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**Partnerships and Risk Allocation Strategies in Managing Sustainable Infrastructure Development in
Saudi Arabia**

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Introduction

Public-private partnerships have become increasingly common due to the rising demand for new infrastructure as well as the rehabilitation of aging infrastructure. At the same time, public resources have become increasingly limited, thus making Public-Private Partnerships (PPPs) popular. In Saudi Arabia, Public-Private Partnerships have become increasingly common in many sectors for several reasons. Saudi Arabia aims to have modern and sustainable infrastructure in line with the country's Vision 2030 goals. It also aims to become a modern nation with a diverse economy whereby the local population learns new and diverse skills essential for maintaining a modern economy (Saudi Vision 2030, 2024). Public-Private Partnerships facilitate this process through the transfer of technology to public-sector workers. With a growing population, Saudi Arabia has to build new and sustainable infrastructure to accommodate the growing population. Thus, PPPs are crucial to the country's plans to meet highly ambitious goals. This research essay explores the links between PPPs and risk allocation strategies that exist in Saudi Arabia's sustainable infrastructure development plans and their implementation.

Research Problem

PPPs come with several benefits, especially when it comes to infrastructure development. However, there are also several challenges when it comes to the area of risk allocation. The traditional practices used to allocate risk are largely obsolete as they do not factor in sustainability, and thus, using them can hinder a project from achieving most of its environmental, social, and economic sustainability goals. New and emerging concerns are becoming a major part of risk allocation, such as long-term financial viability, regular

environmental impact assessments, and community engagement, so as to ensure that the infrastructure projects are both sustainable and meet the needs of the people they are being built for. As such, risk allocation strategies require innovative approaches to risk allocation in the context of sustainable infrastructure projects. From the context of Saudi Arabia, risk allocation also has to factor in the country's legal framework, institutional capacity, and social dynamics when looking at how existing risk allocation models can be adapted or new models can be developed to meet the needs of the PPPs.

This research seeks to answer the following questions:

- How do existing risk allocation practices in Saudi Arabian PPPs meet infrastructure projects' new sustainable development goals?
- What are the limitations and challenges that existing risk allocation models have in the context of sustainable infrastructure development within PPPs?
- How can risk allocation strategies be modified or new models designed to promote financial viability, environmental sustainability, community engagement, and social responsibility in Saudi Arabian PPPs?

The Importance and Objectives of the Research

Examining the relationship between PPPs and risk allocation strategies in Saudi Arabia's sustainable infrastructure development is important for several reasons. It allows us to better learn and understand more about the country's existing practices and whether they have been effective when it comes to achieving sustainability goals. The research findings can also go a long way in facilitating the development of more relevant and effective risk allocation frameworks and best practices tailored to the Saudi context. Finally, the study aims to provide

valuable insight into how Saudi Arabia and other nations with similar ambitious goals can use PPPs, especially when it comes to sustainable infrastructure development, transfer of technology, and long-term creation of job opportunities and economic growth.

The research aims to achieve the following objectives:

- Identify and critically analyze the limitations of the risk allocation strategies used by companies in Saudi Arabia, particularly when it comes to PPPs focusing on sustainable development.
- Analyze and establish how effective different risk allocation models are when it comes to various types of sustainable infrastructure projects that are to be done via PPPs.
- Make recommendations that focus on developing risk allocation frameworks whose focus is on financial viability, environmental sustainability, and social responsibility in Saudi Arabian PPPs.
- Contribute to the broader discussion on whether to embrace PPPs and the risk management frameworks that need to be put in place, especially when incorporating sustainable development in Saudi Arabia.

Research Hypotheses

Based on the identified research problem, the following hypotheses can be formulated:

- Hypothesis 1: Current risk allocation practices in Saudi Arabian PPPs focus on short-term financial gains at the expense of long-term environmental and social sustainability goals.

- Hypothesis 2: Many of the existing risk allocation models do not incorporate sustainability and thus cannot address the specific challenges and complexities of sustainable infrastructure development within PPPs.
- Hypothesis 3: Implementing innovative risk allocation strategies, such as shared-risk models and performance-based contracts, can significantly improve the financial viability, environmental sustainability, and social responsibility of Saudi Arabian PPPs.

Literature Review

Global Trends in PPPs and Sustainable Infrastructure

There is a growing demand for infrastructure as the global population continues to grow and nations become wealthier over time. The global infrastructure gap is estimated to reach \$15 trillion annually by 2040 (Naladekoba, 2022). It is unlikely that public funding will be sufficient to meet all of the infrastructure needs; thus, innovative solutions are needed to fill the gap. Public-private partnerships can play an important role in bridging this gap as they not only allow for collaboration between the private and public sectors but also allow for private sector capital and expertise to flow into infrastructure that is to be used by the general public.

Due to having more mature financial markets, PPPs were mainly restricted to developed nations. However, they have increasingly been widely adopted, especially when it comes to infrastructure development in the Middle East. In Saudi Arabia, one sector where successful PPPs have worked is the desalination sector. In 2002, the country created a framework for private sector participation through build-own-operate and build-own-operate-transfer schemes. Saudi companies, in partnership with Bechtel, built the Shuaibah III, Jubail III, and Shuqaiq II desalination plants and the power plants that sustain them. Further collaboration led to the

establishment of Jubail Industrial City, one of Saudi Arabia's major industrial centers (Murden, 2024). The success of this PPP has paved the way for the implementation of other PPPs in Saudi Arabia. One important area of the models used was to ensure that there was technology transfer from the private companies to the Saudi companies working in collaboration with them. In the long term, the aim was for a Saudi workforce to be able to operate and maintain the infrastructure built and also gain the ability to build similar infrastructure in Saudi Arabia rather than always relying on foreign companies.

Another aim of PPPs has been technology transfer. In line with the Saudization of the economy, PPPs offer the potential to transform the economy by transferring skills and knowledge from foreign companies with technical expertise to local Saudis (Mansouri, 2016). Through extensive collaboration, local Saudis will learn the skills and knowledge to build, operate, and maintain large infrastructure projects that will allow the Saudi Arabian economy to be both diverse and self-sustainable. It will also lay the foundation for Saudi Arabia to establish a technology sector that will allow the country to become a center of research and innovation.

In recent years, there has been a strong emphasis on sustainability. Due to growing environmental concerns, many governments and the general public are advocating for the development and financing of projects that are sustainable in nature. (Munyasya & Chileshe, 2018). These include projects that incorporate concepts such as using renewable energy, energy efficiency, green buildings, sustainable water management and wastewater reuse, and climate-resilient infrastructure. With sustainability becoming an integral part of infrastructure building, a project must select the most suitable sustainability project that will not end up being costly to maintain in the long term while also providing a benefit to the public.

Sustainability is also increasingly a necessity for Saudi Arabia. As a water-scarce nation, it is important that Saudi Arabia is able to find ways to maximize the use of its water resources, as well as reuse its wastewater through treatment and using it in activities that do not involve human consumption, such as in maintaining green spaces, washing vehicles and in sanitation(Dawoud et al.,2022). As such, the country needs sustainable infrastructure to conserve its scarce water resources and maximize the use of the expensive desalinated water that the country relies on for its needs.

The current PPP models often emphasize using private capital to build the infrastructure. In turn, the private entity operates the infrastructure for a period during which it is able to charge for the use of the infrastructure at market rates; then, it eventually transfers the asset back to the public sector. The models that fall under this system are the Build-Operate-Transfer (BOT) model, the Design-Build-Finance-Operate (DBFO) model, and public-private partnerships for availability (PPPAs), which incentivize performance and efficient operation(Delmon, 2010).

Saudi Arabia and PPPs: Opportunities and Challenges

Under Vision 2030, Saudi Arabia needs to invest considerably in infrastructure with the aim of job creation, technology transfer, and economic diversification. PPPs offer both huge opportunities and pose a number of challenges regarding their role in infrastructure development.

Opportunities

PPPs are an easy and low-cost way of attracting private-sector capital with the aim of addressing the issue of financial shortfalls from public coffers at a time when significant financial resources are needed for infrastructure development (Biygautane, 2023). PPPs have proven themselves in the past when it comes to industrial cities, infrastructure like pipelines and toll roads in that they allow for the quick set-up of infrastructure, grow the private sector, which

is able to profit from the infrastructure, and allow the public to have free access to high-quality infrastructure after the private entity exits the project. Another opportunity is when it comes to enhancing efficiency. The public sector is often characterized by low efficiency and productivity. PPPs work to bring efficiency, innovation, and best practices from the design of the project and, once constructed, how the project is operated in the long term, leading to efficient systems, cost savings, and high ROI from the project. These benefits often continue, even after the private partner has exited the project and it has been handed back to the public. From the context of Saudi Arabia's Vision 2030, PPPs will play a major role in diversifying Saudi Arabia's economy, particularly through the process of technology transfer, where Saudi nationals in the public sector gain skills from the private sector, which, over time can be used to maintain the infrastructure built, particularly if the PPP is using the BOT or DBFO model(Delmon, 2010).

Challenges

One challenge is in Saudi Arabia's legal and regulatory framework. To some degree, Saudi Arabia remains a highly regulated economy in some sectors. Thus, many private sector participants in PPPs feel that the current legal framework transfers a lot of the risks to the private sector. As such, the legal and regulatory framework needs to be adjusted with the aim of ensuring that risks and rewards are allocated fairly between the public and private sectors (Biygautane, 2023). Essentially, Saudi Arabia's legal and regulatory framework should strike a balance between attracting private sector capital and participation while at the same time protecting public interests.

Another challenge is capacity building. For a long time, the Saudi public sector has been bloated, and a large percentage of the workforce lacks the expertise to play a role in PPPs. As such, there is a need for training and development programs that help the workforce develop the

expertise needed in areas like project development, risk assessment, and contract management to utilize PPPs effectively (Biygautane, 2023). Transparency throughout this process is crucial so as to ensure that a competent workforce emerges over time. , fair competition, and public trust.

Another major challenge is in Project selection and structuring. Given that the process of selecting the right projects for PPPs and structuring them based on the Saudi context is essential for their success, one has to look at a wide range of variables, such as project risks, affordability, and long-term sustainability.

Global Experiences and Lessons Learned

PPPs have been used widely across the globe, and thus, Saudi Arabia can learn from past and existing PPPs to navigate the challenges that PPPs bring to a sector and maximize their potential. One area that risk planners can focus on is looking at the successful PPP models in various countries across the globe, especially those with similar cultural ties to Saudi Arabia, like the UAE, as well as in places where PPPs have long been implemented successfully, such as in China, the United States and the European Union (Biygautane et al., 2018). One area that Saudi Arabia can learn from is the Thames Tideway Sewer project. The project is one of the largest sanitation projects ever implemented in the UK, whereby the UK government and the city of London partnered with Dutch-owned BAM Nuttall Ltd., UK-based Morgan Sindall Plc. and Balfour Beatty Group Ltd. The private contractors brought in sophisticated boring machines from Germany and France, which made it possible to complete the project in record time. The project is backed by European Union financing and thus meets EU laws despite the UK no longer being in the EU (Reina, 2018). The project was a significant upgrade from the combined sewers that often cause pollution when heavy rainfall leads to the sewers overflowing into the rivers. As such, the UK benefitted immensely from a PPP project that was completed within a

short time and allowed the UK to upgrade its water and sanitation system to modern and sustainable standards.

The UAE also used the Build-Operate-Transfer (BOT) model when it came to the Dubai Metro as well as the Al Maktoum International Airport's expansion (Bambridge, 2012). Such models can provide valuable insights for project design and implementation of sustainable projects. When the PPP involves an international organization, sharing best practices can facilitate the process of knowledge transfer and allow for the necessary adjustments for the project to fit into the Saudi context (Biygautane et al., 2018). From a risk management perspective, the focus would be on the development of robust risk management frameworks aimed at addressing a wide range of risks, such as project overruns, environmental concerns, bureaucracy, and the country's economic conditions.

Risk Allocation in PPPs

A wide variety of risks exist when implementing a PPP. Project Risks are uncertainties associated with the project itself, including design flaws, construction delays, cost overruns, and unforeseen technical challenges. Factors such as geological complexity, weather events, and unforeseen environmental issues may also fall into this category. Business Risks are risks related to the financial viability of the project and its ability to generate sufficient revenue to cover costs. These may include fluctuations in demand for services provided by the project, changes in economic conditions, and unexpected operating costs. Political and legal risks are risks arising from changes in government policies, regulations, or laws that may affect project profitability or operations. Public opposition, social unrest, and regulatory lags can also be considered political and legal risks (Abd Karim, 2011).

Risk allocation is the process through which a decision is made on deciding who bears the cost and/ or reaps the benefit of various project risks. If done well, it enhances project efficiency while ensuring that both parties share responsibility for the project (Jubair & Singh, 2022). The main principles of PPP Risk allocation include efficiency, which ensures that the risks are spread out in a manner that the party best able to manage them is in charge of the risk and is able to handle them at the lowest cost; fairness, where both the private and public sector are allocated risks in a fair and balanced manner based on the expertise and contributions of both sectors; transparency, whereby the process is done in a manner in which there are no grey areas and thus, lowers the risk of potential disputes. Another principle is direct risk sharing, whereby collaboration and shared responsibility are encouraged to not only foster a sense of partnership but also enable both parties to collaborate when it comes to risk mitigation.

Common PPP Risks and Potential Allocation

In this case, the ideal approach to use is the Matrix Approach, which is outlined below.

Risk Category	Example Risks	Public Sector Allocation	Private Sector Allocation
Market risks	Major fluctuations in interest rates, sudden changes in commodity prices or exchange rates, supply chain disruptions	Low unless the sector intervenes to bridge the costs of the risks when they occur	High, as they have more exposure to market conditions

Construction risks	Poor site preparation, delays in permit approvals, cost overruns, defects emerging during construction, or unexpected site conditions	The risk is low but can be shared depending on the selected risk transfer mechanisms.	The private sector is in charge of construction, especially when it comes to defects and unexpected site conditions.
Operational risks	Changes in Consumer tastes and preferences, technological changes, or regulatory changes that directly impact the project	The public sector may provide guarantees that minimize such risks, especially when it comes to regulatory changes, which may include clauses that provide immunity to the private entity for the period it is building and operating the project.	High as they are in charge of operations
Political risks	Changes in government policies, laws, and regulations.	High as political risks come from the government	Limited as they have limited control over political events

	changes in Local government policies		
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(Hopkin,2018)

Other Approaches to PPP Risk Allocation

- **Contractual Clauses:** Contractual clauses outline each party's risk allocation and mitigation strategies (Almarri et al., 2019). It is very similar to the Matrix approach, except that contractual clauses focus on collaboration between the two parties regarding both allocation and mitigation, unlike the Matrix approach, which focuses only on allocation.
- **Risk Transfer Mechanisms.** Risk transfer mechanisms include warranties, guarantees, and insurance to transfer specific risks to the party best equipped to manage them. In most PPPs, the public sector is often obligated to provide guarantees that ensure that the project is completed even when the market and economic conditions change.

Risk Allocation Models

Risk allocation models refer to the way in which these risks are shared between the public and private partners and determine the overall risk profile of the PPP. Common risk allocation models include:

Public Sector Adoption Model. In this case, the public sector bears a large portion of the risk. The model can be used for projects with significant social benefits but limited commercial viability. However, it may be less attractive to private partners due to limited profit potential.

Private sector hypothetical model. In this model, the private sector bears a larger share of the risk. This may be suitable for commercially viable projects where the private partner has

greater control over revenue generation. However, if the private partner prioritizes profit maximization, this may result in higher royalties or reduced public benefits.

Balanced Risk Allocation Model. This model attempts to create a balance and allocate risk based on which party is best able to manage the risk. For example, the public sector may retain risks related to land acquisition or regulatory changes, while the private sector is responsible for managing construction delays or operational inefficiencies.

Benefits of Effective Risk Allocation

There are several benefits that come with effective risk allocation. One benefit is improved project success rates as both the public and private sectors have clear responsibilities, ensuring that the chances of disputes are minimized. If done optimally, it leads to improved cost efficiency, which lowers the project's cost. A successful PPP with efficient risk allocation mechanisms can, in the long term, encourage the private sector to collaborate more with the private sector, thus leading to the private sector playing a significant role in sustainable infrastructure development (Almarri et al., 2019). Overall, effective PPP risk allocation allows for both the private and public sectors to collaborate effectively, manage risks proactively, and contribute to the delivery of valuable infrastructure and public services.

Overall Risk Mitigation Strategies

Type of Risk	Mitigation Strategy
Market and Financial Risks	1. Use hedging instruments to mitigate currency and interest rate fluctuations. 2. Diversify funding sources by seeking a mix of domestic and international investors. 3. Conduct thorough financial modeling and sensitivity analysis to assess the project's adaptability to market changes.

Operational risk	1. Implement strong project management methodologies such as the Critical Path Method (CPM) to ensure compliance with schedule and budget. 2. Invest in advanced construction technologies tailored to local conditions to improve efficiency and reduce risks. 3. Develop contingency plans to address potential supply chain disruptions or unforeseen technical issues.
Legal and Regulatory Risks	1. Engage in proactive legal consultation to ensure compliance with current and anticipated Saudi Arabian laws and regulations. 2. Design iron-clad contracts with clear risk allocation provisions and a dispute resolution mechanism adapted to the Saudi legal framework.
Political Risks	1. Build strong relationships with relevant ministries and regulatory agencies. 2. Keep a close eye on the political landscape in Saudi Arabia and strategize to adapt to possible political changes. 3. Consider including political risk insurance provisions in contracts to mitigate unforeseen government actions.
Social Risks	1. Conduct a comprehensive social impact assessment during the planning stage to identify potential issues. 2. Communicate openly with local communities throughout the project lifecycle to address their grievances and build trust. 3. Prioritize the hiring of local labor and implement training programs to contribute to the socio-economic development of the region.
Environmental Risks	1. Conduct a thorough Environmental Impact Assessment (EIA) in compliance with Saudi Arabia's environmental regulations.

	2. Design sustainable infrastructure solutions that minimize environmental impact and water consumption. 3. Develop a waste management plan that complies with local regulations.
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(Hopkin,2018)

Risk Monitoring and Review

1. Continuous monitoring. Establish a continuous risk monitoring system through regular meetings, reporting mechanisms, and data analysis.
2. Regular Review and Adaptation. Regularly review and update the risk management strategy based on new information, project progress, or changes in the economic, political, or social landscape of Saudi Arabia.
3. Stakeholder Engagement. Proactively communicate identified risks and mitigation plans to all stakeholders, including government, private sector partners, lenders, and the public.
4. Accessibility. Ensure communication materials are clear, concise, and available in multiple languages relevant to project stakeholders.
5. Timeliness. Provide timely and up-to-date information on risk identification, mitigation efforts, and any changes in the risk landscape.
6. Feedback mechanisms. Establish clear channels for stakeholders to provide feedback and raise concerns about identified risks.

Sustainable Infrastructure Development in Saudi Arabia

Saudi Vision 2030 provides an extensive and comprehensive roadmap outlining how Saudi Arabia aims to diversify its economy, wean itself off its dependence on oil, and focus on sustainable development (Saudi Vision 2030, 2024). The plan is highly ambitious and recognizes infrastructure's role in meeting the vision's goals. Some of the areas the vision focuses on include the development of smart and sustainable cities, diversifying the economy by focusing on sectors

like the service industry and manufacturing, which the PPPs infrastructure projects will support, and overall, improving the quality of life for the average Saudi citizen(Saudi Vision 2030, 2024). As such, sustainable infrastructure is a major pillar of Vision 2030, and PPPs can play a major role in attracting both private capital and enhancing the efficiency of the use of public funds aimed at achieving them.

Since 2016, several policies have been created with the aim of promoting sustainable infrastructure development and facilitating PPP projects. They include The National Transformation Program (NTP) (Saudi Vision 2030, 2024). This is Saudi Arabia's core program aimed at economic diversification through setting specific targets, how they will be achieved, and the role sustainable infrastructure will play in various sectors like transportation, energy, and water. Another policy is the Saudi Vision 2030 Real Estate Sector Strategy (Saudi Vision 2030, 2024). This policy specifically focuses on constructing and maintaining sustainable and smart cities with highly efficient infrastructure systems, allowing for the seamless movement of people and goods while supporting a high quality of life. Through various agencies and ministry policies, Saudi Arabia has been trying to streamline the process of setting up PPPs to attract private capital. Some of the policies include providing tax breaks and guarantees, promoting sustainable practices, and defining clear guidelines for PPP projects.

Despite Saudi Arabia actively promoting PPPs, it still faces several challenges. The country lacks the expertise to manage complex PPP projects; thus, foreign companies continue to dominate some sectors regarding PPPs (Biygautane et al., 2018). While Saudi Arabia has made extensive reforms, it continues to have a large bureaucracy, making the approval process time-consuming and complex (Biygautane et al., 2018). Standardized PPP contracts have yet to

become the norm in Saudi Arabia; thus, there is still some degree of uncertainty, discouraging PPPs from certain projects.

Social Impact

Saudi Arabia's focus on using public-private partnerships (PPPs) to develop infrastructure and social services as part of its Vision 2030 will also have a social impact, both positive and negative. While most of the impacts are positive, there are also a number of concerns that may lead to some opposition to PPPs.

Positive Social Impacts of PPPs

PPPs can leverage private sector expertise and financing to accelerate the development of critical infrastructure like transportation networks, healthcare facilities, and education institutions. This infrastructure expansion can improve access to essential services for all citizens, particularly those in remote areas and towns and cities in the eastern and southern parts of the country that have not received the same level of infrastructure development as cities in the central and western parts of the country (Gazze & Abubakar, 2018).

Saudi Arabia has already benefitted immensely from existing PPP projects, which have played a role in lowering youth unemployment to the historical low of 15.6 percent in 2022 (St. Louis Fed, 2024). This is because the projects generate employment opportunities during the construction and operation phases. Skilled and unskilled labor demands can boost local economies and contribute to national GDP growth. Additionally, successful PPPs can attract further private-sector investment, creating a virtuous cycle of economic development. By adding the sustainable phase, which is often a long-term endeavor, PPPs can play a role in reducing youth unemployment even further.

As highlighted earlier, collaboration between public and private entities fosters knowledge exchange and technology transfer, especially if the partner companies are from developed nations. Private sector expertise can introduce innovative solutions for service delivery, leading to improved efficiency and cost-effectiveness for the government. These advancements ultimately benefit citizens through enhanced services (Almarri et al., 2019). At the same time, Saudi Arabia will be able to build a society that includes a highly skilled workforce when it comes to both knowledge and technical expertise.

PPPs can play a major role in changing the lackluster culture prevalent in the Saudi public sector through the introduction of private sector performance-based incentives, leading to a focus on quality and efficiency in service delivery. This can result in higher standards of education, better healthcare outcomes, and reliable utilities. As such, PPPs may play a major role in building confidence in the Saudi Public sector when it comes to public service delivery.

By incorporating social considerations into project design and operation, PPPs can transform Saudi society by overall, increasing job opportunities and also helping make Saudi society into a more knowledge and skill based one. PPPs may be required to have local employment quotas and training programs and take part in CSR and community development initiatives alongside the core infrastructure project (Elsig & Almaric, 2008). Such projects will foster a sense of ownership and inclusivity among citizens and make them more likely to support PPPs in their communities.

Negative Social Impacts of PPP

PPP projects often include user fees or cost compensation mechanisms to recoup private sector investment. This can result in higher costs for accessing vital services such as water, electricity, or transport. This cost burden can disproportionately impact low-income households

and exacerbate social inequality. This phenomenon is already seen when it comes to traffic congestion on public roads versus those paying to use less congested toll roads.

Complex PPP structures may lead to transparency and accountability issues. Citizens may not have clear channels to resolve complaints or hold private entities accountable for service quality or social impact (Al-Barrak et al., 2016). To address these issues, strong oversight mechanisms and public participation in project planning and implementation are needed. In Saudi Arabia, while there are accountability mechanisms with regard to private corporations being directly accountable to the government, the mechanisms do not involve direct engagement with the citizens.

The pursuit of cost efficiencies in some public-private partnerships may lead to labor exploitation, particularly in the employment of migrant workers who form the bulk of the workers used to build infrastructure in Saudi Arabia. Ensuring fair wages, safe working conditions, and compliance with labor laws are critical to PPP projects. The process of attaining sustainability can initially have a negative impact on the environment, particularly in ecologically sensitive areas. As such, there is a need for extensive environmental impact assessment, which is critical to minimizing the footprint of PPP projects and ensuring sustainable development. Some argue that widespread reliance on PPPs has weakened public control of essential services. Striking a balance between attracting private sector expertise and maintaining public oversight of social services is crucial.

Research Methodology

The research paper will combine both qualitative and quantitative data collection and analysis techniques.

Qualitative Methods

In this case, direct interviews were conducted with key stakeholders involved in PPPs in Saudi Arabia, both government officials and private sector representatives, and their responses were collected.

(See Appendix)

Quantitative Methods

When it comes to quantitative methods, a questionnaire was used in order to gauge the impact of PPPs in Saudi Society. In addition to asking for basic information like age, gender, occupation, and residence, the Questionnaire focused on obtaining information that aimed at gauging how aware the Saudi public is with regard to PPPs and whether they are viewed positively or negatively. (See Appendix)

Data Analysis

Qualitative Data Analysis

Based on the qualitative data, there is strong support from all stakeholders in the PPP sector. The government representatives interviewed see PPPs as the primary solution, especially when it comes to knowledge and technology transfer. The representatives also see PPPs as one of the main drivers to achieving Vision 2030. The private sector representatives interviewed also indicated that PPPs are often preferred as a lot of the risk that comes with initiating large projects in Saudi Arabia is borne by the public sector under most PPP models, especially when it comes to financing. However, some of the interviewers indicated that Saudi laws need a number of reforms, especially when it comes to the minimum value that can be delivered under the allowed PPP models. Currently, PPPs are largely confined to large projects, locking out medium-sized

contractors from participating, thus also locking out local companies, which tend to be smaller than the foreign companies participating in PPPs.

All stakeholders are highly supportive of the role PPPs play when it comes to knowledge and technology transfer. The government representatives interviewed highlighted how many areas of the Saudi economy, particularly in manufacturing, mining, and transportation, have led to the creation of a highly skilled Saudi workforce, as many Saudis have worked with and have been mentored by skilled workers from developed nations. There is a need to sustain this process so that eventually, Saudi Arabia will be able to have its own independent skilled workforce.

When it came to risk allocation, both the government representatives and the private sector representatives interviewed found that the risk allocation process in PPPs in Saudi Arabia is fairly balanced. Nonetheless, there were some concerns from both sides. The government representatives felt that the private sector needs to provide value for money and thus maximize both the quality of infrastructure provided and the terms of financing that the government makes possible. The private sector, on the other hand, appreciates the fact that much of the risk is borne by the public sector, and there is a need for better guarantees, especially during the construction phase of PPPs.

When it came to sustainability, both the government and private sector participants agreed that sustainability should be incorporated into all PPP projects, with government representatives indicating a strong preference for water reusability being incorporated into major infrastructure projects, while private sector participants indicated a preference for setting up solar based infrastructure like solar lighting.

Decision Tree of Risk Allocation and Risk Management

Risk Allocation and Risk Management	
Are there risks associated with...	
Yes	
No (Project proceeds with minimal monitoring)	
Market or Financial Risk	Operational Risk
Fluctuations in Oil Price, Domestic Demand, or Regional Instability (Assess Severity and Likelihood)	Delays in Permits, Cost Overruns, Supply Chain Issues, Technical Deficiencies (Severity & Likelihood Assessment)
High or Moderate Probability and High Impact (Government Mitigation Strategies)	High or Moderate Probability (Private Sector Mitigates) Develop Contingency
	Plans, Invest in
	Technologies
Low Probability or Low Impact (Monitor and Periodically Reassess)	Low Probability or Low Impact (Monitor and periodically Reassess
Legal & Regulatory Risk	Political Risk
Changes in Laws, Regulations (Environmental, Labor, Investment) (Severity & Likelihood Assessment)	Changes in Policies, Global Oil Price Fluctuations (Severity & Likelihood Assessment)
High or Moderate Probability and High Impact (Government Consultation & Contract Clauses)	High or Moderate Probability (Government Mitigation Strategies) Build Relationships,

		Political Risk Insurance
Low Probability or Low Impact		Low Probability or Low
(Monitor and Periodically		Impact (Monitor and Reasses)
Reassess)		
Social Risk		Environmental Risk
Public Opposition, Displacement,		Fragile Ecosystems, Water
Labor Violations (Severity &		Usage, Waste Disposal
Likelihood Assessment)		(Severity & Likelihood Assessment)
High or Moderate Probability		High or Moderate Probability
and High Impact (Social Impact		(Environmental Impact
Assessment & Community		Assessment & Sustainable
Engagement)		Design)
Low Probability or Low Impact		Low Probability or Low
(Monitor and Periodically		Impact (Monitor and Reasses)
Reassess)		
		Risk Management Strategies Implemented
		(Continual Monitoring & Communication)
		Project Proceeds with Mitigated Risks

from Jazan region, 4 from Al Baha region. No respondents were from the Al Qassim and Al Jawf Region.

35 percent of the respondents were between ages 18-29, 50 percent were between ages 29-45, and 15 percent were above the age of 45.

70 percent of the respondents were male, and 28 percent were female. 2 percent did not indicate their gender

When asked about being familiar with the concept of PPPs, 30 percent stated that they were very familiar with the concept, 50 percent stated that they were somewhat familiar with the concept, and 20 percent were unfamiliar with the concept.

When asked whether PPPs have a positive contribution to the economy, 45 percent stated that they strongly agree, 15 percent stated that they agreed, 10 percent stated that they were neutral, 15% stated they disagreed and 15 percent stated that they strongly disagreed.

When asked which sector benefits the most from PPPs in Saudi Arabia, 60 percent stated transportation, 20 percent stated healthcare, 10 percent stated energy, 2 percent stated education and 8 percent indicated other sectors like communication and defense.

When asked whether PPP projects in their region contributed to job creation. 60 percent stated significantly, 12 percent stated moderately, 8 percent stated not at all, and 20 percent stated they didn't know. The highest number stating Significantly came from Riyadh, where all respondents stated significantly, and so did 80 percent of those from Makkah, Medina, and Najran. On the other hand, those who stated moderately came from Tabuk and Asir, where half of the respondents chose this option. Those who said Not at all mainly came from Al Jawf and Al

Qassim, where 50 percent of the respondents chose this option. The Do Not Know option was evenly distributed throughout the country.

When asked whether jobs created through PPPs in terms of of high quality, in terms of salary and working conditions? 90 percent of the respondents responded Yes, No respondent chose the Somewhat option while 2 percent chose No. 8 percent chose the Don't know option.

When asked to rate the quality of public services provided through PPPs, 60 percent selected very high quality, 10 percent chose high quality, none chose moderate quality, 30 percent stated low quality, and none selected very low quality.

When asked whether PPPs made public services more accessible to you and your community, 22 percent chose Significantly more accessible, 16 percent selected Somewhat more accessible, 10 percent selected No change, none chose Less accessible, while 52 percent chose Not applicable/Don't know.

When asked if PPPs contribute to the socio-economic development of your region? Overall, 30 percent of Saudis stated strongly agreed, 25 percent selected agreed, 25 percent selected neutral, 20 percent selected disagree, and none selected strongly disagree. Riyadh, Makkah, and Medina had the highest number of respondents selecting strongly agree, while Eastern Province had most of its respondents selecting Agree. The Northern Region and Tabuk had the most respondents selecting neutral, while Al Jawf, Najran, Asif, Al Baha, Hail, and Al Qassim had most of their respondents selecting disagree.

Discussion

Based on both the qualitative data from the interview and the quantitative data from the Questionnaire, there is clear support for PPPs, especially sustainable PPPs, from government

officials, the private sector, and the public. Both the government and the private sector seem to agree that the way risk is allocated and mitigated is ideal and balanced, but there are areas both seem to disagree on some areas. The areas of disagreement are value for money, access to financing, legislation, and protections at various phases of PPP projects. A lot of the public also feels that their voice is not heard when it comes to such projects taking place in their communities. As such, there is a need to explore various risk allocation frameworks whose focus is on financial viability, environmental sustainability, and social responsibility in Saudi Arabian PPPs.

Despite the additional costs sustainability can add to PPPs, there is strong support for the concept from the government, the private sector, and the public. Many see sustainability as essential to the future of the quality of life for Saudi citizens, and thus, the government, the public, and the private sector, to some degree, are willing to take on the additional risk that comes with sustainable infrastructure development.

Based on the Questionnaire, it is clear that while the concept of PPPs is widely recognized in the country, up to 20 percent of the respondents are not familiar with it. This was largely seen in older generations who are not familiar with the term, as PPP projects in Saudi Arabia are relatively recent. However, despite this, given that the Questionnaire was filled out online, it is likely that some of the respondents looked up the term online and thus filled many of the answers based on their new understanding of what a PPP is and most likely discovered a local PPP in their region, thus explaining the inconsistencies between the lack of familiarity and the fact that more people indicated that they benefited from PPPs, including those who stated that they were not familiar with what a PPP is.

The data indicates that there is a wide disparity in terms of opinion when it comes to the benefits of PPPs, with more developed regions having a more positive attitude towards them than less developed ones. This indicates that a strong correlation exists between being familiar with a PPP project and having a positive attitude towards it. As such, more PPPs need to be initiated in less developed parts of Saudi Arabia so that more citizens can enjoy their benefits, especially given that new PPPs will entail building sustainable infrastructure. Overall, the research strongly indicates that there is strong support for both PPPs and sustainable infrastructure. At the same time, there is a degree of willingness to take on additional risk when it comes to sustainability, thus indicating that overall sustainable infrastructure has strong support in Saudi Arabia.

Research Limits

Some of the data limits include restrictions on data collection due to the sensitivity of some information for both the project documents and during interviews. Another limitation is that the scope will be confined to infrastructure development and the few PPP projects that have taken place in that sector. Another limitation is that the findings may apply to Saudi Arabia but may not be appropriate for application in other nations with different economic conditions.

Ethical Considerations

Before data collection, informed consent will be sought from all interview participants to ensure that the data collected is private and confidential. Ethical research practices will be maintained throughout the entire research process, aligning with the guidelines provided by both the University and the participating institutions(Agunloye, 2019).

Conclusion

Overall, this research outlines a comprehensive plan aimed at exploring the relationship between PPPs and risk allocation strategies in managing sustainable infrastructure development in Saudi Arabia. The proposal tries to address the research problems and objectives while employing a mixed-methods approach to analyze the data collected via qualitative and quantitative methods. As such, the final research will aim to add valuable knowledge and insights into existing PPPs and how risk allocation strategies can be deployed. Thus, the findings can be used in policy-making in Saudi Arabia and other developing countries that aim to use PPPs for sustainable infrastructure development.

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Appendix

Interview Questions

The interview entails the following questions to each group.

Government officials

Framework and objectives of PPP policy

1. Can you describe the overall objectives of the PPP framework in Saudi Arabia?
2. How do current politics support the goals of Vision 2030?
3. What measures has the government taken to ensure transparency and competitiveness of PPP projects?

About risk allocation

1. How are risks identified and allocated between the public and private sectors of PPP projects in Saudi Arabia?
2. Can you give an example of how risk mitigation strategies were successfully implemented in a recent PPP project?

On technology transfer and capacity building

1. What measures are in place to ensure technology transfer and capacity building through PPP projects?
2. How does the government assess the success of technology transfer in PPP projects?

Private Sector Representatives

About cooperation experience

1. What do you think are the key factors for the success of PPPs in Saudi Arabia?
2. How does the regulatory environment in Saudi Arabia support or hinder PPP projects?

For risk management

1. What challenges do private companies face when allocating PPP risks and how can they be addressed?
2. Can you share insights into the innovative risk management strategies your organization has implemented in PPP projects?

About realizing benefits

1. In addition to financial returns, what other benefits does your company expect to gain from participating in a PPP project in Saudi Arabia?

2. How do you measure the success of technology transfer and capacity building in PPP projects?

Questionnaire

1. Age: _____

1. Gender:

- ☐ Male
- ☐ Female
- ☐ Prefer not to say

2. Occupation: _____

3. Region/City of Residence: _____

General Awareness and Perception

5. How familiar are you with the concept of Public-Private Partnerships (PPPs)?

- ☐ Very familiar
- ☐ Somewhat familiar
- ☐ Not familiar at all

6. Do you believe PPPs contribute positively to the Saudi economy?

- ☐ Strongly agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly disagree

7. In your opinion, which sector benefits the most from PPPs in Saudi Arabia?

- ☐ Healthcare
- ☐ Education
- ☐ Transportation
- ☐ Energy
- ☐ Other (please specify): _____

Impact on Employment

8. Have PPP projects in your region contributed to job creation?
 - Significantly
 - Moderately
 - Not at all
 - Don't know
9. Are the jobs created through PPPs in your view of high quality, in terms of salary and working conditions?
 - Yes
 - Somewhat
 - No
 - Don't know

Access to and Quality of Public Services

10. How would you rate the quality of public services provided through PPPs?
 - Very high quality
 - High quality
 - Moderate quality
 - Low quality
 - Very low quality
11. Have PPPs made public services more accessible to you and your community?
 - Significantly more accessible
 - Somewhat more accessible
 - No change
 - Less accessible
 - Not applicable/Don't know

Socio-Economic Development

12. In your opinion, do PPPs contribute to the socio-economic development of your region?
 - Strongly agree
 - Agree

- Neutral
- Disagree
- Strongly disagree