

## **"Bridging the Planning – Execution Gap: The Impact of Poor Project Planning and Management on Construction Project in Sudan"**

**Wafaa Faisal Khidir Mekki<sup>1\*</sup> , Prf. Dr. Awad Saad Hassan<sup>2</sup>**

<sup>1,2</sup> Sudan University of Science & Technology. Sudan.

**\*Correspondence:** Wafaa Faisal Khidir Mekki

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**ABSTRACT:** This paper assesses the implications of inadequate planning and the weakness of management systems on average performance levels among major infrastructure works in Sudan.

It included key findings from 4 detailed case studies (Khartoum Ring Road, New Khartoum International Airport, Foul Power Plant, Port Sudan Port Expansion)

These weaknesses and failures have resulted in major delays, projects being cancelled or left uncompleted, and rampant cost over-runs.

This paper proposed several criteria using institutional panels (university sector, bonding and independent control (contingent risks) or digital planning tools over the gap between planning to implementation in construction & infrastructure sector in Sudan.

**Keywords:** *Project Management, Risks, Implementation Failure, Construction Delays, Infrastructure Planning, Case Study Analysis.*

### **1. Introduction**

The infrastructure system in Sudan suffers from a chronic performance deficiency of planning and management in engineering and construction projects that made the national

development regulations contradict with failure to complete. There are several strategic infrastructure projects — highways, ports, power generation and even the aviation sector — we need immediately or in the near future but many of these have been either halted and abandoned outright, stuck or over-budgeted to 200% of what they originally intended for it creating a message that public money is being wasted on incomplete assets.

As a result of these failures, the Sudanese construction and infrastructure sector has become structurally disconnected between its planning and implementation phases; weak feasibility studies, poor institutional coordination, lack of transparency in decision-making and absence of effective risk management protocols are normative features.

Typically, projects are launched without a well-defined role for stakeholders or vision for sustainable financing and environmental/spatial planning. In addition to all this, the institutional fragility and weakness of political instability, poor regulation implementation, and governance between it-self & others.

The study was to address these failures, deficiencies and failure of implementation processes at 4 cases of critical infrastructure projects. Using this study as a foundation, the paper aims to offer some practical and real evidence-based contextual recommendations that could be implemented to support reform, build resilience in institutions and fill the gaping chasm that exists between planning and implementation preventing most of the country's infrastructure projects from proceeding.

## **2. Literature Review**

### ***2.1 Principles of Infrastructure Planning and Management***

The implementation and success of any infrastructure program are based on a coordination of balance integrating policies with project construction and management. The emphasis should be on strong planning happily married to an army of workers that can together win the day all be but

It is only when the management is called into action and turns these proposals and objectives into practical operation through making proper use of resources, taking risks and right decisions throughout the life cycle. Project management literature, such as the IAM 2021 regulations and Flyvbjerg 2002 studies, suggest that where one of these two elements is absent (whether it be poor planning or execution), then there will be considerable delays to production schedules and costs, and overall quality of implementation result plummeting sharply as well.

These problems are even more severe in most mega-projects than small ones of public assets because of institutional complication and political pressures.

## **2.2 The best international methods in the implementation of infrastructure projects**

As projects grow more complex and major stakeholder expectations are raised, a number of countries have adopted combination best practices than integrate technical development with governance and institutional reforms. Like, to picture the East Coast Railway project in Malaysia and to use geographic info system (GIS) technology for mapping purposes with Building Information Modeling Technology (BIM) which can be evangelized as tool for risk identification.

Determine the implementation phases and prevent design changes during implementation phases.

The completion of the Lamu Port Development Project in Kenya further exemplifies how central regulatory bodies are instrumental to encouraging stakeholders, to promote these projects, as well as even resource discovery.

In a world, the use of digital permit systems, open contract frameworks and real time project monitoring bodies has all come together to deliver some of the best results globally for a transitioning middle-income economy that seeks very rapid economic and civilizational development. (ADB, 2022; UNDP, 2021).

## **2.3 Structural and organizational weaknesses in Sudan**

With the exception of that, a relatively immaterial archaic infrastructure planning footprint exists in Sudan. Preliminary assessments including feasibility studies,

environmental impact assessment or cost-benefit analysis are often missing or unrealistically conducted.

Projects are frequently launched with no well-defined network of infrastructure or risk management, which results in coordination collapse and regulatory disputes between ministries, regions and private contractors. With that, there are frequent political interference and planning disruptions due to unpredictable project timelines, budgeted entitlement changes and the breaking of continuity across cycles.

This construction environment has since been a high-risk area due to weak structural systems, lack of transparency in procurement sites, lack of digital control tools and the absence of public mobilization whereby weaknesses and wastefulness become evident as indispensable for implementation.

Sudan has, in consequence, not just failed or weakened its essential infrastructure systems but also eroded the trust of public and private investment in state-led development projects.

### **3. Methodology**

To overcome this situation, the current study utilizes the multiple-case study approach to scrutinize and evaluate the underlying causes of inefficient planning and execution in infrastructure projects in Sudan.

This course provides an intensive education with specialization in the real depths of field, while Area Focus on institutional, financial and political inter-related to technical aspects lead for the implementation of construction engineering projects.

The analysis used 3 sources of information:

- Government documents.
- Project audit reports.
- Estimates organized by various international institutions such as the United Nations Development Program and the African Development Bank and the World Bank.

Also sprang from an additional study into the case material, this fresh delving contributed to a wider and much deeper coverage; It was therefore helpful in verifying final conclusions.

The secondary literature and investigative press reports confirm the same facts.

According to the intentional sample, the projects were selected based on four main criteria,

- Significant divergence from the initial timetable,
- A large surplus of funding that exceeds planned expenditure by 100%
- Destruction of governance system or institutional coordination.
- The occurrence of political interventions and social disturbances.

The final sample included four major infrastructure projects representing different sectors and regions in the country:

- The Khartoum Ring Road project is intended to reduce traffic jams in the capital.

Cessation of the Aviation Sector Aerospace Industry A major project in the aviation field the new international airport Mattar, and complete cessation of aviation industry Sharat Al Fola Power Station A local energy project that encounters logistical difficulties and security problems

Characterized by expansion, it is a global trade enhancing project; the Port Sudan Port expansion.

- Every case was treated as a single case and the assessment system consisted of four main criteria that were reviewed.
- level of planning (feasibility studies, environment impact assessments)
- Financials like never-ending budget, and stable-cost
- Working arrangement across key entities such as real and unambiguous contracts, stay away from institutional drag

The risk management like a contingency plan and plans for cost crisis.

This methodological framework demonstrates that the conclusion is reached in reference to other studies on the synergic impact of infrastructure system over specifically investment also it provides a systematic framework for the examination of structural systems that hinder infrastructure projects success in Sudan.

The diversity of sectors and the common types of governance weaknesses across sectors combined to make this analysis relevant at a country-wide level for policy recommendations.

#### 4. Results and Analysis of Case Studies

In this section we compare and analyze four case studies by applying them to large infrastructure projects in Sudan, made possible by snowballing one-handed engine driving.

The four sector physical challenges of each project also illustrate every project's common weakness in planning, financial control and institutional coordination. The end results confirm that performance weaknesses and lacunae mane these projects not just in addition to situational circumstances every day sharpens the pitch fork, are not limited only to the specific factors or conditions of each project itself.

Instead, they also illuminate more general problems at a level of system or governance; they indicate major public policy issues.

**Table Summary 1: Selection of case study project**

N o.	Project	The nature of the project	The plann ed perio d	THE TRUE PERIOD	Transc end the budget (%)	The main reason	Sta rt Dat e (firs t)	End Dat e (firs t)	Star t Dat e (Re al)	End Date (Real)	Current Status
1	Khartou m Ring Road	Highway Infrastruc ture	3 years	6+ years	80%	Lessness of the budget and the contractor's agreement	201 5	201 8	201 5	It is still execut ed (2024	Delayed , partially operatio nal

						took land				)	
2	New Sudan International Airport	Aviation Infrastructure	5 years	Discontinued	150%	Political interference, financial mismanagement, feasibility gaps	2014	2019	2014	2017	Abandoned / On hold
3	Al-Fula Power Plant	Energy Infrastructure	4 years	7+ years	100%	Confusion in supply, contractor conflicts of security	2016	2020	2016	It is still executed (2024)	Delayed, partial operation
4	Port Sudan Seaport Expansion	Maritime Infrastructure	4 years	7+ years	200%	Lack of environmental planning, the absence of politics and systems	2017	2021	2017	It is still executed (2024)	Incomplete, delayed

(World Bank,2020; Ministry of Transport, Sudan,2019; UNDP Sudan Report,2021)

#### 4.1 Khartoum Ring Road (Transport Sector):

It was launched as a three-year programmed to develop the national urban railway system at an initial cost of \$500 million. But the commencement timescale widened to over six years and the true cost was upped to \$900 million, so hit about 80 per cent of initial budget.

The primary target of the project is that this sector was to:

- **Road Network Development**
- **Improving road efficiency**
- **Traffic Facilitation**
- **Improving traffic safety**

Regional connectivity improved but the chronic problems and obstacles of implementation had led to a slow stopping up of the completion stage and hampered its various phases.

- **Key Problems Stopping the Project Is Still at This Stage** To locate collectively held land: A weak legal regime for expropriation and disputes over rights to property -- particularly in the peri-urban areas. This has resulted in expensive legal action by all involved parties, including locals who are often arrayed against expropriation.
- **Alterations in original budget:** Distribution of government funding is not commensurate with the needs of various vestiges simply rot away, from sources of content and funding the old ones are being terminated into new debts on a whim--And so frequent was the project's suspension that it could not possibly be called complete.
- **Contractor recession and institutional conflicts:** The national authorities, local government and contractors never cooperate which resulted in contract disputes, site abandonment and noncompliance by contracted agent can Ra. License to sacraments.

The case study reveals how poor land use planning and management, inadequate supervision does not in fact make these projects any easier to get behind one may note that even the complete absence of any concerns on this issue from those voices most raised about it government is responsible for leveling off social strata on which it can be built The lively interaction between them influences the implementation of infrastructure projects in Korea.

#### **4.2 New Sudan International Airport (Aviation Sector):**

At the beginning, the project was designed to be a luxury alternative to the existing Khartoum airport due of its small capacity and began implementing it in 2014 with a financial budget for the construction is only \$1.2 billion and scheduled opening in 2019. In 2017 the project was indefinitely frozen, having already absorbed over \$3 billion of Iran's own resources as well as external grants.



#### **Main causes of failure:**

- **Relocation and political influence:** The most significant reason is its proximity to the airport where it borders military camps installations, and government areas thus causing bureaucratic disputes, security holdups, and organizational gridlocks.
- **Corruption and financial mismanagement:** No financial control whatsoever and the abuse during the procurement process hyperinflation in costs, inconsistent contracts with many problems.

#### **4.3 Al Foul Power Plant (Power Sector)**

The primary purpose for which the project was designed to reduce the power outages that afflicted Khartoum recently, is a character-building crisis south Kordofan State at a cost of up to \$ 800 million initially and all completion by 2020. It was, however, still not complete until this year after \$1.6 billion in budget inflation.

#### **Causes of Failure**

- **Logistical difficulties:** There is a lack of accessibility and transportation infrastructures which leads to challenges in transporting heavy equipment, machinery and building materials; especially during the seasonal lockdown period.
- **Dispute with the contractor:** Misunderstanding regarding some terms written in the contract for payments and scheduling them. Typical performance measures and ways in which their judicial challenge are bound to keep arising, necessarily leading to the suspension of enforcement.
- **Deteriorating security and environmental changes:** Ongoing tribal conflict, lack of government capabilities to deter these conflicts has remained one core impediment for the delays in the implementation process and this threat constantly poses a risk to life and property.

So, we understand that facilitation in logistics in the study of this case is evident to us and indeed, it should remind us the issue of site specificity too as well [sic] to design projects however addressing these sensitivities of conflicts by differences environments.

#### **4.4 Port Sudan Port Expansion (Maritime Transport Sector):**

The project was launched in 2017 as one of the most strategic projects for financing and trade development to re-engineer Sudan's iconic Red Sea Front into a unique regional center.

But the project was hit by a massive cost and time blowout, blowing out its \$700 million budget to in excess of \$1.54 billion.

##### **Main causes of failure:**

- **Non-availability of environmental monitoring:** Short fall in Marine/Environment Impact Assessment (EIA) has caused excessive time delay for construction stages and phases, start-up re-design budgets and coastal eco-system damage.
- **Divided planning:** Conflict, incompatibility and misunderstanding with national institutions using the Project heterogeneity to customs and shipping improvements.
- **Inefficient operations:** poor transport and distribution of goods, slow government clearances/ permissions, and the lack of an extensive protocol system amongst different government arms, all in turn substantially constrained port capacity utilization.
- **The investigation of this case:** This case study demonstrates how the lack of environmental review and integration with infrastructure planning undermines the strength and thereby the effectiveness of a project as well as its long-term economic benefits.

## 5. Discussion

### *5.1 Analysis and study of failures and systemic patterns*

The systemic papers on infrastructure projects in Sudan have illustrated a shared occurrence of systemic disruptions and deviations throughout sectors using a comparative analysis. This atavistic gap proves poor project performance is not human error (not even technical part) anymore and it results from a recurrent, stagnant institutional/govt syndrome that perverts all phases of projects execution, i.e., from birth through implementation to operation post-construction.

#### *Four Reasons for Failure:*

##### **A. Plan A. Weaknesses in project-initiation planning Structural gaps Folgen Sie unframe works for projects.**

The four studies together indicate that the rigid initial plan is near-entirely out the window. Because the projects were initiated without a realistic and through feasibility study improper areas of work that was not compatible with the project, inaccurate design specifications, untemplated constraints during implementation etc. The cost and timing estimates were provided from political perspective of the country not based on practical assessment with available data which led to much lower than actual requirement which ended in time delays overruns.

Also, none of the projects had simple environmental or social impact statements prepared before they commenced. The result is noncompliance with regulations, late-stage panic re-designs, and the emergence of resilience from afflicted communities. Expropriation and property contracts have become even more problematic due to the lack of integrated consolidation with spatial planning, which has been repeated in the Khartoum Ring Road Project with its unofficial landowners.

##### **B. Mismanagement of finances Poor budget; Slow to respond:**

In our previous case study, both these things abode well for us in the sense that financial governance was a clear weak link and not sustainable. The cost ratio was between 80% and 200%+ of this, the preparation of budget schedules was weak with

no risks or the just emergency reserves required, coupled to Inflation There has been credit constraints from inflation on many projects but most will have started funded partially / conditionally relying on monitored government amounts or non-fixed quantities them top up later with external borrowing.

Long delays in disbursement of funds and the lack of funding or guaranteed payment for several years also caused many construction jobs to be periodic, as well as some contractors to shrink from, and simply refuse work. This delay in payments also affected the cash flows of contractors; this would expose the state into a legal liability and high risk. We see this in examples like the Fula Electric Plant and the New Sudan Airport.

### **c. Divided governance dismantling:**

although similar enough the four projects dismantling commitments between institutions, local authorities, global contractors and giving agencies are common things that attracted the attention of stakeholders in.

No army equivalent gathering and distributing, managing the inputs, reading non-coordination conflicts, disagreements to be managed with a standard coordinate approach and most importantly no big boss.

It has led to a blurring of roles, duplication of powers and organizational inconsistencies in the project especially where federal ministries and regional entities have come together.

Formal community involvement has rather disappeared in front of the drawing board, displacement being habitual or naturalized and local workforces left untrained to distrust.

Acting upon the Social Declaration was not perceived as a "given" strategic parameter, which meant that site access could be delayed, higher waste risks until late project decision lead etc. and deterioration in relationships with important stakeholders.

### **D. Risk with management and no alternate plan**

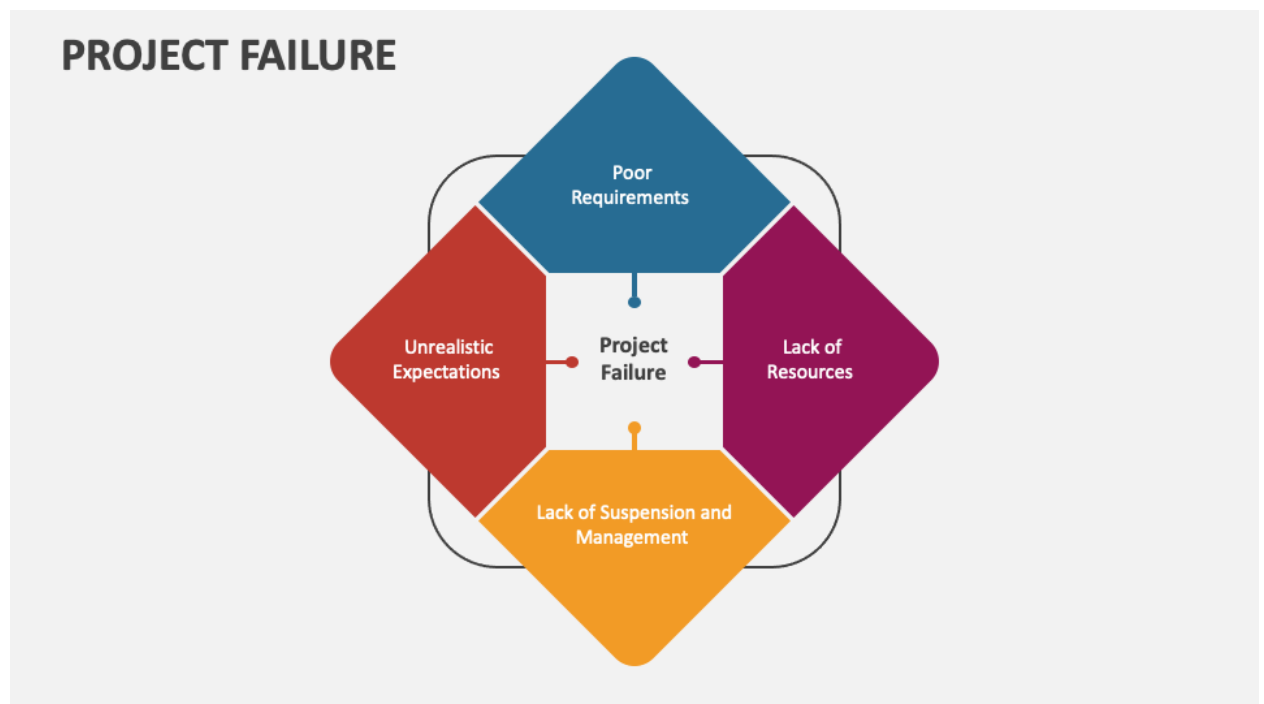
Not one of the projects included any official risk management and crisis response plans

Political instability, regional insecurity and environmental disturbances (such as floods and road degradation) have been addressed only reactively, not pro-actively with yet-to-be-determined risk mitigating measures in place.

In Kordofan, for example, the remote site of the Foul power plant should have triggered early security planning and sophisticated logistical modeling in a conflict-prone area -- but neither was done

In addition, the implementation was postponed in two projects, which are the port and the airport at Port Sudan, for later to respond to political trends that were also ignored.

The lack of formal triggering processes for risks, schedule to-do list items, and fast actions during execution has made projects highly responsive to external influence>> unable to re-condition midstream.



**Figure 1:** Analysis and study of failures and systemic patterns

## 5.2 The bottom line:

The session focused on the key factors that led to this failure i.e., lack of good privatization, weak financial management, no synergy between stakeholders and absence of risk management. In the absence of institutional restitutions and re-platforming of infrastructure and its project's failure in perpetuity will remain, loss of public trust would be a further cost, and so shall myriad private and other investments that are made to supplement the national endeavor.

## 6. Strategic Suggestions and Directions to Bridge the Planning and Implementation:

Based on field evidence resulting from case studies of infrastructure projects in Sudan, and lessons learned from International best practices, this work presents different dimensional reform treatments that lead to bridging the gap between project planning and implementation. These instructions are by way of a governmental or institutional response and pathway to change, targeting the failures at their root cause not muscling through with superficial cures. Summary Table of Proposed Interventions with Implementers & Systemic Impact:

**Table Summary 2: Strategic** Suggestions and Directions to Bridge the Planning and Implementation

Guidance Required	Responsible Entity	Expected final result
Impose a feasibility study and environmental assessments	Ministry of Infrastructure	Early detection and remediation of hazards;
Creating central units to arrange and follow up projects	National Planning Council	Enhancing communication between stakeholders and ensuring implementation
Structuralize the use of BIM and GIS and follow up on immediate projects	Public and Private Sectors	Improve planning accuracy, budget knowledge, and full transparency among stakeholders

Guidance Required	Responsible Entity	Expected final result
Collecting fuel molds and applying payment systems on time	Ministry of Finance	Lack of legal conflicts and project suspension resulting from financial mismanagement
Creating separate bodies to follow up and review the infrastructure	National Audit Bureau Anti-Corruption Commission	Raising trust between stakeholders and achieving organizational justice
Conducting national training programs in digital project management and risk management	Technical Universities and Development Partners	Improving and improving implementation capabilities and preparing to face major challenges
Strengthening Public-Private Partnership (PPP) Systems for Infrastructure Finance	Ministry of Investment	Different sources of funding and easing the financial burden on the government

These imperatives should reinforce each other as they can all only be effective if pursued in unison and require long term political buy-in.

Infrastructure reforms represent a national priority for Sudan, which percolates from governance and creates systemic capacities to the economic development level.

Furthermore, digital transformation should only be an enabler: the infrastructure project framework in Sudan will perform within the scope of more accountability, transparency and performance traceability from land use planning to procurement processes to monitoring implementation, operation and maintenance.

## 7. Conclusion

Investigation and analysis of the major infrastructure projects in Sudan demonstrates that planning-implementation gap, which continuous and permanent, are not only due to technical requirements but they are resulted from great weakness at political organization, planning and institution system of the country.

The Khartoum Ring Road, the new Sudan International Airport, the Foul Power Plant and enlarging of The Port Sudan port are all failures resulting from this weakness that we can observe better if we look at its depth this structure.

Starting with the non-implementation of a thriving Strategic Planning methodology and application, absent feasibility planning or even worse lack of alignment between project interested parties, which ends up placing what should be the greatest investment in our country as compromised.

These include an absence of clear risk management, lack of long-term financing and community trust in the projects thought to be located within one or more sectors such as the infrastructure category. And after completion, due to bad contract work, poor and dispersed management and reactionary truth denier, these projects are dissipated or completely disappear.

This obviously failed to yield the desired results, since ultimately not enough infrastructure was completed and this meant consistent stiffing of funding, furthermore because most of these companies that applied managed to waste investor funds within a year creating little value without any products or services yet ready for market, beyond vaporware we all know how this ended up with no paved connections in its wake waged speculation against public interest, taking advantage from bearish markets and property bombings hurting investors of real Tudor capacity.

To exploit and face these difficulties and challenges, a complete system must be in place for Sudan through reforming on remedy based on four conditions:

- **Clearly planned:** These are based on early feasibility studies, environmental assessments and initial analysis of risks that should not start a project without them.
- **Developing institutions & managing laws:** Establish the necessary administrative and legal conditions to apply realistic timetables, with an emphasis on contract implementation, and employing accounting systems for each stage of project implementation.



- **Digitizing & Predictive Tools Outsourcing:** Implementing the use of Building Information Modelling (BIM), GIS and integrated project dashboards which are critical in forecasting (GIS) as well as scheduling coordination and real time path optimization.
- **Split in charge and needful openness:** Set up a separate executive leg to oversee execution of the project as also be clarified/ announced regarding real-time developments, disbursement and funding.

Through a clear vision for these reforms and treatments and from benefiting from the experiences of similar projects in other countries which have succeeded in overcoming similar challenges which are like the institutional coordination model in Kenya, participatory financing model for infrastructure in Ethiopia, using digital tools in planning process at Malaysia Sudan can adopt clear one strategy with standards amongst by regular of infrastructures that prioritize building credibility and completeness and sustainability on national construction development projects.

## 7.1 Applied Effects on Policy and Industry

The really appalling outcomes of these studies highlight just how significant the behaviors of particular actors within Sudan's infrastructure system can be. Finally, much more than a technical barrier between the planning and execution need to be overcome for which it will require integrated research from policy makers, industry activists, academic institutions and development industries.

- **For policymakers**

Projects need to be specific to access funds (e.g., national standards-based project), priority for design and development of country's essential national standards as prioritized by government implementation. These are things such as the need for an unambiguous pre-feasibility study, clear project stages in terms of implementation, and minimum inputs for stakeholders, costing and environmental impact studies.

Construction of an independent project's regulatory framework, which has all the legal authority to monitor performance and issue sanctions when orders are not

conducted, thus these will be ad-hoc remedies to avoid or recover confidence building between the project owners and public or investors.

#### Construction Companies and Working

- **For Organizations and companies working in**

The infrastructure field in Sudan, need to uplift their internal project management competencies. These bring in the modern internationally recognized digital tools including Building Information Modeling (BIM) and Primavera software.

He advised state agencies to add more partnerships and alliances because they are core competencies for unclear project systems calling for technical knowledge and attention to risk management that can adapt better to financial and operational changes. And also, with due attention to clear tendering processes and transparent contract systems disputes are sure to reduce thus resulting in division symmetry and harmony amongst all the stakeholders associated.

- **For academic and training institutions,**

Sudanese universities and technical institutes must update their curricula to meet the demands of implementing current infrastructure. This was through efforts integrating tools of digital project management, stakeholder collaboration methods in Engineering, Architecture and Public policy to risk-based thinking for planning with the addition of international academic institutions support can also bring in quality knowledge and interest on certifications. It will increase the job possibility and performance of area cadre.

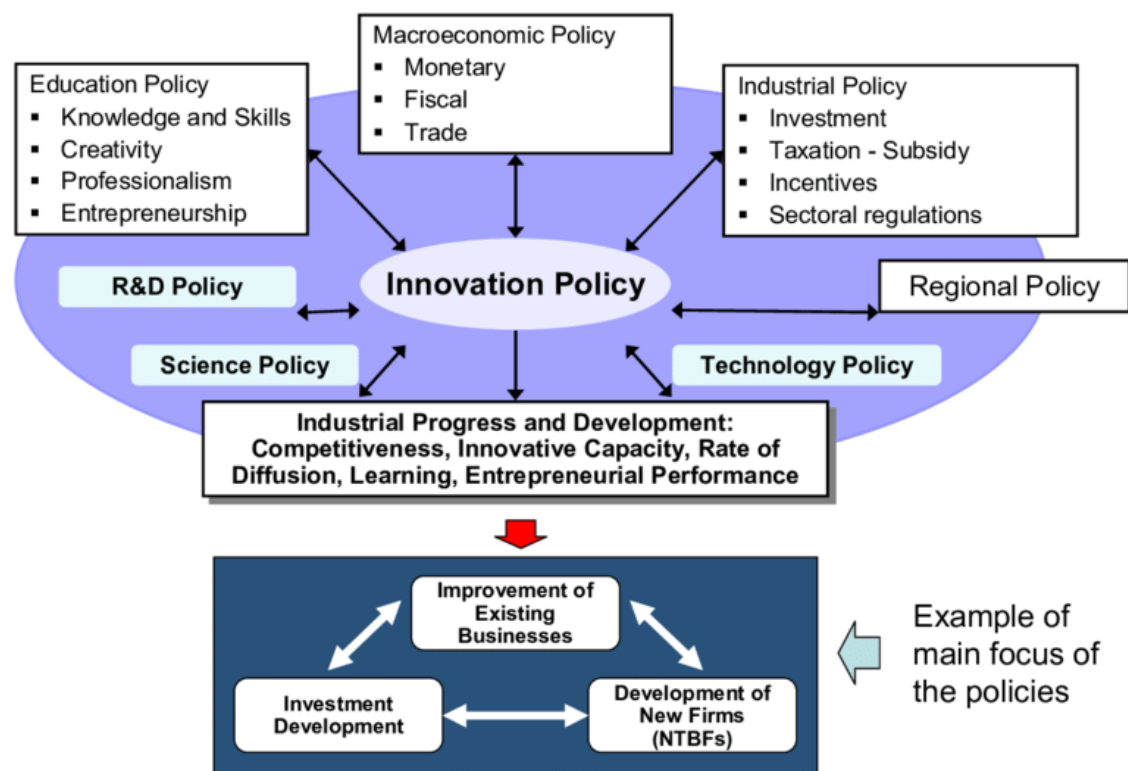
- **For donors and development partners,**

Contracts and treaties with international financial institutions and development partners for financing infrastructure in Sudan should set performance-based limits, conditions This involves the connection of fund disbursement and budgets to best practices such as transparency in procurement, environmental compliance and application modern digital surveillance systems.

This must include donor-funded technical assistance to build institutional capacity and help government institutions design, implement, and evaluate infrastructure in line with international standards.

Sudan has by now matched reform across these four studies that have put it at the leading of a crucial change in reactive built infrastructure to an active, data and result-driven notion.

This work will be rigorous in integrating policy, industry strategy and donor support to create a future that works and serves us. Infrastructure based on certification and sustainability is the country's landmark.



**Figure 2:** Applied Effects on Policy and Industry

## 7.2 Limitations and Future Research Directions

These boundaries serve as a way to gain an understanding of the weaknesses in Sudanese infrastructure, though they also severely limit the scope of what can be covered within the study itself so that only 4 large urban projects are compared.

Directions: The directions provided need to be strictly followed with future research terms proposing new ones that give a clear the broader view on how infrastructure works in Sudan.

## Limitations

- **Urban Focus:** The selected case studies are set up in or close to urban centers, and therefore do not fully represent the logistical, security, and institutional dynamics that mark conflict-affected areas.
- **Cross-sectional:** Having static pictures of project performance and governance failure and success prevents us following more advanced interventions along the full lifecycle of a LDP. Some projects are missing records (primarily financial documents and contract reports) which impacts the results, and their granularity.
- **Heterogeneity of stakeholders:** The research had no diversity, countering opinions and ideas from the local community and certain groups (egg women, other marginalized groups) were not considered even though their participation are successful and crucial for planning urban commons.

## 7.3 Future research directions

More generally, future research should highlight the need to scale-up and reach out on infrastructure reform in Sudan by:

- **Rural Trials:** Doing Implementation Research for Infrastructure Projects in Remote/Conflict-Impacted Areas, where the logistical obstacles, insecurity, and institutional vacuums can be substantial barriers.
- **Long-term project tracking:** development and enhancement of a lasting data base which is meant to be used for numerous years, following projects from the point of pre-feasibility study up until post-implementation evaluation, spelling out ways in which an institution can benefit overtime and adapt.

- **Advanced Technologies for Planning:** Assessment of the probability of solutions in digital transformation and innovation, such as an AI simulation to forecast project completion, using 4D/5D digital twins, and sensing technology to reduce risks while improving accuracy in design within a low-capacity environment.
- **Gender-equitable and socially inclusive criteria:** Understanding of gender equitability in infrastructure design and appraisal, community inclusion across the range of communities, as well as both output and outcome-based development results.

It is said that expanding the research plan to cover all other areas is necessary not only because it would bridge a planning-implementation gap but because it would be useful in developing policies and systems rooted in reality, reality-grounded with the capacity to confront/scuttle through choppy water, if needs be resilient to handle future uncertainty whether taking place in Sudan or elsewhere practiced by replicated weak development frameworks.

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