreements. In that case a remedy in the form of a purchase agreement is routinely exercised; the governmental authority is often willing to commit themselves into acquiring the product or the serviced provided under the signed PPP agreement in an attempt to secure the stream of revenues the private investor¹⁶¹. On the other hand, private investor would be presented with incentives to be more competitive, thus improving overall VfM, in the case that the stream of their revenues depended on market demand rather than if they were guaranteed a stream of revenues by the public authority; in fact, it has been suggested that in the case of renewable energy PPP projects, when the prime revenue source depends on the sales to electricity consumers, private investors have more incentives to be efficient and competitive, and thus are more attracted to invest in project with these characteristics, despite the fact that in a pool 1,371 renewable energy PPP project, 73% of them were financed through a purchase agreement with the state as a main revenue source, whereas only 12 per cent electricity fees were paid solely by retail and wholesale consumers¹⁶². Hence, it is the authors belief that the importance of a purchase agreement must not be underestimated, as it will be studied in the following case studies from the MENA region.

Another major financial risk, which the private firm is expected to bear, is that of structuring the necessary financial instruments. It needs to establish the appropriate combination of funding sources in order to financially secure the structure of the project and mitigate the relevant risks. During construction period, funds are raised from loans granted by financial institutions (banks, insurance companies, brokers, mutual saving banks, investment type financial institutions, trust companies, etc), equities and sponsor's own capitals, or through domestic funds, which may provide further insurance for the government regarding the successful completion of the project, but they are not easily raised due to weaknesses of the economies of developing countries (immature stock markets, lack of private funds, insufficient structure, etc.). For the securitization of the private funds invested it is usually promoted the connection between project financing and project progress. In this case though, project financing remains unsure should any complication in the completion process arise. During the operation/maintenance period, cash inflows are partially used for project financing and,

¹⁵⁹ Mona Hammami, Jean-Francois Ruhashyankiko, and Etienne Yehoue, 'Determinants of public-private partnerships in infrastructure' (2006) International Monetary Fund, Working Paper No. 6-99, Retrieved from <https://www.imf.org/external/pubs/ft/wp/2006/wp0699.pdf>

¹⁶⁰ Yao Yu, Robert Osei-Kyei, Ping Chuen Chan, Chuan Chen, and Igor Martek, 'Review of social responsibility factors for sustainable development in public-private partnerships' (2018) 26 Sustainable Development 515–524.

¹⁶¹ Jessica Kaminsky, 'Culturally appropriate organization of water and sewerage projects built through public private partnerships', (2017) 12 PLoS One.

¹⁶² Fleta-Asín and Muñoz 2021 (n 97).

therefore, a non-profitable exploitation of the project directly and negatively impacts the financial plan. Finally, a private partner to a PPP contract, as every private firm, faces the risk of bankruptcy, inability of debt service and lack of creditworthiness, which could result to smaller loans than required, with stricter terms, or even no loans at all, whereas an unfavorable economic environment of the countries wherein the main stakeholders of the private consortium are located and operate most of their business, can seriously hinder the ability to properly and adequately fund the project.

Market-rooted risks

The general market conditions, under which the private partner is anticipated to execute the long-term PPP contract is crucial for the successful implementation of the agreement. As already mentioned, an accurate estimate of the future demand for the service or the product offered by the concessionaire is of paramount importance for the viability and profitability of the project, but can be adversely affected by several parameters, among others the economic environment.

An increase of the inflation can cause not only the production costs to increase, thus negatively affecting product or service's competitiveness, but also end-users' purchase power to suffer, and thus, demand for the offered product or service to be adversely affected; significant problems may also arise in case of deflation. Currency risk impact is twofold as well; a possible devaluation of the currency is affecting end-users' purchase power and ultimately demand and, as in most cases PPP projects are funded via foreign capitals, a currency crisis alongside currency convertibility restrictions can create an imbalance between the revenues generated in local currency on the one hand, and loan repayments, supplies and shareholders' dividends paid in foreign currency on the other. Finally, a period of recession of the global economy can also greatly impact the successful implementation of a PPP contract as each national economy is crucially linked to all the others, and geographical borders' importance is diminishing in terms of trade and economic cooperation, as growing number of companies have cross-border business all around the world.

A stable and steady tax regime can attract foreign investments because the private firm can accurately estimate throughout the entire lifecycle of the project its profits based on previous calculations of its costs, part of which is the liable tax. Most often developing countries have been eager to provide for such tax provisions to foreign investors in order to boost their local economies. However, it is not uncommon for these provisions to be amended or annulled during the long implementation period of a PPP contract and new adverse tax provisions, such as increases in tariffs, taxes and custom duties, cancellation of tax relieves or exemptions, to be imposed, negatively affecting project's viability and profitability. Furthermore, a complete reformation of the local tax regime can end up by imposing new tax burdens to end-user, and thus affecting the demand for the product or service provided.

Finally, the general market conditions, under which the product or services provided through the PPP scheme, are expected to be offered are of considerable importance. As this thesis mainly focuses on large energy infrastructure projects, it is

not unusual for the concessionaire, via the framework established by the PPP agreement itself, to be anticipated to act as a player in an oligopoly market with the consequent advantages (e.g. larger market share, few competitors), but also disadvantages (e.g. pricing policy imposed by the market and tough competition)¹⁶³. However, an open-market-type competition can still occur. Hence, it is strongly advisable that the potential bidders, prior to structure their final offer, undertake a thorough analysis of the market conditions, such as structure and size of the market, market shares, intention of competition, competitive advantages concerning quality, promotion, etc. On the contrary, a rush and careless appraisal can actually endanger project's viability and ultimately its success.

¹⁶³ Xenidis and Angelides (n 152).

Chapter 5: Aspects of PPPs in the Energy sector: the case of MENA Region

Introduction

It has already been established that investments in the energy sector are absolutely necessary not only in the direction of improving -economic- efficiency of already existing and operating energy facilities, such as oil rigs and natural gas reserves, refining plants, transmission and distribution networks, but mainly in the direction of fulfilling a carbon-neutral climate-friendly future scenario, where now immature and expensive, yet clean energy sources will cover global population's energy needs. Furthermore, it has been suggested that the implications due to rising global temperature are expected to excessively impact standards of living in the developing countries compared to more developed ones for three reasons: agricultural sector is generally playing a pivotal role in the economies of developing countries, while simultaneously less advanced water management techniques are applied, leading these countries to be more exposed to adversary weather conditions; secondly, developing countries are usually located in hotter places, meaning that their eco-systems are closer to their biophysical upper limits, and, at least for now, there are no examples of human behavior and technologies being able to cope with these new looming conditions in these areas; thirdly, developing countries have generally demonstrated limited capacity to adapt due to less advanced technology capacity¹⁶⁴. Finally, it has been established that partnerships between public and private players, despite the risks posed to both participants, have already been utilized in a plethora of projects, that entail serving a public interest purpose. Thus, it has been repeatedly suggested that PPPs have been used to deliver public infrastructure services, among others in the energy sector as well, especially in the developing countries, that are facing unprecedented environmental and climate-related challenges among others¹⁶⁵.

In this chapter, the special characteristics of energy infrastructure investments shall be presented, alongside the role that institutional investors could play in this framework. Furthermore, an overview of the most recent data from the World Bank PPI project database regarding private participation in the electricity and natural gas sector shall be presented. Finally, the focus of this chapter is to examine the growth -or not- of energy-related PPP projects, the trends, and the related policy initiatives and strategies in MENA region in an attempt to shed light on the crucial determinants that influence the willingness of private investors to fund such projects and, that ultimately affect the success of such partnerships.

The Special Characteristics of Energy Infrastructure Investments

Large energy infrastructure projects are predominantly capital-intensive investments, in which large sums of money have to be invested up-front, and the

¹⁶⁴ Richard Tol, 'The Economic Impacts of Climate Change' (2018) 12 Review of Environmental Economics and Policy, 4–25.

¹⁶⁵ Ragosa and Warren (n 128).

investor is expecting to be compensated in a long-term horizon. Assets, that are considered to be conducive for long-term investment, are generally more illiquid and longer-term, and thus are perceived as riskier¹⁶⁶. However, an investor that funds a long-term investment anticipates to be compensated by the income generated by the investment, and is less focused on the financial and stock market value of the asset itself.

Constraints on Long-Term Investments

Long-term investment except for being considered as illiquid, and thus riskier, presents some additional constraints. Firstly, an investor before funding a long-term investment should always check if its liability profile suits the financial need of such a long-term commitment. If, for example, an institution is fairly expected to face a need to meet short-term obligations by liquidating a certain percentage of its assets, it is advisable not to be engaged in long-term investment decisions.

Secondly, it is suggested that long-term investments can be manipulated by behavioral constraints¹⁶⁷. In that sense, investment belief can lead investors to believe that long-term investments can be more profitable, whereas risk appetite pertains investor's tolerance against potentially higher losses. It has been suggested by behavioral economists that humans, and as an extension, investors tend to focus on recent past performance as a proxy for future performance, which is certainly not optimal when taking decisions on the unstable environment of the financial markets. Furthermore, behavioral researchers have argued that humans dislike losses about twice as much as we like similar gains¹⁶⁸.

Finally, some governance-related constraints can occur during the execution period of a long-term investment. For example, institutional investors, such as pension funds, often lack in-house investment management expertise and they outsource relevant services to external consultants and asset management team. Simultaneously, pension funds may often fail at effectively overseeing external consultants and thus, their long-term investment rights and entitlements are negatively affected. Moreover, investors generally will only be willing to take the plunge into investing in long-term infrastructure projects, as long as the general political environment is bolstering

¹⁶⁶ World Economic Forum, 'The Future of Long-term Investing' (2011), A World Economic Forum Report in Collaboration with Oliver Wyman, Geneva, Retrieved from https://www3.weforum.org/docs/WEF_Future_of_Long_term_Investing.pdf

¹⁶⁷ Isabella Alloisio, and Carlo Carraro, 'Public-Private Partnerships For Energy Infrastructure: A Focus On The MENA Region' In Stephano Caselli, Guido Corbetta and veronica Vecchi, (eds), *Public Private Partnerships for Infrastructure and Business Development* (2015).

¹⁶⁸ Richard Thaler, Amos Tversky, Daniel Kahneman, and Alan Schwartz, 'The Effect of Myopia and Loss Aversion on Risk Taking: An Experimental Test' (1997) 112 *The Quarterly Journal of Economics*, 647–661.

towards infrastructure development. Long-term investors are eager to be aware of the government's development plans beyond the current political circle¹⁶⁹.

Risk and Return in Energy Investment Decisions

In any entrepreneurial attempt, risk and return elements are integral part, so it is the case with capital-intensive long-term energy-related investments. The higher the perceived risk, the higher the desired internal rate of return (IRR) will be. However, each investor and lender have a different risk-return profile, which is manipulated by the type of capital they are willing to invest or lend.

169 Sophie Justice, 'Private Financing of Renewable Energy: A Guide for Policy Makers' (2009), UNEP, SEFI, Bloomberg Renewable Energy Finance, Chatham House, Retrieved from https://www.chathamhouse.org/sites/default/files/public/Research/Energy,%20Environment%20and%20Development/1209_financeguide.pdf

	Venture capital	Private equity	Insurance companies (life insurers)	Pension funds (defined benefit)	Bank mezzanine debt	Bank senior debt
Deployment	Equity investments in start-ups	Equity investments prior to initial public offering	Equity investments in private companies and projects	Equity investments in private companies and projects	Loans for emerging technology	Loans for proven technology
Investment Horizon (years)	4-7	3-5	15-20	12-15	≤6-7	≤6-7
IRR	>50%	35%	15%	15%	LIBOR + 700 bps	LIBOR + 300 bps

Figure 13: Deployment, IRR, and Investment Horizon by Source of Capital for Renewable Energy Projects

source: Isabella Alloisio, and Carlo Carraro, 'Public-Private Partnerships For Energy Infrastructure: A Focus On The MENA Region' (2015) Public Private Partnerships for Infrastructure and Business Development

Debt financiers, such as commercial banks are mostly concerned with ensuring that given loans are paid back on time, and hence they are willing to finance less risky projects and already established companies. On the contrary, early venture capitalists, who are aiming at maximizing their profits, are inclined to take higher risks by investing in new companies and technologies. As a result of the riskiness factor of the projects funded by venture capitalists, it could be required an IRR of 50% or higher¹⁷⁰ for ensuring this kind of funding. Simultaneously, private companies that may fund similar projects through equity are also inclined to invest in more established companies and technologies and still require an IRR of 35% taking under consideration a plethora of factors, such as the technology, relevant industry and the country at which the funded project is located. Under those circumstances, it has been suggested that major energy infrastructure projects as well as renewable energy investments could be funded by institutional investors, such as insurance companies and pension funds, which possess large amounts of capital, have lower expectations regarding investment returns and are willing to commit themselves in an investment project with significant longer investment horizon; in the case of life insuring companies investment horizon could reach up to 15-20 years, whereas for pension funds could be on average 12-15 years¹⁷¹.

The Role of Institutional Investors

Institutional investors could be a promising contestant regarding energy project financing; it has been suggested that under optimal conditions and with no policy barriers, they could meet 24 percent of project finance equity needs and 49 per cent of project finance debt needs in OECD countries renewable energy targets¹⁷². Furthermore, in the aftermath of the global economic crisis of 2008, new global regulatory frameworks were established, that aimed at ensuring short-term liquidity and solvency in the financial markets, such as the introduction of the Third Basel Accord (Basel III)¹⁷³. Although Basel III intended to set some minimum standards to the banking sector safeguarding its healthy operation after the shock of the Lehman Brother's collapse, ultimately it affected among others, energy projects developers as well, because the cost of borrowing for funding long-term energy projects increased, and most commercial banks were reluctant to issue long-term project finance loans due to new stringent regulations.

On the other hand, institutional investors such as pension funds and insurance companies, acting in a countercyclical manner, seeking to take advantage of new

¹⁷⁰ Alloisio and Carraro (n 167).

¹⁷¹ Ibid.

¹⁷² Ibid.

¹⁷³ Oshani Perera, 'Basel III: To What Extent Will It Promote Sustainable Development?' (IISD Report, 2012) Retrieved from <https://www.iisd.org/system/files/publications/basel3.pdf>

investment opportunities and willing to take the risk by investing in riskier assets, could be the solution to the problem of funding capital-intensive and long-term energy projects. With assets of almost USD 54 trillion held in 2020 by pension funds¹⁷⁴ and assets up to USD 40 trillion held by insurance companies worldwide¹⁷⁵, institutional investors could be the most promising source of funding for capital intensive energy infrastructure projects.

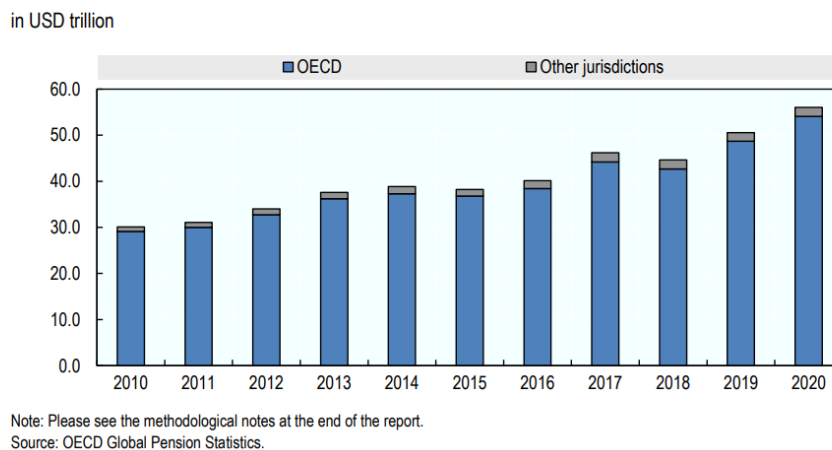


Figure 14: Total Amount of Assets in Retirement Savings Plans in the OECD Area and in Other Jurisdictions, 2010-2020
source: OECD Global Pension Statistics

Yet, institutional investors are said to be facing a number of structural constraints and policy and regulatory barriers¹⁷⁶. First of all, project financing of large, capital intensive and long-term investments such as those of energy infrastructure are liable for large transaction costs and require a high degree of specialization on the part of the investor, that many institutional investors may not be able to bear or may not possess, respectively. Furthermore, institutional investors, as any kind of investor, should not channel all of their capital to fund a single economic sector, such as energy, but instead they should diversify their investments portfolio aiming to minimize their exposure and hence risk. Additionally, different governmental incentivizing schemes, which would otherwise attract mostly foreign investors by providing tax credits, may be proved inefficient in attracting institutional investors such as pension funds, which are considered tax-exempt investors. Moreover, the operation of pension funds and insurance companies is highly regulated and thus, it has been suggested that investment in energy transmission projects is preferred because the commodity price and demand risks are lower comparing to renewable energy generation sector, which is highly

¹⁷⁴ See further in OECD, ‘Pension Markets in Focus 2021’, 2021, Retrieved from <https://www.oecd.org/daf/fin/private-pensions/Pension-Markets-in-Focus-2021.pdf>

¹⁷⁵ Data from statista.com, Jennifer Rudden, ‘Assets of insurance companies worldwide 2002-2020’, January 13 2022

¹⁷⁶ Alloisio and Carraro (n 167).

regulated as well, yet revenue risk is inherent and could severely hamper financial performance of these institutional investors. Finally, investment strategy of every investor, and thus institutional ones as well, is heavily depended to the general political stability and consistency of the country to which investors are intending to channel their funds; hence, an incentive policy, which is perceived as short-term and ambitious can ultimately have small or even negative impact on the attractiveness of investment¹⁷⁷.

Furthermore, similarly to financial regulation for banks, a new regulatory framework was established (Solvency II) that required European insurance companies to meet specific liquidity standards aiming to strengthen financial security. Hence, it has been suggested that this type of institutional investors is very likely to be disincentivized in investing in large energy projects, which are considered as illiquid, such as power generation via renewables¹⁷⁸.

The Role of Insurance Companies

Insurance companies are divided into two main categories regarding liquidity standards and liability profile. On the one hand, liabilities associated with life insurance assets are -in most cases- long-term and more predictable, because nowadays life insurance companies have established an elaborating and detailed way to accurately calculate life expectancy based on extensive data. Hence, life insurance companies are able to better and more efficiently manage their funds by investing into more long-term projects such energy-infrastructure-related ones, even though they are bounded by a 4% investment cap in illiquid assets. Thus, it has been suggested that the estimated allocation to illiquid investments of each investor's portfolio can be considered a good proxy for the propensity to invest in long-term and subsequently riskier investments¹⁷⁹.

On the other hand, nonlife insurance companies, such as property and casualty funds, are in most circumstances smaller companies and are bounded by more stringent liquidity standards and liability constraints. Contrary to life insurance companies, property and casualty counterparts have shorter investment horizons due to higher liability requirements and thus they eventually become sub-optimal for long-term investments in energy project finance markets. Finally, regarding reinsurance companies could potentially fit in the framework of funding long-term energy project-financed investments because, they are bounded by longer term and more predictable liabilities and in most cases, they possess very good expertise of the technology risk linked to energy investment.

The Role of Pension Funds

Pension funds are managed mainly by small funds. The size of a given fund, its ownership, the age of its members, as well as national differences are the main criteria that will ultimately determine the final investment strategy that each pension fund

¹⁷⁷ David Nielsen, and Brendan Pierpont, 'The Challenge of Institutional Investment in Renewable Energy' (2013) CPI Report.

¹⁷⁸ Ibid.

¹⁷⁹ Alloisio and Carraro (n 167).

intents to follow¹⁸⁰. Size is considered as one of the most important factors, because only the bigger pension funds have the necessary resources needed to discern between alternative investment opportunities, that will prove profitable in the long run, and those that are just too risky to tarnish future economic results. Furthermore, age does matter, and it is expected that the older the executive members of a fund get, the lesser they are inclined to assume riskier projects. Finally, a distinction has to be made between defined contribution plans, which usually have a shorter investment horizon and thus are expected to invest more in liquid assets, and defined benefit plans where the risk of poor performance remains with the plan sponsor, and thus it totally depended on the risk profile of the latter. Hence, pension funds that are structured on defined benefit plans are considered optimal to invest in longer term and thus riskier project-financed investments, rather than defined contribution plans.

Despite the fact that institutional investors have the potential to play a pivotal role in energy project financing, their footprint regarding green energy investments remain exiguous. It is worth pointing out that pension funds usually require an investment of more than 250 million in equity, with debt taken on to support the investment, in order to get involved in funding a project¹⁸¹. Furthermore, it has been suggested that worldwide there are about only 45 pension funds that have the capacity to directly fund investments in the renewable energy sector and that they are unlikely to make up more than 1 percent of an investor's total portfolio, due to liquidity constraints and the inherent need to diversify among different classes of illiquidity investments¹⁸².

Regarding developing countries, the case of funding long-term projects, that would potentially yield variable returns into the future, is even less appealing from an investor point of view, such as the institutional ones, mainly due to higher perceived political instability, and hence risk, and the expectation of higher average IRR than in OECD economies. Yet, life insurance companies and defined benefit pension funds could potentially play a decisive role in providing necessary equity for funding energy projects through project finance structure, which in the case of developing countries may consist of a high equity share of more than 30 percent.

The Role of Sovereign Wealth Funds

Sovereign Wealth Funds have accumulated high-valued liquid assets from the exploitation of hydrocarbon reserves and repeating current account balance surpluses. They have gradually emerged into being a key factor in the global financial markets by providing significant liquidity and shaping a new global financing framework that would put in the spotlight the then underdog of the global economy, namely the developing countries. Unlike, most prominent insurance companies and pension funds that originated from developed countries, mostly members of the OECD, SWFs mainly have their roots in one or more developing countries. Indicative of the SWFs' interest

¹⁸⁰ Ibid.

¹⁸¹ Ibid.

¹⁸² Nielsen and Pierpont (n 177).

in a promising, yet challenging sector, the energy sector, is the fact that only in 2013 their total energy investment imprint was US 5.2 billion¹⁸³.

In Middle East and North Africa (MENA) region are located many SWFs of the Gulf Cooperation Council (GCC) countries that have recently been leading the way regarding investments mostly in renewable energy in this very crucial part of the world. For many decades, national oil companies from MENA region have been exploiting and exporting to the rest of the world tremendous amounts of hydrocarbons, that have supported global economic growth and social advancement, while at the same time they have been accumulating vast oil wealth, at least for each country's political, economic and societal elite. At the present time though, and while simultaneously global economy slowly but irrevocably is transitioning towards more viable economic models, through promoting green energy and efficiency, these resourceful countries are eager to diversify their hydrocarbon-based economies and transform already accumulated oil wealth into a global renewable energy technological leadership. Furthermore, it has been suggested that GCC countries are supportive of investing in renewable energy not only due to strategic vision of safeguarding their geopolitical status regionally and globally, but also due to other and more pragmatic reasons; energy demand is expected to continue to rise exponentially due to significant population growth and greater urbanization¹⁸⁴. It has been calculated that MENA region population is expected to continue to grow in the next decades and up until 2050, whereas at the same time period population at the neighboring Europe is expected to continue to be at a downward path, mainly due to population ageing.

Hence, in this framework, population growth alongside urbanization will mathematically result into higher energy demand from MENA region countries that will only be met if additional investments in the energy sector are made. At accomplishing this goal, the role of an infrastructure fund, called InfraMed has been decisive. InfraMed was created in 2010 aiming to attract significant private capital and predominantly private capital offered by Gulf SWFs and convert it into much needed funding for infrastructure projects in the south and east of the Mediterranean basin. The main characteristic of the InfraMed fund, namely the fact that has long-term investment horizon, render it the best counterpart for SWFs and the best investment vehicle for large-scale renewable energy projects¹⁸⁵. InfraMed through providing much necessary guarantees decisively contributed for the Abu Dhabi Mubadala Development Company, the third-largest SWF, via its Masdar branch, to invest in 2012 in a multi-

¹⁸³ Bernardo Bortolotti, 'The Great Reallocation, Sovereign Wealth Fund, Annual Report 2013' (The Baffi Center on International Markets, Money and Regulation, Sovereign Investment Lab, Università Commerciale Luigi Bocconi, 2013) Retrieved from https://www.ifswf.org/sites/default/files/Publications/int_report_SIL_2014_completo.pdf

¹⁸⁴ Simone Tagliapietra, *The Geoeconomics of Sovereign Wealth Funds and Renewable Energy* (Claeys & Casteels 2012) 50.

¹⁸⁵ Alloisio and Carraro (n 167).

million-dollar worth project, the construction of a wind farm power plant in Jordan. Hence, it becomes more than obvious that the harmonious cooperation between SWFs, that hold significant liquidity, and other financial institutions, that possess the necessary know-how, is pivotal for the success of such complicated and capital-intensive projects, such as renewable energy projects in developing countries.

Finally, it has to be mentioned that SWFs enjoy some considerable advantages in comparison to other institutional investors regarding investing in major energy-related projects. First of all, SWFs are entitled to allocate up to 10% of their assets to illiquid investments, whereas defined benefit pension funds and life insurance companies are only allowed to retain up to 9 and 4 per cent respectively in illiquid assets as a percentage of their total portfolios. Furthermore, contrary to pension funds and insurance companies, SWFs can invest their assets in perpetuity, as they are bounded by a defined liability profile. Finally, SWFs tend to have a moderate propensity to risk, whereas the rest of the institutional investors tend to restrain themselves of assuming more risky projects such as ones related to energy infrastructure¹⁸⁶.

Developing Countries' Challenges in Energy Infrastructure Financing and Multilateral Organizations' Role

It has already been suggested that many countries, and predominantly the developing ones, in the aftermath of the economic crisis of the late 1970s and early 1980s faced rising public debt and consequent budgetary constraints, that limited their capacity to adequately fund the expansion of needed electricity infrastructure projects; this led them to adopt new ownership and procurement formulas in view of attracting private investment in the expansion of their domestic energy sector, as government investments were proven insufficient to expand access to modern infrastructure in rural areas¹⁸⁷. Furthermore, the fact that energy projects, and predominantly those related to renewable energies, are characterized as highly capital-intensive investments, and generally suffer from greater risks and lower rate of return, even compared to mature fossil-fuel-related projects, is stated to be the main barrier of the proliferation of their development¹⁸⁸

Especially, the additional risks generally associated with the materialization of major infrastructure projects in developing countries might often discourage and disincentivize private investors to fund such capital-intensive projects. Hence, it comes as no surprise that it is reported a significant disparity concerning the expected internal rate of return of infrastructure projects between industrialized countries, where an IRR of 12% will be applied, and developing countries and emerging economies, where an

¹⁸⁶ Ibid.

¹⁸⁷ Benjamin Sovacool, 'Expanding Renewable Energy Access With Pro-Poor Public Private Partnerships In The Developing World', 13 (2013) Energy Strategy Reviews 181–192.

¹⁸⁸ Sun and others (n 127).

IRR figure of 20% is going to be expected in order for the project to be eligible for financing¹⁸⁹.

Furthermore, due to investors' perception that projects located in developing countries are riskier, lenders require a higher equity share than normal. While a typical project finance structure in a developed country may consist of 10-30% equity and the rest through loans and other supporting schemes and mechanisms, in developing countries equity share tends to be significantly higher in the total funding mix¹⁹⁰. But it is widely known that in developing countries equity tends to be scarce and long-term capital -much needed to fund energy projects- is difficult to be accessed and quite often not affordable, thus, hampering economic viability of such projects. It has been reported that local banks in developing countries are generally not in a position to lend money for a period of 15-25 years, mainly due to their own balance sheet constraints, such as the mismatch in the maturity of assets and liabilities¹⁹¹.

Except for the perception of risk regarding the potential to invest in a large-scale long-term energy project, which translates to higher cost of capital and higher IRR, developing countries are facing another set of challenges concerning financing energy infrastructure projects. Developing countries in general and those located in the Mediterranean Basin and Middle East and North Africa (MENA) region are presenting some uncommon economic and demographic patterns, that ultimately affect energy demand and supply in those countries.

On the one hand, the Mediterranean energy sector present a high degree of interdependence, both for electricity and natural gas markets¹⁹². Despite that, Mediterranean remains today a highly fragmented region, mainly due to cultural, historic, political and geopolitical reasons; yet, it is expected to face in the near future unprecedented challenges regarding its social, political, economic and energy structure¹⁹³. Furthermore, in a more general framework, where persisting discrepancies are expected to last for the coming decades, although with a declining gap, there is certainly ground for promoting and developing cross-border electricity and gas

¹⁸⁹ UNEP, 'Catalysing Low-Carbon Growth in Developing Economies. Public Finance Mechanisms to Scale Up Private Sector Investment in Climate Solutions', UNEP, 2009, Retrieved from https://www.unepfi.org/fileadmin/documents/catalysing_lowcarbon_growth.pdf

¹⁹⁰ Alloisio and Carraro (n 167).

¹⁹¹ Kirsty Hamilton, 'Scaling Up Renewable Energy in Developing Countries: Finance and Investment Perspectives' (Chatham House, Energy, Environment and Resource Governance Programme Paper 02/10, 2010), Retrieved from https://www.chathamhouse.org/sites/default/files/public/Research/Energy,%20Environment%20and%20Development/0410pp_hamilton.pdf

¹⁹² Carlo Cambini and Alessandro Rubino, *Regional energy initiatives. MedReg and the Energy Community* (London Routledge 2014)

¹⁹³ Olivier Roy, 'The transformation of the Arab World' (2012) *Journal of Democracy*, 3(23), 5-18

transmission infrastructure¹⁹⁴. Finally, cross-border interconnection and cooperation is anticipated to play a positive and crucial role in reducing the energy gap among sub-regional markets¹⁹⁵.

On the other hand, the general trend is that developing countries in general and particularly South and East Mediterranean Countries (SEMCs)¹⁹⁶, while representing a much lower Gross Domestic Product (GDP) in comparison to the North Mediterranean counterparties, are expected to grow in population at a remarkably faster rate than developed countries, constituting by 2030 60% of the total population that inhabits Mediterranean basin¹⁹⁷. Simultaneously, it is often cited that alongside population and economic growth come urbanization that adds pressure to already weak transmission and distribution networks of the developing countries. Moreover, in SEMCs alone, it has been calculated that approximately 20 million people are without access to stable and affordable electricity network, while at least 12 million use traditional biomass for cooking and heating¹⁹⁸. Thus, it can be suggested that the electricity sector in the region of South and East Mediterranean, as well as in MENA region, is required to respond to a combination of short-term goals and long-term patterns, that will guide the development of the system in the coming decades¹⁹⁹.

The fact that fast expansion of population in the developing countries is accompanied by the general trend of urbanization is highly expected to lead to rapid increase in electricity demand. In order to cope with this surge of additional energy needs, significant funds must be channeled towards targeted investments that will focus on the incremental electricity demand. It has been calculated that during the period of just 15 years - 2015 to 2030 - €715 billion-worth of investments in additional capacity will be needed to meet generation needs in the whole Mediterranean basin, which will correspond to 446 GW of new capacity from natural-gas power plants by 2040 and 449

¹⁹⁴ Angelo L'Abbate, Gianluigi Migliavacca, Roberto Calisti, Brancucci Martinez-Anido C, Chaouachi Aymen, Gianluca Fulli, 'Electricity exchanges with North Africa at 2030, The European and the Italiana approach' In Carlo Cambini, Alessandro Rubino, *Regional energy initiatives. MedReg and the Energy Community*. (London Routledge 2014) 225-245

¹⁹⁵ Alessandro Rubino, 'A mediterranean electricity co-operation strategy. Vision and rationale' In Cambini C, Rubino A, (eds.), *Regional energy initiatives. MedReg and the Energy Community*. (London Routledge 2014)

¹⁹⁶ This group of countries is formed by: Algeria, Egypt, Libya, Morocco, Tunisia, Israel, Jordan, Lebanon, Palestine, Syria.

¹⁹⁷ Observatoire Méditerranéen de l'Énergie (n 1).

¹⁹⁸ Renewable Energy Policy Network for the 21st Century, 'MENA Renewable Status Report', 2013, Paris: REN21, Retrieved from https://www.ren21.net/wp-content/uploads/2019/05/GSR2013_Full-Report_English.pdf

¹⁹⁹ Rahmatallah Poudineh and Alessandro Rubino, 'Business Model for Cross-Border Interconnections in the Mediterranean Basin' (Oxford Institute for Energy Studies, 2016) Retrieved from <https://www.oxfordenergy.org/wpcms/wp-content/uploads/2016/06/Business-model-for-cross-border-interconnections-in-the-Mediterranean-basin-EL-19.pdf>

GW of renewable energy sources²⁰⁰. Furthermore, it has been cited that the majority of new generation capacity is expected to be added to the system of SEM countries - in total 313 GW – due to special characteristics of the countries located in this region. Additionally, the fact that energy systems on both sides of the basin are steadily getting more depended on RESs for power generation, requires not only the strengthening and integration of the Southern Mediterranean networks, but also their integration with the Northern ones²⁰¹. The construction of additional interconnection capacity between the countries will be crucial for smoothly integrating such large quantities of intermittent wind and photovoltaic power generation, safeguarding the stability of the grids and ensuring the security of supply. The association of the Mediterranean TSOs²⁰² has calculated that there is the need for the construction of at least 33.000 km of high voltage lines and 3000 MW of North-South Interconnections, which correspond to over €20 billion-worth of investments²⁰³. It has been suggested that among other things, additional interconnection capacity can enable Mediterranean countries to achieve energy policy objectives, such as climate change mitigation measures and RES targets²⁰⁴.

In this framework, large-scale investments in the energy sector can only be financially viable if adequate and competitive-priced capital is attracted into developing countries; hence the importance of stable inflows of direct foreign capital is paramount. Furthermore, it has been suggested that energy-related project sponsors could potentially rely on external assistance in the form of multilateral development banks in order to cover some of the project development cost²⁰⁵. Although it has been cited that in developing countries governments remain the main source of infrastructure financing

²⁰⁰ Observatoire Méditerranéen de l’Energie (n 1).

²⁰¹ Ernesto Somma, & Alessandro Rubino, ‘Public-Private Participation in Energy Infrastructure in Middle East and North African Countries: The Role of Institutions for Renewable Energy Sources Diffusion’ (2016) 6 International Journal of Energy Economics and Policy 621–629

²⁰² Med-TSO is the Association of the Mediterranean Transmission System Operators (TSOs) for electricity, operating the high-voltage transmission networks of 20 Mediterranean countries and was established on 19 April 2012 in Rome, Italy. It constitutes a technical platform that, using multilateral cooperation as a strategy of regional development, would facilitate the integration of the Mediterranean Power Systems and foster security and socio-economic development in the region.

²⁰³ Mediterranean Transmission System Operators, ‘Master Plan of the Mediterranean Interconnections and Related Investments’, 2013, Rome: Med-TSO Retrieved from <https://www.med-tso.com/masterplan.aspx?f=&title=Paving+the+way+2013+-+Master+Plan+for+the+Mediterranean+Electricity+Interconnections>

²⁰⁴ Bernhard Brand, ‘The renewable energy targets of the MENA countries: Objectives, achievability, and relevance for the Mediterranean energy collaboration’ In: Alessandro Rubino, Maria Teresa Campi, Veronica Lenzi, Ilhan Ozturk, (eds.), *Regulation and Investments in Energy Markets*. (San Francisco: Academic Press 2016) 89-100.

²⁰⁵ World Bank, ‘Doing Business 2011: Making a Difference for Entrepreneurs’ World Bank, 2011, Retrieved from <https://openknowledge.worldbank.org/handle/10986/2549>

providing around 70% of the funds necessary, while only 8% is provided by official development assistance (and 22% is provided by the private sector)²⁰⁶, there exist a plethora of supporting schemes provided by multilateral developing banks, which aim at ensuring the availability of needed long-term funding and at providing country risk and policy risk guarantees.

From a broader point of view, multilateral development banks, such as the World Bank, the Asia Development Bank, the Inter-American Development Bank, the European Investment Bank or the West-African Development Bank, among others, have been suggested that can act as an effective mechanism of credit enhancement and risk reduction, consequently enabling the raising of private flows and helping governments to perform the necessary reforms²⁰⁷. Hence, it is often mentioned that these multilateral organizations play a key role in funding infrastructural projects, particularly when they are located in developing countries. Furthermore, it has been proposed that the presence of active MDB's support can have a positive effect to the overall infrastructural PPP project's likelihood of success²⁰⁸, while simultaneously empirical studies have shown that PPP projects in the renewable energy sector, which are supported by MDB, are more likely to attract more private investment funds²⁰⁹; thus, private investors are heavily incentivized to get engaged in PPP projects supported by this type of international support. Finally, it has to be mentioned that the significance of the MDB's support is not the same in every host country; it has been proposed that PPPs' failure likelihood, when projects are deployed in countries characterized by deteriorated institutional framework, can effectively be diminished should multilateral institutions, in the form of MDB, be actively involved²¹⁰. Moreover, empirical data have provided evidence that the support of multilateral organizations can be more relevant in attracting private investors when institutional and economic environments, where the projects are deployed, suffer from more weaknesses²¹¹. The operational assistance of MDBs can actively mitigate the negative ramifications of potential institutional deficiencies, that many developing countries present in sectors such as the

²⁰⁶ Somma and Rubino (n 201).

²⁰⁷ Maria Basílio, 'The degree of private participation in PPPs: Evidence from developing and emerging economies' In João Leitao, Elsa de Morais Sarmiento, & João Aleluia (eds), *The emerald handbook of public-private partnerships in developing and emerging economies* (2017, Bingley, England: Emerald Publishing Limited, 81–111).

²⁰⁸ Darwin Marcelo Gordillo, and Schuyler House, 'Effects of multilateral support on infrastructure PPP contract cancellation' (World Bank Policy Research Working Paper Series No. 7751, 2016), Retrieved from <https://elibrary.worldbank.org/doi/pdf/10.1596/1813-9450-7751>

²⁰⁹ Fleta-Asín and Muñoz 2021 (n 97).

²¹⁰ Srividya Jandhyala, 'International Organizations and Political Risk—The case of multilateral development banks in infrastructure projects' (Working Paper, 2016), Retrieved from https://ppi.worldbank.org/content/dam/PPI/resources/ppi_publication/theme/The-case-of-multilateral-development-banks-by-Jandhyala2016.pdf

²¹¹ Fleta-Asín and Muñoz 2021 (n 97).

judicial impartiality and poorer regulatory quality indices, while providing for competent credit enhancement and risk-reducing mechanisms.

One of the most prominent supportive mechanisms launched by multilateral organizations is the Multilateral Investment Guarantee Agency (MIGA) of the World Bank Group, which is designed to offer political risk insurance instruments to investors in the poorest developing countries and is eligible to partially cover and mitigate the impact of policy change, such as for example, a feed-in tariff reduction that could substantially affect economic results of the equity and debt provider, since this change would qualify as an expropriatory change in the regulatory framework of the host country; the same would apply in case of a breach of the Power Purchase Agreement (PPA), that would accompany the agreement for the construction, operation and servicing of a new multi-million-dollar power plant. Another guarantee instrument designed and implemented by the World Bank is the partial risk guarantee, that was firstly introduced in 1994, and aimed at supporting debt financing during the dawn of the development of new infrastructure projects in developing countries. It covers policy risks such as changes in law and retroactive measures, expropriation of the site, and payment default by the national power company under the PPA. However, this supportive mechanism, against what expected, didn't receive broad acknowledgment and has only been issued 23 times since its creation²¹². Finally, the World Bank has also implemented the Green Bond Initiative, which raises funds from fixed income investors to support World Bank lending for eligible projects both in mitigation and adaptation areas and aims at covering investors' demand for secure and highly rated fixed income financial products that support green projects.

However, the governments of many developing countries have chosen to promote and support investments profoundly in renewable energy through a set of incentives, mainly of fiscal nature, such as subsidies. Furthermore, the fact that public financing instruments, such as public investment, loans, or grants are still heavily utilized and feed-in-tariff mechanisms are quite common up until today, attests that governments are still playing a pivotal role in financing energy infrastructure development, as already mentioned.

Taking under serious considerations the above mentioned observations, it becomes easily understood that modernization of the energy sector regarding mostly countries in the South and East Mediterranean, as well as in the MENA region requires significant investments both in additional power generation capacity – via renewable energy sources and traditional yet efficient fossil-fueled power plants- and in expansion of electricity interconnectors among the countries and between the north and south regions of this specific area; the realization of these energy infrastructure projects

²¹² Valerio Micale, Gianleo Frisari, Morgan Hervé-Mignucci and Federico Mazza, 'Risk Gaps: Policy Risk Instruments' (Climate Policy Initiative Report, 2013), Retrieved from <http://www.climatepolicyinitiative.org/wp-content/uploads/2013/01/Risk-Gaps-Policy-Risk-Instruments.pdf>

requires significant up-front investments as well as technology innovation both in the electricity generation sector and transmission and distribution sectors²¹³. Yet, most of developing countries are significantly lagging both in terms of fiscal and budgetary capacity, as well as in terms of innovative capacity²¹⁴. This leads investments in infrastructure to barely meet less than half of the needs in most MENA region countries. PPP financial schemes could be an effective mitigating tool, as this procurement formula would allow the attraction of private money for funding electricity services' expansion and the harnessing of the skills and technology innovation of the private sector²¹⁵. Thus, under these conditions, many governments have been motivated to view private participation in provision of infrastructure services (PPI)²¹⁶ as an integral part of their developing strategy regarding energy sector.

Data Source

The data analyzed in this dissertation are from the World Bank PPI project database, which is developed by the World Bank Group by compiling publicly available information. The dataset covers infrastructure projects that meet a list of criteria:

- Dataset refers to infrastructure projects developed in low- or middle-income countries;
- There is participation of private companies, in the definition of which it may be included foreign state-owned enterprises. A private sponsor is a company controlled by private parties or the majority of equity shares is owned by private parties. State-owned enterprises or their subsidiaries are considered private investors only in projects located in foreign countries. Partially divested state-owned enterprises or their subsidiaries that remain owned by government entities are not considered private sponsors in their own countries.
- The private party usually assumes at least operating risks. That is, a private sponsor is at least partially responsible for operating cost and associated risks. This could be by either having the rights to operate alone or in association with a public entity or owning an equity share in the project;
 - The project is supposed to serve a public purpose;
 - The project has achieved financial or contractual closure. The definition of financial or contractual closure varies among types of private participation as a result of availability of public information;
 - The private participation is above a minimum threshold;

The database records PPI projects in terms of investment year, project name, type of PPI, sub-type of PPI, project status, primary sector, sub sector, segment, technology,

²¹³ Bindzi Zogo Emmanuel Cedrick and Wei Long, 'Investment Motivation In Renewable Energy: A PPP Approach', (2017) 115 Energy Procedia 229-238.

²¹⁴ Ragosa and Warren (n 128).

²¹⁵ Sun and others (n 127).

²¹⁶ The terms Private Participation in (provision of) Infrastructure (PPI) and Public-Private Participation (PPP) are being used interchangeably in this dissertation.

location, contract period, private participation percentage, government payment commitment, total investment, capacity, sponsor, etc. The database is updated every half year through a comprehensive review of activity in each of the low- and middle-income economies.

Global Overview

Following the wide definition of PPPs proposed by the World Bank and Public-Private Infrastructure Advisory Facility (PPIAF), it is mentioned that worldwide and across a time period of 31 years, over 8500 infrastructure projects in the transport, energy, telecommunications, and water and sanitation sectors have reached financial closure in almost 140 low- and middle-income countries. The aggregate number of investments that corresponds to these infrastructure projects exceeds US\$ 2 trillion²¹⁷.

Only in 2021 almost US\$ 22.4 billion worth of funds were channeled into 102 energy infrastructure projects worldwide, that were developed through different PPP investment schemes and correspond to 29% of total PPI investments in the same year. Compared to 2020 when almost US\$ 30 billion were invested in energy projects and corresponded to 59% of total PPI investments of that year, it seems evident that the repercussions of the Covid-19 pandemic severely and negatively affected both the net value of energy investments as well as investments in the energy sector comparing to other sectors. It is crucial to mention that for the first time for many years transport sector outpaced the energy sector posting US\$ 43.8 billion across 82 projects representing 58% of global PPI investment. Furthermore, it has to be pointed out that total energy investment, after following a steadily growing path for the first two decades recorded by the PPI Database, since 2012 it has been registering a declining trend, which has been inflamed during the past two years mainly due to the pandemic outbreak, and despite the fact that favorable monetary and lending policies have been adopted to face these challenges.

²¹⁷ World Bank, 'Private Participation in Infrastructure (PPI) Project Database', Data retrieved by <https://ppi.worldbank.org/en/ppi>

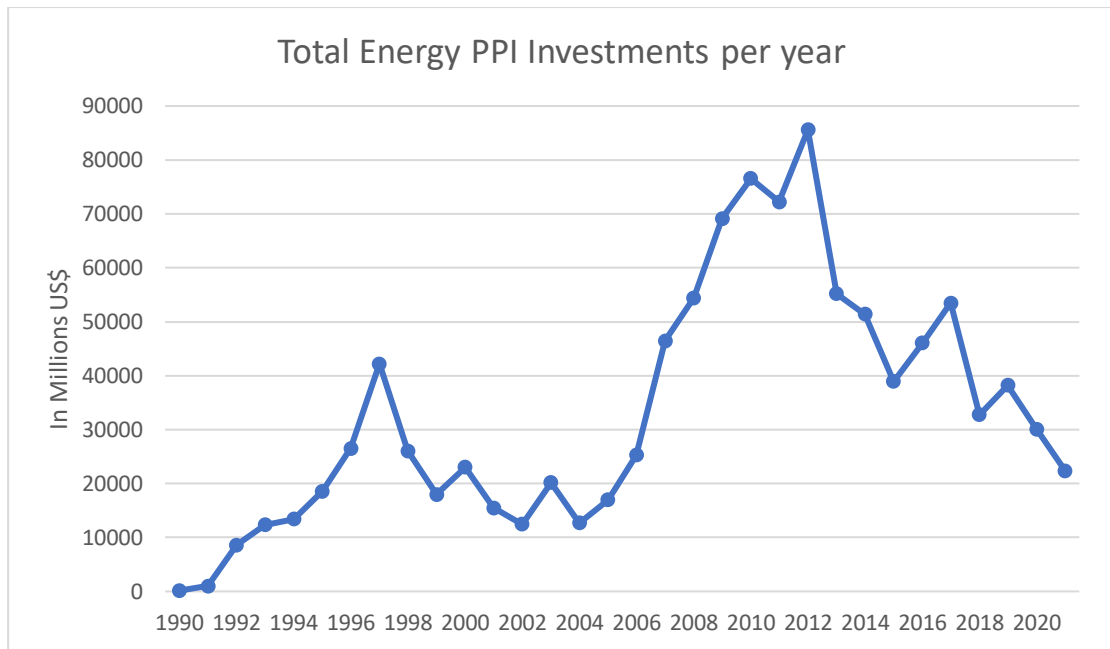


Figure 15: Total Energy PPI Investments per Year

Source: Author's elaboration based on World Bank and PPIAF, PPI Database (<https://ppi.worldbank.org/en/ppi>)

The vast majority of PPI projects in energy has taken place in the electricity sector recording 5262 projects since 1991, with only 709 of those being developed in the natural gas sector in the same period. The dominance of the electricity sector continued in 2021, when all energy projects developed and financed through some kind of PPP scheme were in the electricity sector and accounted for all US\$ 22 billion invested in the energy sector. Furthermore, electricity generation sub-sector was able to attract 98% of energy projects, whereas worldwide only three projects in the distribution and transmission sub-sectors were able to reach financial closure. In this point, it worth pointing out what has already been suggested by the academia²¹⁸; historically, very few transmission and distribution projects have accomplished to receive adequate funds via PPI to materialize, mainly due to the inherent complexity that characterizes such infrastructural endeavors.

²¹⁸ Somma and Rubino (n 201).

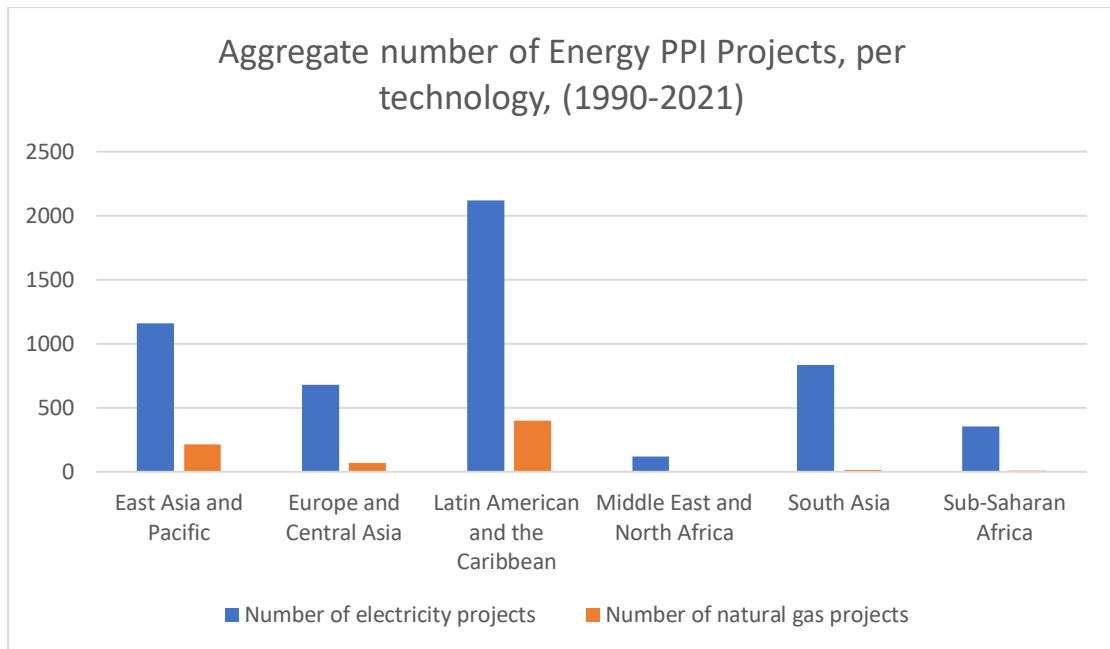


Figure 16: Aggregate Number of Energy PPI Projects, per Technology, (1990-2021)

Source: Author's elaboration based on World Bank and PPIAF, PPI Database (<https://ppi.worldbank.org/en/ppi>)

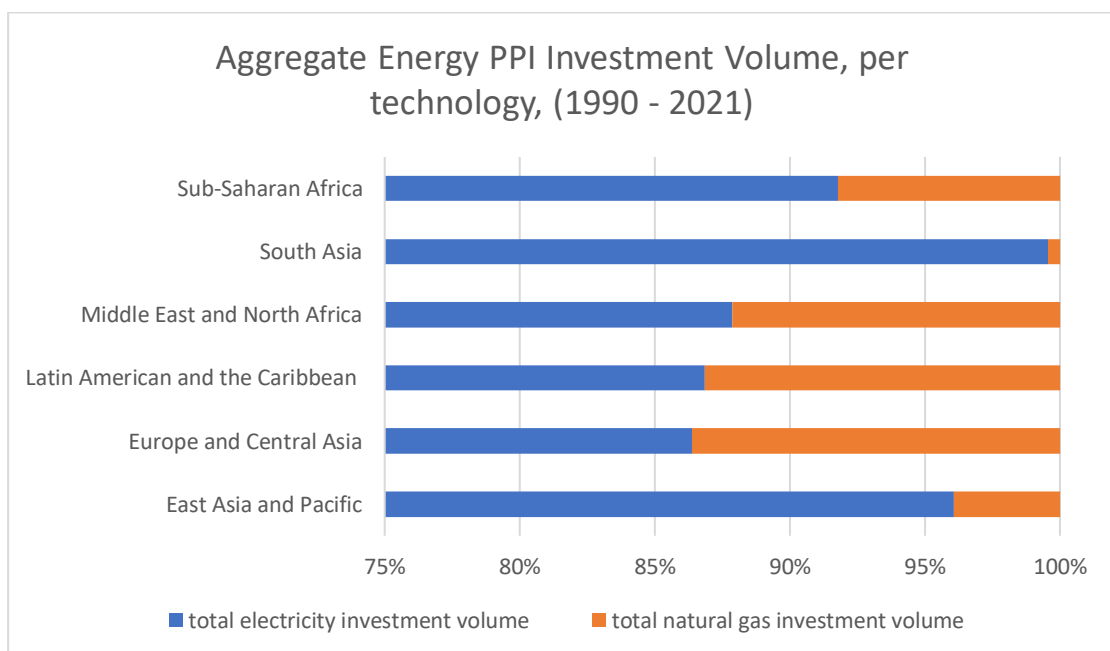


Figure 17: Aggregate Energy PPI Investment Volume, per Technology, (1990 – 2021)

Source: Author's elaboration based on World Bank and PPIAF, PPI Database (<https://ppi.worldbank.org/en/ppi>)

Furthermore, it is suggested that despite the outbreak of the Covid-19 pandemic, which indirectly led to the short-lived plummeting of hydrocarbon fuels, such as oil and natural gas, the shift towards renewable power generation continued, as 94 projects related to electricity produced by all sorts of renewable sources reached financial closure in 2021, compared to only five conventional projects, developed in countries such as Bangladesh, Malaysia, Uzbekistan and Vietnam; ultimately, these four countries were the only low- and middle-income countries under study that exhibited higher investments in conventional-fueled projects, than renewable. It is worth mentioning that during the same year, the number of countries that displayed complete renewable rate (100%) regarding energy PPI projects increased, reaching a total number of 33 compared to 29 countries with complete renewable rate in 2020²¹⁹.

Regarding the power generating technology, it is pointed out that solar technology accounted for 45% of energy projects by investment value, significantly outnumbering the past-five-year average which was 22%, followed by wind, which in 2021 accounted for 22% of the total investment value in PPP energy projects showing a subtle increase compared to 21% displayed in 2020. The lion's share of solar technology in energy investment values is mainly attributed to a number of projects developed in India and Brazil that use photovoltaic technology. The growing appeal of solar energy had already started since 2020, and it seems that it has established the foundations to continue to grow in the following years.

Investors' predisposition to fund energy projects that promote electricity generation via renewable sources is heavily driven by the competitive economic advantage of these environmentally friendly technologies; it is underlined that both solar and wind power generation technologies have witnessed their leveled cost of electricity (LCOE) continue to fall through the pandemic period, despite the fact that, as already mentioned, fuel prices followed an unprecedented downward path. Renewable energy projects despite requiring larger initial capital commitments than their traditional hydrocarbon-fueled counterparts, have zero fuel costs throughout their lifecycle and relatively small variable costs; thus, the competitive advantage of renewable energy projects becomes all more evident under today's circumstances, where natural gas' prices predominantly – but also oil prices as well – have escalated during the past few months as a result of the Russian invasion to Ukraine and the turbulences caused to the global energy markets. Additionally, it has been suggested that improvements in technology, competitive procurement, increased developer and operational experience and maturing energy markets, are all factors that are anticipated to contribute to renewables' LCOE continue to decrease until 2030²²⁰.

²¹⁹ World Bank, 'Private participation in Infrastructure (PPI) 2021 Annual Report', World Bank, Retrieved from <https://ppi.worldbank.org/content/dam/PPI/documents/PPI-2021-Annual-Report.pdf>

²²⁰ Ibid.

Finally, investment commitments towards energy projects related to hydro power generation shrunk during 2021 reaching US\$ 309 million, mainly due to significant upfront investment needs, as well as environmental considerations. While diesel-powered energy projects were able to attract no investment commitments during 2021, coal-powered plants were able to receive almost 11% of the total energy investment value in 2021, which is significantly decreased compared to the past five-year average of 21 per cent. Lastly, the share of investment commitments in natural gas remained the same at US\$3.8 billion in 2021; it is interesting to monitor how the recent energy crisis will affect investors' willingness to fund such projects, as, on the one hand increased natural gas retail prices may favor relevant yields, but on the other hand, growing number of European countries have demonstrated their intention to eliminate their energy markets' dependency upon natural gas, thus hampering future viability of projects.

Scrutinizing performance per region, it is easily noticeable that throughout the time period under study, East Asia and the Pacific, and Latin America and the Caribbean clearly have had the lead in terms both in terms of investments' value and number of projects executed. In 2021, East Asia and the Pacific region was able to attract US\$ 7.7 billion in investments, while during the same period Latin America and the Caribbean region achieved US\$ 4.2 billion; these two regions were followed by Europe and Central Asia, which noticeably displayed a significant growth in the value of investments in the energy sector reaching US\$ 5.2 billion compared to US\$ 1.3 billion in 2020, yet it wasn't enough to offset the year-over-year decline regarding total energy investments from US\$ 38 billion in 2020 to only US\$ 22 billion in 2021. Regarding South Asia region, after 2010, it has been steadily following a downward path from an-all-time high of US\$ 35.5 billion to US\$ 1.8 billion in 2021. Finally, in the last two places, Middle East and North Africa, and Sub-Saharan Africa, with the latter following a positive trend since 2010, when it barely accomplished to attract US\$ 471 million in energy projects, whereas in 2021 investment commitments worth over US\$ 3 billion were made; on the other hand, MENA region has consistently been unable to attract significant investments in its energy sector, despite the fact that it is endowed with some competitive advantages, such as generally sunny weather and under certain circumstances adequate wind energy potential.

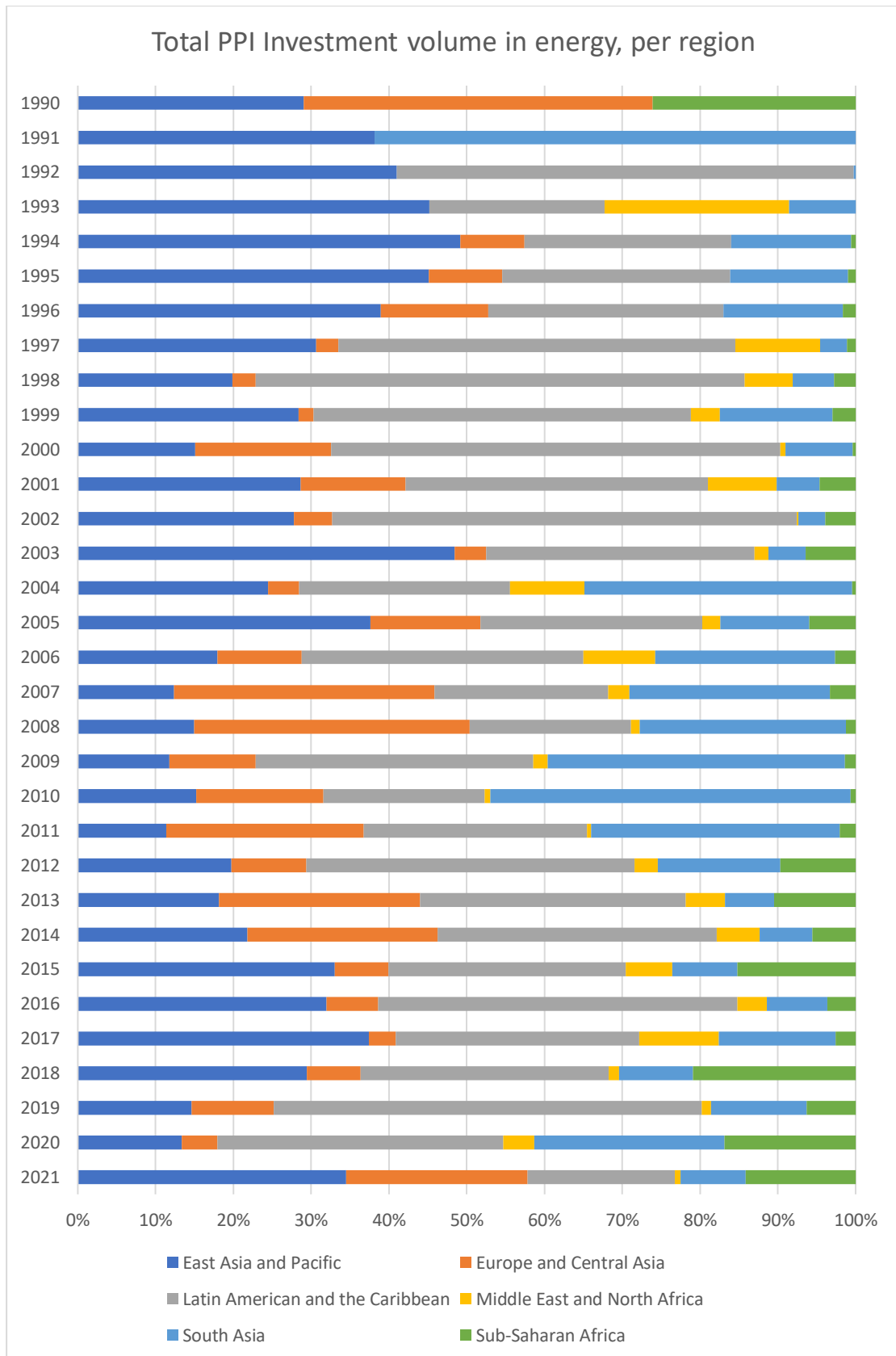


Figure 18: Total PPI Investment Volume in Energy, per region
Source: Author's elaboration based on World Bank and PPIAF, PPI Database
(<https://ppi.worldbank.org/en/ppi>)

At a more general level, East Asia and Pacific represent 34% of the total investment value in the energy sector for 2021, which can be translated to a noteworthy difference compared to historic average -which is 23 per cent-, while Europe and Central Asia represent in 2021 more than 24% of the global energy investments under PPP funding schemes. The fact that Latin America and the Caribbean region representing only 19% of total energy investments in 2021 stands in clear contrast to the all-year leading performance of the region (over 35% of the aggregate value of energy investments), while Sub-Saharan Africa exhibited in 2021 a record-high 14% of the global energy investments. Finally, South Asia representing only 8% of the total funds invested in its energy sector in 2021, is far below its historic average (18%), and MENA region with investments of only US\$ 165 million in its energy sector, represents less than 1% of the global energy investments in the same year. In this point, it is worth pointing out that energy projects in MENA region funded via a PPI scheme are of a significant larger size compared with similar investments in all other regions; more specifically, throughout the time period that the PPI Dataset covers, each energy project developed in the countries located in the MENA region had an average value size of over US\$ 320 million, outnumbering every similar project developed in each and every of the rest regions under study.

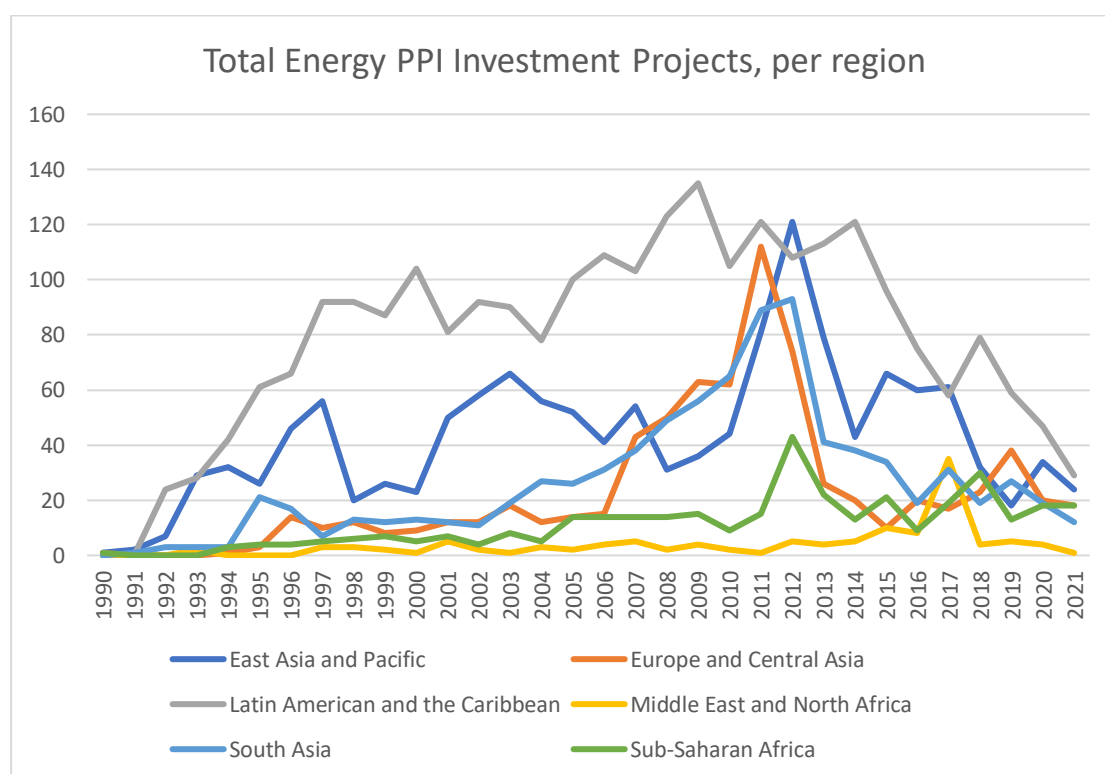


Figure 19: Total Energy PPI Investment Projects, per region

Source: Author's elaboration based on World Bank and PPIAF, PPI Database (<https://ppi.worldbank.org/en/ppi>)

Among all regions, the total number of new energy projects in 2021 was 102, none of which in the natural gas sector, as already mentioned. Generally, the number of energy projects has been following a downward path after the period 2008-2012; it

is worth mentioning that the number of projects in the energy sector developed during 2021 is lower compared even to 2020, when the initial outbreak of Covid-19 pandemic led many businesses to reconfigure their development strategies. Of the 102 projects, almost one third -28%- was developed in the Latin America and the Caribbean region; 24 energy projects reached financial closure in the East Asia and the Pacific region, while Europe and Central Asia, and Sub-Saharan Africa came in the third-place accounting for 18 energy projects each. These data confirm the development and penetration of PPI financial schemes in the Sub-Saharan Africa and it could be suggested that it is directly correlated with the effort made by major developing economies, such as China, Russia and Turkey to establish or enlarge their sphere of influence in this new and promising economic area. In the fourth place, we could find East Asia region with 12 energy projects in 2021, and in the last place Middle East and North Africa region with just one project worth US\$ 165 million.

Overview of MENA region

MENA region is comprised by a number of low- and middle-income countries, which present a series of peculiar characteristics. According to PPI Project Database, MENA region includes Algeria, Egypt, Iran, Iraq, Jordan, Lebanon, Morocco, Tunisia, Yemen and Gaza/West Bank, the latter of which is not recognized universally and has received no investments via a PPP scheme, and hence it won't be taken under consideration in this study. The rest of the countries, that comprise MENA region, present contradictory and conflicting peculiarities as already mentioned; on the one hand, most of these countries are considered well-endowed, and a significant portion of them has been exploiting their domestic hydrocarbon reserves by exporting oil and natural gas, whereas on the other hand, all of them are considered to present significantly lower GDP per capita compared to other middle-income countries, that might not be so well-endowed. Furthermore, it has been cited that in a time period of just fifteen years -2015 to 2030- the demand for electricity is expected to triple, requiring 200 GW of generation capacity to be installed, mainly due to steady growth in population, urbanization and gradual increase in GDP per capita. Additionally, the fact that MENA region countries possess high renewable energy sources potential, intent to continue to exploit hydrocarbon reserves by exporting them and boosting their fiscal position, and are gradually moving towards more environmentally-friendly energy strategies and choices, that promote GHG mitigation actions, create the underling context for a plethora of renewable energy projects to be developed in the region.

Despite that, MENA region in 2021 came last regarding energy investments developed under PPP financial scheme, being able to attract just US\$ 165 million in one energy project, whereas the next worst performing region -that is South Asia- was able to attract over US\$ 1.8 billion in the same year. PPI in MENA region during 2021 correspond to less than 0.75 per cent of the global energy sector PPI, as only Egypt was able to welcome one energy project in the electricity sector.

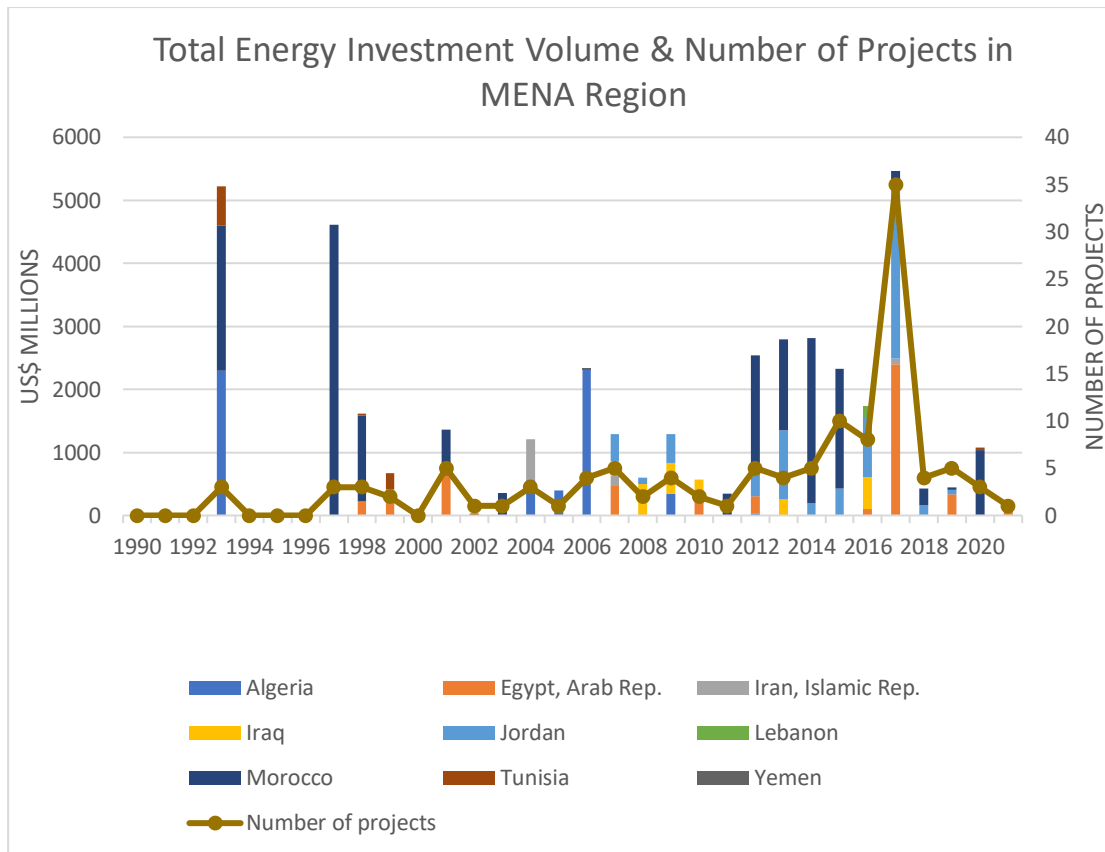


Figure 20: Total Energy Investment Volume & Number of Projects in MENA Region

Source: Author’s elaboration based on World Bank and PPIAF, PPI Database (<https://ppi.worldbank.org/en/ppi>)

Taking under consideration the aggregate data regarding PPI energy investment in the MENA region, it can be noticed that throughout the time period under study around US\$ 40 billion have been invested in 120 energy projects; this corresponds to almost 3.8% of the total funds invested in the energy sector through some kind of PPP scheme. It can be underlined that, while this percentage is significantly higher than that achieved in 2021, which is a clear sign that PPP agreements have seriously been affected by the recent covid-19 pandemic and its repercussions, yet it remains that MENA region is the least performing region globally. It is noticeable that the region was able to overcome the difficulties caused by political turbulences in 2011 and during the six-year period of 2012 to 2017 were attracting almost US\$ 3 billion annually, and in 2017 achieved a record of attracting more than US\$ 5 billion in 35 energy projects. However, from that time onwards it has been steadily following a downward path barely able to attract more than US\$ 500 million annually.

Regarding the energy sub-sector at which funds were channeled, it is more than evident that electricity outpaced natural gas both in terms of total investment volume during the period under study and in term of number of projects that have reached financial closure during the same time; hence, throughout the 30-year period under study more than US\$ 34 billion were invested in more than 110 energy projects in the

electricity sub-sector, whereas during the same period only around US\$ 7 billion worth of funds supported 7 energy projects in the natural gas sector; and that, despite the fact that many of the countries under study are endowed with significant natural gas reserves. This can be translated to the fact that the importance of electricity as energy carrier is steadily growing compared to fossil fuels, and that there exist huge opportunities regarding power generation via renewable resources.

Finally, at a country level, it is evident that Morocco has been able to attract the lion's share regarding energy investment in the MENA region; in the 30-year period under study more than US\$ 19 billion were invested in different energy infrastructure projects in that country, which translated to more than 45% of the total investment volume in the MENA region. Morocco is followed by Jordan, which was able to attract more than US\$ 7 billion in 34 energy projects during the period under study; it is worth pointing out towards the possible reasons behind these two countries' success, which we will be trying to explain in the remainder of this dissertation. Close to Jordan, we can find Algeria and Egypt, with the former being able to attract cumulatively 14% of the total funds in the region -US\$ 5.9 billion- and the latter almost 13% of the aggregate energy investments in the region -US\$ 5.3 billion. In the next places, Iraq, despite its inherent political instability, was able to attract more than US\$ 2 billion -5% of the total investment volume-, whereas Iran and Tunisia received just under US\$ 1 billion each -representing 2% of the aggregate energy investment volume of the region. Finally, in the final places, we can find Lebanon and Yemen, with the former having received US\$ 180 million in just 6 energy projects, while Yemen being able to attract just over US\$ 15 million of energy investments in the 30-year period under study clearly comes at the last place compared to the rest of the countries in the MENA region.

Favoring Factors For Energy PPI Investments

Theoretical studies and empirical evidence have illustrated that the level and magnitude of PPI investment, that each country receives, clearly depends on a number of factors. It has been suggested that factors such as the macroeconomic stability, the quality of institutions, the control for corruption, and an independent judicial system can play a pivotal role regarding PPPs being used as a financial instrument to fund major infrastructural projects, mainly in developing countries²²¹. Hence, within this long list, it is often mentioned that there exist specific factors that have played a pivotal role in the energy context regarding MENA region and that can be grouped into three main categories²²²:

- ❖ Factors that determine governments to engage the private sector and utilize private funds in infrastructure financing
- ❖ The underlying context in terms of the overall macroeconomic environment, which determines to some extent the motivations of each party to a PPP agreement -public and private-, and

²²¹ Hammami, Ruhashyankiko, and Yehoue (n 159)

²²² Mengistu (n 4).

❖ Factors that affect the incentive and motivation of the private sector to enter into a PPP agreement with the government

Firstly, regarding the willingness of the governments to engage to a PPI financial scheme, it is often cited that, on the one hand in the MENA region energy infrastructure is mostly old, obsolete and devaluated, while on the other hand, energy demand is expected to steadily increase mainly due to population growth, and the available public budgets are not able to match the investment needs in the region²²³. As a consequence, MENA region countries are devoting an increasing attention to develop an investor friendly environment aiming to bolster and boost the level of PPI investment in these countries, which is much needed²²⁴. Finally, as greater emphasis is gradually placed on investments in renewable energy, local governments are expected to adapt and reform the existing energy paradigm, which is mostly based on fossil fuel generation, to a new and diverse model. In this framework, it is often suggested that recent energy policy initiatives in the form of the establishment of national RES targets or quotas, and feed in tariff remuneration schemes, were set up to encourage private participation in energy investment and to signal a gradual opening of their internal markets²²⁵. Hence, it is cited that the factors inducing governments to engage private players in financing energy infrastructure projects are present in the MENA region, and constitute the main driver in the policy dynamics displayed during the previous decade²²⁶.

Regarding the second group of factors, upon which energy PPI investments is suggested to be depended, they are directly correlated to the macroeconomic environment of the host country in terms both of favorable economic conditions and stable political environment. In this framework, it has been suggested that a better overall economic environment not only can positively impact the likelihood of PPP agreement's success²²⁷, but also can act as a major attraction for private funds to be invested in the renewable energy sector, in particular²²⁸. Although, GDP is often used as an indicator of wealthier countries' ability to attract private funds in more and higher-value PPP agreements, there is also empirical evidence that countries with lower GDP can be an attractive destination for private investors to get involved in renewable energy PPPs, mainly due to corollary budgetary constraints, that hinder governmental efforts

²²³ Hounda Ben Jannet Allal, Matteo Urbani, 'Financing Mediterranean electricity infrastructure: Challenges and opportunities for an interconnected Mediterranean grid' In: Alessandro Rubino, Maria Teresa Campi, Veronica Lenzi, Ilhan Ozturk, (eds.), *Regulation and Investments in Energy Markets* (San Francisco: Academic Press 2016) 275-291.

²²⁴ Carlo Cambini, Alessandro Rubino, 'EU pressures and institutions for future Mediterranean energy markets: Evidence from a perception survey' In: Alessandro Rubino, Maria Teresa Campi, Veronica Lenzi, Ilhan Ozturk, (eds.), *Regulation and Investments in Energy Markets* (San Francisco: Academic Press 2016) 133-153.

²²⁵ Brand (n 204).

²²⁶ Somma and Rubino (n 201).

²²⁷ Fleta-Asín, and Muñoz 2020 (n 140).

²²⁸ Fleta-Asín and Muñoz 2021 (n 97).

to expand electricity services delivery and make private involvement necessary²²⁹. In particular, another proxy of favorable market conditions, general economic freedom, has been identified as an important determinant of foreign direct investment inflows in areas, such as Latin America²³⁰ and East Asia²³¹.

Regarding most MENA region countries, while displaying strong demographic growth, which have led to a bottom-heavy population pyramid, significantly lower GDP rates compared to other developing countries have not hampered emblematic PPP projects in the renewable energy sector to be deployed in this region. On the other hand, riots and general political turbulences during the past decade led to a contraction of the fiscal space at the time when the need for expansionary infrastructure policies was greater. In this context, it is often cited that country risk, that takes into consideration among other indicators, the political unrest in a region, is always considered when planning long-term investments, because it can impact the remuneration anticipated by the private partner in order to engage in a PPP agreement²³². It is easily evident that the higher the country risk, the higher the premium is needed by the private consortium for it to manage and mitigate this risk; however, higher premium translates into higher cost for the project, leading, ultimately, to negatively impact its financial viability. Hence, the instability of a region inherently creates uncertainty about the future, hampering its financial and investment potentials. It has been proposed that political instability is a broad term referred to as multiple and different political changes leading to different economic performance consequences²³³ and it has generally been observed that political stability is an important factor to attract private funds²³⁴. Countries such as Morocco and Jordan, that display better political stability²³⁵ score, as defined by the Worldwide Governance Indicators (WGI) project developed by the World Bank, compared to MENA region country average, are expected to receive higher foreign investments in the form of PPI agreements. Consequently, it is stated that countries perceived to be less financially and politically stable, are compelled to grant investors

²²⁹ Fleta-Asín and Muñoz 2021 (n 97).

²³⁰ Marta Bengoa, and Blanca Sanchez-Robles, 'Foreign direct investment, economic freedom and growth: New evidence from Latin America' (2003) 19 *European Journal of Political Economy* 529–545.

²³¹ Rahim Quazi, 'Economic freedom and foreign direct investment in East Asia' (2007) 19 *Journal of the Asia Pacific Economy* 329–344.

²³² Alberto Ponti, 'Investing in infrastructures: What financial markets want' In: Alessandro Rubino, Maria Teresa Campi, Veronica Lenzi, Ilhan Ozturk, (eds.), *Regulation and Investments in Energy Markets* (San Francisco: Academic Press 2016) 311-331.

²³³ Yi Feng, 'Democracy, political stability and economic growth' (1997) 27 *British Journal of Political Science* 391–418.

²³⁴ Oliver Morrissey, and Manop Udomkerdmongkol, 'Governance, private investment and foreign direct investment in developing countries' (2019) 40 *World Development* 437–445.

²³⁵ "Reflects perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism" from the The Worldwide Governance Indicators project.

higher returns to offset risk, to the detriment of the project's viability²³⁶; alternatively, they are inclined to take all the necessary political, institutional, financial and fiscal measures in order to limit host country's political risk, as perceived by the investors.

Finally, the third group of factors, which could be highly evaluated by the private investors in their decision to engage in a PPP agreement, includes, among others, the adequacy of the domestic regulatory framework and the proper enforcement of the law, the independence of the regulatory authorities and the processes they follow, the access to credit, the consumers' ability to pay for services, government effectiveness and responsiveness, as well as the public opinion on private provision of infrastructure services. It is often suggested that the presence of a sounder and more stable institutional environment can be positively correlated to the adoption of PPP agreements, in which the private partner is willing to take more responsibilities, as its trust towards public partner is bolstered²³⁷. Furthermore, a more transparent institutional framework has been reported to act as an effective counter-measure against potential risks that the private partner is expected to bear throughout the entire duration of a PPP project²³⁸. Finally, it has been reported that overall success regarding PPP projects located in developing countries is anticipated to be higher, when the institutional and economic environments in these countries are perceived as better and more favorable to private initiative²³⁹; in particular, regarding private participation in renewable energy PPPs, it has been maintained that host countries that present sound institutional and environmental frameworks would be more attractive to private companies, since the uncertainties surrounding the projects and the transaction costs would be lower²⁴⁰. The rule of law score²⁴¹, as defined by the Worldwide Governance Indicators project developed by the World Bank, represents a synthetic indicator that can reflect those aspects. It is cited that the level of investment realized in one country could be significantly bolstered by a well-structured institutional framework²⁴² and the presence of a National Regulatory Agency²⁴³. Morocco and Jordan also display higher than MENA region average regarding the rule of law score, as well.

²³⁶ Somma and Rubino (n 201).

²³⁷ Percoco (n 144).

²³⁸ Wang, Liu, Xiong, and Song, (n 80).

²³⁹ Fleta-Asín, and Muñoz 2020 (n 140).

²⁴⁰ Fleta-Asín and Muñoz 2021 (n 97).

²⁴¹ "Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence" from the The Worldwide Governance Indicators project.

²⁴² Laura Abrardi, Carlo Cambini, Laura Rondi, 'Investment and regulation in MENA countries: The impact of regulatory independence' In: Alessandro Rubino, Maria Teresa Campi, Veronica Lenzi, Ilhan Ozturk, (eds.), *Regulation and Investments in Energy Markets* (San Francisco: Academic Press 2016) 243-273.

²⁴³ Somma and Rubino (n 201).

Following previous literature regarding PPP projects, in order to measure the quality of the institutional environment and to capture the general political conditions we use the World Bank's Worldwide Governance Indicators database, which covers six dimensions, namely: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. Since these indicators are highly correlated, it is not advisable to be used all together in the same model to avoid potential multi-collinearity problems; we cherry-picked two of them, political stability, and rule of law, the study of which we expect that it is going to be relatively fruitful.

In this context, the fact that these two MENA region countries, Morocco and Jordan, display a relatively positive performance in terms of political stability and rule of law, could explain why they have received the highest investments in their energy sector via PPI financial schemes compared to the rest of the MENA region countries. It is often mentioned that these two factors can facilitate the establishment of an environment conducive to attract private funds in the energy infrastructure sector; on the one hand, political stability indicates the existence of sufficient social and political cohesion, that among other benefits, contributes to lower the returns on investments anticipated by the private party -due to lower country risk-, on the other hand, rule of law has a great impact on the growth rate of developing countries, as it signals that the host government restrains themselves from intervening with ad-hoc actions and reducing investors' anticipated yields²⁴⁴. In the remainder of the present dissertation, we will present and review an approximate description of the energy policies and initiatives followed in Morocco and Jordan, as well as one energy project financed via PPI agreement for each country.

The Morocco Case Study

Morocco started reforming its energy sector in 1995, when it introduced an innovative strategy aiming to liberalize its power generation sector, which up until then, was under the utter control of local government. Yet, it wasn't but until the end of the first decade of the new millennium, when the government of Morocco started shaping and introducing a far-more reaching energy strategy aiming to respond to the challenges that this sector represented for the country.

In 2009, Moroccan government passed a new law that constituted its National Energy Strategy (NES), which focused on achieving tangible results and maintaining precise targets. In this framework, Moroccan NES aimed at establishing an optimal fuel mix for power generation by boosting the deployment of renewable sources; furthermore, it laid the foundations for welcoming private investors into host country's energy sector, it introduced energy efficiency and conservation measures for the first time, and finally it promoted regional integration and cooperation with the neighboring countries. Furthermore, Moroccan government, as an answer to the growing domestic energy demand, planned for adding further power generation capacity by 2020, mainly

²⁴⁴ Ibid.

focusing on renewable sources. Establishing and reinforcing its renewable energy program, Morocco scheduled to install 2000 MW of wind energy capacity, 2000 MW of solar energy capacity and to increase its hydropower capacity to 2000 MW by 2020. Attaining such ambitious renewable energy targets required the establishment of a new institutional framework, which would be able to cope with the challenges posed by the fundamental changes in the energy mix; hence, Moroccan government pushed for the creation of the Moroccan Solar Energy Agency making it responsible for taking any required initiatives regarding the newly-born solar power program. Furthermore, it established an institute, L'Institut de Recherche en Energie Solaire et Energies Nouvelles – IRESEN, which aimed at promoting relevant research, innovation, and development in the energy sector, and founded an energy investment firm intending to boost private investments in the energy sector. Finally, Moroccan government updated, reformed, or set up new rules in the legal and administrative framework regarding power generation, transmission, and distribution with special focus on renewables. Thus, it is often cited that Moroccan government's strategy and policy initiatives in the institutional, legal and administrative level draw the attention of many stakeholders on the future role of renewables in Moroccan energy mix²⁴⁵.

Under these favorable conditions, in Morocco took place a number of energy projects, which were financed via some kind of PPP agreement. The most iconic of those has to be the Quarzazate concentrated solar power (CSP) plant. At its first phase, which has already been developed and is currently operational, Quarzazate CSP has added to the Moroccan power generation mix 160 MW of capacity, while there are plans for the second phase, which would add 300 MW of additional capacity. The project was developed through a PPP agreement by a special purpose vehicle, that is, a consortium of private developers, led by the Saudi International Company for Water and Power Projects (ACWA), and the Moroccan Agency for Solar Energy. PPP agreement offered 75% of equity share to the private consortium, with ACWA Power as the majority owner, and the remaining 25 percent to the government agency. In order to secure the financial viability of the project, Moroccan government granted a substantial subsidy in the form of a power purchase agreement (PPA) with the consortium, which would cover the potential difference between the grid price and the actual cost of electricity produced in CSP plant for a period of 25 years. Signing of the PPA was a turning point for private investors to engage into a PPP agreement to develop such a complex energy project, because it actually shifted revenue risk for the private players to the Moroccan government, whose revenue risk burden was in turn guaranteed for US\$200 million by the International Bank for Reconstruction and Development (IBRD). Furthermore, international institutions, such as the Clean Technology Fund (CTF) provided concessional loans and grants with competitive terms thus, substantially reducing financing costs and leveraging private capital investment.

It is often suggested that energy projects that require the development of immature and hence, expensive technologies such as CSP, can only be realized, only if

²⁴⁵ Ibid.

strong public support, which can drive down costs and maximize future public benefits, is present. Furthermore, the procuring method – either competitive bidding or direct negotiation - followed by the state authority can be crucial for the success of a complex energy infrastructure project; academia have suggested that optimal PPP award method could depend on project features and ownership requirements²⁴⁶. Thus, in this framework, it is often proposed that competitive bidding methods would be optimal, when the public sector aims to select the private contractor by procuring a specific facility at the lowest price, whereas other methods based on direct negotiation could lead to a decreased project duration, provide flexibility for changes, reduce adversarial relationships between the partners, and enlarge the scope of activities in which the private contractor can be involved – among other things, design and funding²⁴⁷. Some researchers have claimed that competitive tendering could potentially attract more efficient private companies due to the transparency of these methods; it is pointed out that efficiency gains from competitive tendering process can lure private funds to invest in such projects²⁴⁸; whereas others have supported that alternative contract award methods may not have a direct negative impact on the degree of private investor participation in renewable energy PPPs, because competitive procurement methods, whilst they might increase efficiency gains, may also reduce profitability due to the competition among private agents, thus hampering private investors’ willingness to participate in a PPP agreement²⁴⁹. Regarding the Quarzazate CSP plant, where a competitive tendering procedure was followed, it is underlined that only in case of a PPP agreement, which efficiently allocates risks and shares them between public and private investors, the success economic viability of such complex projects could be achieved²⁵⁰.

More specifically, on this case study, technology risk, which included the construction of the project and the performance of the power plant, was assumed by the private sector, which was able to better cope with it, whereas the lion’s share of the financial, country, policy and commercial risks were assumed by the government of Morocco²⁵¹. Finally, it has to be pointed out that Quarzazate CSP plant’s success was also supported by the signing of an agreement between project’s developers and the national Transmission System Operator (TSO), because the expected stream of revenue

²⁴⁶ Kaminsky (n 161).

²⁴⁷ Christopher Gordon, ‘Choosing Appropriate Construction Contracting Method’ (1994) *Journal of Construction Engineering and Management*, vol 120, 196–210.

²⁴⁸ Huanming Wang, Bin Chen, Wei Xiong, and Wu Guangdong, ‘Commercial Investment in Public Private Partnerships-The Impact of Contract Characteristics’, (2018) 46 *Policy & Politics* 589–606.

²⁴⁹ Fleta-Asín and Muñoz 2021 (n 97).

²⁵⁰ Alloisio and Carraro (n 167).

²⁵¹ Gianleo Frisari, and Angela Falconer, ‘San Giorgio Group Case Study: Ouarzazate I CSP Update’ (CPI Report, 2013), Retrieved from <https://climatepolicyinitiative.org/wp-content/uploads/2012/08/San-Giorgio-Group-Case-Study-Ouarzazate-I-CSP-Update.pdf>

and benefit would only be realized, should the construction of a consistent network able to transmit and distribute the electricity produced to the final consumers was guaranteed.

It becomes evident that Morocco followed a centralized investment strategy aiming to attract and develop flagship projects, like the one already presented, while simultaneously it expanded and reformed its policy towards green growth and RES production; however, it should be underlined that ultimately the incentives and the regulatory framework established by the Moroccan government didn't promote distributed generation and didn't favor small-scale projects, such as roof top photovoltaic installations, as well as there wasn't any specific indication in relation to the type of technologies targeted to be developed. Hence, the focus of Moroccan renewable energy strategy towards solely large-scale projects ultimately limited its potentials.

The Jordan Case Study

Jordan is another MENA region country, that has relatively recently undergone a structural reform of its national energy strategy in view of the effort to cope with a series of challenges. The government of Jordan voted for the adoption of an updated NES for the period 2007-2020. The revised energy strategy aimed at providing a reliable energy supply by increasing the share of local energy sources in the energy mix and at reducing dependency on imported oil. Furthermore, new policy initiatives were taken towards the diversification of energy sources, while environmental protection measures were included for the first time.

Jordan, which possesses non-negligible shale oil and natural gas reserves, intended to minimize its dependency on imported hydrocarbon fuels, which negatively impact every country's current account balance creating tremendous deficits, by maximizing the utilization of domestic resources, expanding the development of renewable energy projects, and promoting energy conservation and awareness. In this context, Jordanian government issued on April 17th 2012 the Renewable Energy and Energy Efficiency Law. In accordance to that law, unsolicited or direct proposal submission was allowed for the first time; potential investors would now have the opportunity to identify and develop their own renewable grid-connected electricity generation projects and then propose them to the Ministry of Energy and Mineral Resources.

Following a decentralized investment model, Jordanian government invited private investors to submit expressions of interest for the development of renewable energy power generation projects, and indicated the maximum tariffs that they (the government) would be willing to pay for different types of renewable sources. Then, should private developers had explicitly expressed their investment interest, they were responsible to find and purchase the land required for the project, and to identify the optimal size and type of the facility; only after that, memoranda of understanding between private investors and governmental authorities were to be signed for expressions of interest that would fulfill certain requirements posed by the government.

Signing of these memoranda would provide private investors with an exclusivity period of 24 months, during which time they were expected to develop the project, sign project agreements with the government and reach financial closure.

Under this bottom-up approach a series of energy projects in Jordan were financed via a PPP agreement with the participation of private investors. The first -and maybe the most iconic- project to be undertaken through a direct proposal was the Tafila wind power project. Tafila wind farm, which reached financial closure in 2013, added 117 MW of capacity to Jordanian national electricity generation system – an increase of 3%-, producing 400 GWh of energy and accounted for 10% of Jordan's 1.2 GW renewable energy target. The private consortium of companies that undertook the development of the project comprised by Jordan Wind Power Company (50% equity share), in which the main shareholder is InfraMed, Masdar Power (31% equity share), which is the branch of the Abu Dhabi's Mubadala Sovereign Wealth Fund, and the Cypriot privately owned company EP Global Energy (19% equity share). The fact that, upon completion of construction of the wind power farm and its connection to the grid, domestic electricity was provided at a price of 25% below then current wholesale market, that almost 72,000 local citizens were now able to connect to a secure and stable power generation source, and that GHG emissions were reduced by 224,000 tons of CO₂, certainly boosted the appeal of energy projects financed by PPP schemes. It has been suggested that success of the Tafila wind farm has to be mainly attributed to export credit agencies, such as the Danish Export Credit Agency, which provided necessary guarantee to loans granted by development banks, such as European Investment Bank (EIB), improving the attractiveness of the relevant funding. The role of such export credit agencies is pivotal in boosting and safeguarding the attractiveness of both public and private funding. Furthermore, it is often cited that the importance of the private debt issued by commercial banks should not be underestimated, and can financially support the development of such projects, as much as debt issued by multilateral development banks²⁵².

Ultimately, Jordan put serious emphasis into promoting widespread diffusion and social acceptance of renewable energy sources, and simultaneously favored the installation of small-scale, domestic and residential power generation solutions. Additionally, decentralized investment strategy of the Jordanian government allowed for a series of stakeholders -that is, citizens, rural communities, local authorities and private organizations- to actively participate in selecting, funding and developing the exact energy projects, which were deemed able to provide suitable solutions and to meet local needs, while serving government's localism and rural development agenda²⁵³.

²⁵² Alloisio and Carraro (n 167).

²⁵³ Somma and Rubino (n 201).

Concluding Remarks

Undoubtedly, the outbreak of the Covid-19 pandemic, the recent Russian invasion to Ukraine and the subsequent energy crisis, that led electricity and fossil fuels' prices to skyrocket, have had a profound impact on the global energy landscape. The data, published by the most acknowledged researchers and institutions, such as IEA²⁵⁴, and presented in this dissertation, show the potential trends, opportunities and challenges regarding each energy sector; investments in power generation from renewable sources during 2020 showed considerable resiliency mainly due to favorable policy incentives and governmental support, as well as steadily diminishing LCOE, which set that kind of investments more profitable than in the past. On the other hand, investments on fossil fuels plummeted during the same period, as a result of the historically low prices. Yet, current disinvestment strategy followed by major traditional fossil fuel supply players, such as oil and natural gas exploration companies, developers and operators, combined with geopolitical tensions have been deemed responsible for the recent unprecedented rises in the fossil fuel prices. Finally, outbreak of the pandemic hampered investments in energy efficiency measures and energy R&D, both of which are expected to be at the forefront of the global endeavor to decarbonize our economy and ultimately to achieve the goal of carbon-neutrality.

The aforementioned ever-ambitious and critical targets to reduce GHG emissions and minimize total impact of human activities onto the global environment require tremendous amounts of funds to be invested in energy infrastructure. Expansion and modernization of infrastructure can boost the economy of a state and improve public welfare²⁵⁵ by reducing poverty rates and income inequalities, as well as by promoting environmental protection; hence infrastructure is often described as “the wheels of the economy”²⁵⁶. Public actors still hold a dominant position as regards to funding the development of new or the rehabilitation of already existing infrastructural assets. Despite that, funding requirements are extremely difficult to be met solely by public financial resources due to expansive government monetary policies of the near past, which allocated significant funds to alleviation of covid repercussions, and coexistent increase in governmental loan rates combined with growing inflation rates. Especially, developing countries, such as those in MENA region, additionally face intertemporal budgetary stringencies and equity gap, namely disparity between available domestic equity and needed equity share for constructing new energy infrastructure projects.

In this framework, participation of the private sector in the provision of infrastructural assets and services generally, and specifically in the energy sector, could be a credible solution to most of the problems arisen. Cooperation between public and private actors in the provision of assets and services is not unfamiliar, nor a novice phenomenon. Yet, only since the 1990's, collaboration between governmental

²⁵⁴ IEA (n 5).

²⁵⁵ United Nations Economic and Social Council Economic Commission for Africa (n 40).

²⁵⁶ World Bank (n 13).

authorities and private firms has spurred, predominantly in developing countries in Central and South America, under the dominance of more liberal political theories. Partnerships between private and public players can be found in different shapes and forms; despite that, most PPP agreements have a long-term horizon – usually 20 to 30 years -, they focus on the provision of assets and/or services, that entail the element of public interest and are characterized by output or performance-based criteria. The innovative feature of PPPs comparing to traditional procurement methods lays at the fact that public and private partners reach an agreement on allocating the risks inherent to any major infrastructural project on the basis of who is more capable to bear them effectively.

Both appropriate risk allocation between the partners and partial risk transfer to the private sector counterparty constitute major advantages of PPP procuring method, which enhance VfM of the project under development; that feature in combination with the ‘bundling’²⁵⁷ function–or vertical integration- that incentivizes private bidders to rationalize constructing and operating costs, alongside new and innovative ideas and proposals, and significant efficiency gains²⁵⁸, that the private firm would contribute to the entire lifecycle of a complex project, vividly represent the element of increased VfM regarding PPP procurement method, compared to more traditional ones. Furthermore, the fact that PPPs are often described as ‘off-balance sheet borrowing’ by governments²⁵⁹ indicates why they are utilized in order for budgetary obstacles to be overcome in view of meeting surging infrastructural needs, especially in developing countries; simultaneously PPPs are suggested to promote economies of scale in the construction sector and foster transparency and accountability in cooperating public authorities. On the other hand, critics have argued that PPP procurement method significantly adds up to the complexity and cost of infrastructure projects, as the fees for legal, technical and financial support can reach up to 10% of the project’s total cost²⁶⁰, while more complex projects are proposed to present a greater likelihood of failure²⁶¹.

Optimal risk sharing and allocation is crucial, when PPP procurement method is chosen, because a plethora of risks can potentially occur during the long-term implementation period. On the one hand, it is generally accepted that the private partner is more eligible to bear the inherent technical risks, which may appear throughout the PPP agreement, namely from the design of the project, to the construction and commissioning period, as well as during the operation period, as private firms are expected to possess the necessary resources to identify, quantify, mitigate and manage relevant risks. On the other hand, risks, which can be attributed to the superior position of governmental authorities, such as political and social risks, as well as legal and

²⁵⁷ Daniels and Trebilcock (n 58).

²⁵⁸ De Bettignies and Ross (n 90).

²⁵⁹ Yescombe (n 48) 17.

²⁶⁰ Daniels and Trebilcock (n 58).

²⁶¹ Jiménez, Russo, Kraak, and Jiang (n 95).

regulatory risks, have been proposed to be born by the public party; in this framework, the general political and societal atmosphere in a country, the outbreak of a (civil) war, the case of a coup d' etat, domestic political violence incidents, as well as repeated elections, they all constitute different aspects of the term political risk, which can be defined as action – or lack of it- of a government that serves as a threat to the profitability of a project²⁶². Simultaneously, a sound, stable and coherent legal and institutional environment has been reported to be positively affecting the likely success²⁶³ of PPP's, and hence boosting investors' predisposition to fund projects in countries with more mature and enduring legal and regulatory framework. Both of these risks are carefully and thoroughly scrutinized by private investors, when they decide on which country, they should channel their funds. Finally, while private partner is responsible to design and utilize the optimal financial tools to fund the PPP project, as well as to accurately forecast the future demand and price of the product or service provided under the PPP agreement²⁶⁴, the public player can be deemed responsible to bear a number of other major financial risks; namely, the general economic stability and perspective of the host economy, an underdeveloped stock market and structural deficiencies, sudden and unexpected increases in tariffs, controls on import permissions and restriction of allowance of foreign exchange or repatriation of profits, currency inconvertibility and non-transferability, alongside expropriation measures. Hence, it has been suggested that typical currency risks might be dealt with the establishment of currency funds, that would offer investors hedges for less well-traded currencies, whereas other financial risks could be dealt with by the public sector taking “first-loss” equity position in the partnership, thus disincentivizing public sector from (financially) hampering the viability of the PPP project²⁶⁵.

The plethora of risks, which can potentially arise during the implementation of a PPP agreement, alongside the fact that major energy infrastructural projects are characterized by significant up-front funding requirements and a long-term investment horizon, cast critical arguments on which type of private investors would be more willing to provide the necessary funds at the most competitive terms for the execution of such complex agreements. In this framework, it has been suggested that institutional investors such as insurance companies and pension funds could be legitimate contributors in financing major energy infrastructure projects, because they possess large amounts of capital, have generally lower expectations regarding investment returns and are willing to commit themselves in an investment project with significant longer investment horizon, despite the fact that they are facing a number of structural constrains and policy and regulatory barriers²⁶⁶. Furthermore, other institutional investors from developing countries, such as SWFs, possess significant liquidity, are bound by more favorable policy and regulation regarding illiquid assets, and tend to

²⁶² Butler and Joaquin (n 133)

²⁶³ Fleta-Asín, and Muñoz 2020 (n 140).

²⁶⁴ Xenidis and Angelides (n 152).

²⁶⁵ Alloisio and Carraro (n 167).

²⁶⁶ Ibid.

demonstrate a moderate propensity to risk, hence said countries could be able to successfully fund complicated and capital-intensive projects, such as renewable energy projects in developing countries, should they get endowed with the necessary know-how, generally possessed by other esteemed financial institutions and infrastructure funds, such as InfraMed.

The case with the developing countries is that on the one hand, they demonstrate extremely positive population growth rates and rising urbanization trends, which exponentially increase total energy demand, while on the other hand, they are burdened with increased public budget deficits and consequent budgetary constraints, as well as equity gap in the sense that private investors require both higher IRR and higher equity share, which is extremely difficult to be met due to less mature financial markets, among other reasons. This leads to the conclusion that much needed investments in additional power generation capacity and new transmission and distribution networks can only be materialized with the involvement of private players. In this framework, it has been suggested that energy-related project sponsors could potentially rely on external assistance in the form of multilateral institutions in order to cover some of the project development costs²⁶⁷; (multilateral) development banks provide for an array of schemes and tools, that can act as an effective mechanism of credit enhancement and risk reduction, consequently enabling the raise in private flows and helping governments to perform the necessary reforms²⁶⁸. That has been the case with IBRD, which provided for essential guarantee to Moroccan government during negotiation over Quarzazate CSP PPP project, and with EIB, which granted loans guaranteed by the Danish Export Credit Agency, that supported realization of Tafila wind farm. Moreover, it has been proposed that, when major projects are deployed in countries with deteriorated institutional framework, active engagement of multilateral institutions in the execution of PPP agreement can effectively mitigate possible risks associated with the host legal and regulatory environment²⁶⁹.

According to the data presented and analyzed in this dissertation, which were collected from the World Bank PPI project database, the downward path regarding energy PPI investments continued during 2021, when almost US\$ 22.4 billion worth of funds were channeled into 102 energy infrastructure projects in developing countries across the globe, the outbreak of the Covid-19 pandemic being only one of the reasons for this phenomenon; for comparison in 2012 an all-time record of 444 energy projects had been funded via almost US\$ 85 billion of private investments. Despite this negative trend, we ought to underline, firstly that renewable energy projects' appeal continued to grow among investors, mainly due to reduced LCOE and the spread of favorable relevant governmental policy initiatives, and secondly due to certain developing regions, such as Sub Saharan Africa, having augmented their investment inflows as a

²⁶⁷ World Bank, 'Doing Business 2011: Making a Difference for Entrepreneurs' World Bank, 2011, Retrieved from <https://openknowledge.worldbank.org/handle/10986/2549>

²⁶⁸ Maria Basílio (n 207).

²⁶⁹ Jandhyala (n 210).

result of an assertive attempt on behalf of countries such as China, Russia and Turkey to establish or enlarge their global or regional sphere of influence. During the same period under study, East Asia and Pacific clearly held a dominant position in terms of volume of private energy investments, overthrowing Latin America and the Caribbean, which instead had the lead in terms of number of projects that reached financial closure during 2021; on the opposite side of the spectrum, Middle East and North Africa continued to be the worst performing region, despite the fact that it is endowed with significant renewable energy resources capability, and that the average value size of the projects developed in this region was considerably higher than in all other regions.

Historically, the only two countries from MENA region that were able to receive sizeable private investments in their energy sectors have been Morocco and Jordan. Academia has identified a group of three major categories of factors, which could bolster private participation in such projects²⁷⁰; these factors have to do firstly with the incentives perceived by the host government to utilize private funds in infrastructure financing, secondly with the overall economic environment, and thirdly with the private investors' incentives to participate in a PPP agreement. Regarding the first set of factors, both Morocco and Jordan are part of the MENA region, which currently demonstrates exponential increase in energy demand while they simultaneously are facing serious budgetary constraints, as well as they have passed laws, which put renewable sources in the epicenter of domestic energy mixture. Secondly, in terms of macroeconomic perspectives, both countries, despite achieving modest GDP rates, they also display strong demographic growth and they score higher in the political stability index, as defined by WGI, compared to neighboring countries; political instability is a broad term referring to multiple and different political changes leading to different economic performance consequences²⁷¹ and it has generally been observed that political stability is an important factor to attract private funds, as already mentioned²⁷². Finally, regarding the last set of factors, private investors are eager to recognize whether host country's regulatory and institutional framework is adequately stable and transparent, as it would act as an effective counter-measure against potential risks they are expected to bear; a well-structured institutional environment and the presence of a National Regulatory Agency are credible indicators of rule of law, which can significantly bolster private investments in one country²⁷³. In this framework, Morocco and Jordan also display higher performance than MENA region average regarding the rule of law score, as defined by WGI. Under the already mentioned circumstances, it could be rightfully explained why Morocco and Jordan have been the only two countries that have successfully attracted sizeable private investments in their energy sectors, albeit having followed different strategies.

²⁷⁰ Mengistu (n 4).

²⁷¹ Feng (n 233).

²⁷² Morrissey and Udomkerdmongkol (n 234).

²⁷³ Abrardi, Cambini and Rondi (n 242).

As is the case with every study, our analysis suffers from several limitations that could constitute avenues for further research. Firstly, our data are aggregated at a country and project level, hence information on private companies and public managers' characteristics is lacking. Further analysis on how these characteristics correlate with private investors' willingness to fund energy projects could be of significant importance. Secondly, the data analyzed in this dissertation is solely focused on developing countries. Although developing countries' footprint in the global energy investment framework has set to be far from negligible since a long time, an exhaustive analysis of the deployment of energy PPP projects in developed countries would be of great interest, given that these countries are characterized by more mature institutional and economic environments.

In conclusion, it is the author's robust presumption that in the global energy investment framework, where colossal funds must be channeled towards decarbonization of the global economy and energy transition, active cooperation between public authorities and private firms in the form of partnerships would constitute a credible and legit proposal for every country intending to modernize its energy sector and to upgrade the provision of much-needed infrastructure, with the caveat of properly identifying, mitigating and managing all relevant risks. Moreover, countries like Greece, which has greatly suffered from the recent energy crisis in Europe, could possibly be benefited by such partnerships in developing energy projects, which would allow to confront with intertemporal challenges in their energy sectors.

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