International Journal of Research and Technology (IJRT)

International Open-Access, Peer-Reviewed, Refereed, Online Journal

ISSN (Print): 2321-7510 | ISSN (Online): 2321-7529

| An ISO 9001:2015 Certified Journal |

Risk Management Lessons from the Pan Borneo Highway Project A Comparative Case Study of Public Infrastructure Delivery in Sabah and Sarawak, Malaysia

Dr. Jonathan Gisong

Subject Matter Expert, Kazian School of Management

jonathan.gisong@gmail.com

Abstract

The Pan-Borneo Highway (PBH) is one of the largest transport infrastructural projects in Malaysia, which seeks to boost the level of regional connectivity and social-economic growth in Sabah and Sarawak. However, due to its strategic importance, project implementation has suffered governance inefficiencies, procurement instability, land acquisition wrangles and disproportionate institutional capacity. The paper explores risk management approaches in the PBH project in a comparative case-study methodology, with an emphasis on the influence of the differences in the governance structures and socio-administrative conditions of the two states on the results of project deliveries. uantitative performance data, such as construction progress ratios, contractor continuity rates, and the approval schedules, were analysed to reveal association between risk factors and delivery disturbances. The results indicate that both states used formal risk management frameworks but was mainly technical in nature with underestimation of governance, contractual and community related risks. Sarawak showed relative best practices of inter-agency coordination and adaptive contract practice that resulted in more stability of delivery. Conversely, the project disruption in Sabah was much greater because of fragmented institutional settings, over-transference of risk on the side of the contractor and protracted Native Customary Rights problems. The research findings are summarized to conclude that less important than recorded risk procedures in an effort to determine infrastructure risk outcomes are contextual governance capacity and effectiveness of stakeholder engagement. The study provides empirical evidence to the literature on the risk governance of megaprojects, and give policy recommendations on enhancing the collaborative procurement and institutional coordination and the community-based risk management frameworks in future Malaysian transport infrastructure development.

Keywords: Pan Borneo Highway Project, Risk Management, Public Infrastructure Delivery, Sabah and Sarawak, Mega-Project Governance

I. Introduction

The Pan-Borneo Highway (PBH) is one of the most prominent and largest infrastructural projects undertaken by Malaysia that aimed to make the state of Sabah and Sarawak more accessible and more economically promising through the modernization and connection of over two thousand kilometres of roads in the island of Borneo. The idea behind the PBH was designed as a federal priority, comprising of new construction and improvements to existing routes and, since its announcement, it has become the subject of discussions on cost, procurement models, the land acquisition, and environmental and social effects of large road

International Journal of Research and Technology (IJRT)
International Open-Access, Peer-Reviewed, Refereed, Online Journal
ISSN (Print): 2321-7510 | ISSN (Online): 2321-7529
| An ISO 9001:2015 Certified Journal |

projects in frontier regions (Ikau et al. 2019). Although PBH has shown promise in terms of development, it has been facing incessant implementation risks through slippage of schedule and cost overruns due to intricate procurement deals; controversial land-take and compensation exercises on indigenous and rural communities; biodiversity fragmentation in the face of ecological landscape; and a weak governance approach that adds a layer of political and contracting instability. Due to different administrative arrangements, local land tenure regimes, stakeholder relationships, and project packaging models that provided an opportunity to draw comparative lessons on risk identification, risk allocation, risk mitigation and risk governance in the delivery of public infrastructure, these multi-dimensional risks have been different in Sabah and Sarawak (Abram et al. 2022).

Public infrastructure projects are key economic growth, regional integration as well as social development drivers. Nevertheless, they are also widely known as very sensitive to delivery risks which often take the shape of cost overruns, schedule overruns, governance failure, environmental conflicts, and community opposition globally. Megaprojects of transport projects amplify these risks because of the complexity of the project, the long history of implementation, the complexity of the stakeholder engagement, and the political pressure that overlap each other. Even though formal risk management structures have been developed and implemented within the systems of the public sector, there are still empirical findings that show that there is a still existing gap between the theoretical and practical risk governance framework and its practical implementation especially in the developing and emerging economies (Alamgir et al. 2019). The Pan Borneo Highway (PBH) is one of the biggest transport infrastructure projects of Malaysia. The project targets to improve connectivity, improve trade and tourism, and foster inclusive regional development through visioning as a strategic route cutting across more than two thousand kilometres in Sabah and Sarawak. As much as its strategic relevance cannot be questioned, the PBH has been characterized by lengthy delays in implementation, contractor withdrawal, land acquisition wrangles, environmental compliance issues, and increasing cost of government money. These problems have revealed institutional flaws on risk identification, allocation, and mitigation practices in the delivery system of the project.

Figure 1: The Pan-Borneo Highway (Malay: Lebuhraya Pan Borneo)

It is worth noting that, there are divergent performance outcomes realized between the Sabah and Sarawak arm of the PBH although they are governed by the same federal policy mandate. Sarawak has shown a relatively strong track record in project development and project continuation, and Sabah had seen several hiccups caused by unsettled land claims, poor inter-agency interactions, and contract failure. This diversity poses significant analytical challenges on how institutional governance systems, procurement approaches, the process of stakeholder engagement, and land administration systems determine the risk exposure and effectiveness of risk management in the same infrastructure programme (Abram et al. 2022). This paper takes a case-study comparative approach to study the practice of risk management in the two parts of the Pan-Borneo Highway; Sabah and Sarawak. It aims at establishing the prevailing type of risks that impacted delivery performance, assessing governance systems that contributed to risk outcomes, and coming up with lessons that can be transferred to improving governance of risk management of public infrastructure in Malaysia. This study will be relevant to the academic discussion on the topic of megaproject governance and provide practical recommendations to policymakers, project managers, and industry practitioners dealing with the construction of large-scale infrastructure in the future by bridging the gap between the empirical evidence and the international risk management theory.Justification of the Study

Massive and publicly funded infrastructure developments are commonly known to be a high-risk venture because of their capital-intensive nature, multi-stop and go stakeholder relationships, extended implementation periods and their susceptibility to political, environmental and socio-economic risks. In Malaysia, mega-transport projects have been associated with delivery problems such as cost overruns, project schedule slippage, problems with land acquisition, poor governance and opposition by communities. One of the most educative contemporary cases of such complexities can be seen in the Pan-Borneo Highway (PBH) project. Covering Sabah and Sarawak, the highway will help to promote regional connectivity, trade, tourism, and socio-economic integration. Nevertheless, its development has been characterized by long delays, re-tendering of contracts, and transfer of risks to government and contractors, as well as recurrent issues of transparency and environmental sustainability of the project (Mohmad Shariff et al. 2024).

The research can be explained by the lack of in-depth, comparative scholarly study considering the way risk management has operated differently in the same infrastructure programme in two different contexts of subsidies in the same sub-nation. Policy reports and media commentaries point out the shortage of the delivery, but often have no theoretical basis and systematic comparison. The current academic literature on the study of Malaysian infrastructure projects also tend to consider projects on a national level and fail to disaggregate the governance of risks at the regional level where a different regulatory regime, land governance schemes and the relationship between communities and industries exist. This study allows recognizing institutional, contractual, environmental, and stakeholder-management aspects of risk at once, which exacerbate or alleviate delivery issues in Sabah or Sarawak. It has a direct impact on the areas of project management, infrastructure

governance, procurement in the public sector, and sustainable development. In practice, the results will be used to inform federal and state agencies, project delivery partners and infrastructure financiers to enhance risk forecasting, risk distribution, community engagement models and regulatory coordination of future public megaprojects.

II. Problem statement

Although formal risk management disposition approaches have been adopted in the Malaysian systems of project delivery to the populace, the Pan-Borneo Highway project has remained a consistent failure in terms of scope, cost, schedule, and even stakeholder deliverables. The fact that these are failures indicates that there was a disconnection between risk management theory and practice of governance. Although the engineering risks were predicted and reflected in the project planning, the socio-political, land tenure, environmental approval, coordination between the agencies and contractor capacity risks were not managed or sufficiently assigned. Moreover, the two state arms of the project Sabah and Sarawak show different results even though they are guided by the same national policy. Sarawak has shown to have a relatively high continuity of contracting and quicker delivery portions, but Sabah has shown to have a greater contractor termination, postponements as a result of unresolved land claims and administrative snarls. This deviation suggests that the risk outcomes can no longer be attributed only to the project scale and complexity, but to the variations in the governance structures, procurement models, practices in stakeholder engagements and the institutional capacities.

III. Review of literature

- **Foundations of Risk Management in Infrastructure Projects**

Infrastructure project risk management is the methodical procedure of identifying, evaluating, eliminating, and observing the uncertainty that may influence project goals regarding the cost, time, quality, safety and societal worth. The systems of risk measurement like the ISO 31000 and the PMI Project Management institute PMBOK focus on lifecycle approach where risks are constantly reviewed between the project planning and the commissioning of the project. The infrastructure megaprojects due to long-term periods are capital-intensive and exposed to political risk have a higher degree of uncertainty than smaller projects (Pawar et al. 2015). Some of the major risk factors are changes in technical design, regulatory compliance, market volatility, and conflict of interest between the stakeholders. Literature points out the endemic problems of optimism and misrepresentation of the strategies whereby the promoters of the project will overestimate the costs and complexities of the project in order to gain political endorsement and instill risk in the very system of planning.

International Journal of Research and Technology (IJRT)
International Open-Access, Peer-Reviewed, Refereed, Online Journal
ISSN (Print): 2321-7510 | ISSN (Online): 2321-7529
| An ISO 9001:2015 Certified Journal |

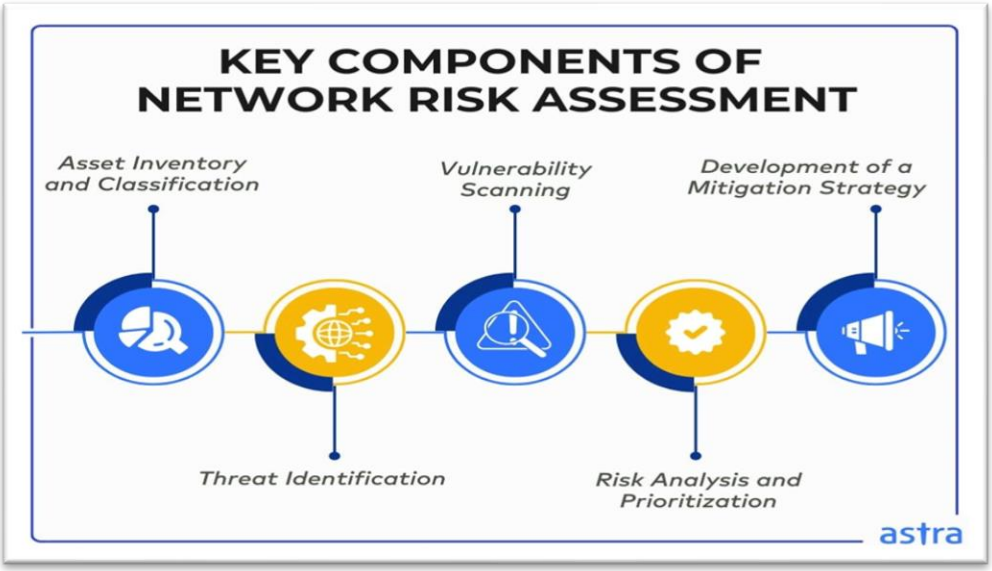

Figure 2: Prominent Components of Network Risk Assessment

Infrastructure projects risk management can be described as the methodical determination, evaluation, reduction, and tracking of uncertainties that jeopardize project goals in terms of cost management, schedule performance and safety and quality, social acceptability and environmental sustainability. Risk management is guided by international standards like ISO 31000 and PMBOK of the Project Management Institute where coordinated processes allow all project life cycles, which are strategic feasibility planning, construction, and post-completion appraisals. These models focus on preventing risks prior to their emergence and constant consultation with stakeholders instead of responding to the impact of disruptions (Das et al. 2021). Nevertheless, the megaproject studies have underscored that irrespective of the formal structures, the risk practices often fail because of structural complexities of the large infrastructure delivery. The common problems faced by transport megaprojects include optimism bias, political pressure, and misrepresentation of strategies in which the promoters of the project downplay the risks so as to obtain funding approvals. The result of this is that contingency budgets are under-budgeted and unrealistic implementation schedules are implemented, which entrench latent project risk. Empirical research will always prove that the magnum road programmes have compounded risks that come as a result of design changes, regulatory approvals, supply chain unpredictability, and overreliance on the conditions of cooperation of local communities that is particularly apparent in the rural and ecologically sensitive areas.

The theoretical issues in the Pan-Borneo highway project are manifested in repeated schedule changes and scope changes in both Sabah and Sarawak. Although it is reported that risk registers were integrated into the supervisory arrangements, most of the non-technical risks (especially land tenure issues and environmental compliance delays) were considered secondary to engineering issues. The lack of this fit is a reference to the disconnect between the theory and practice of risk management. The PBH case shows that managing

International Journal of Research and Technology (IJRT)
International Open-Access, Peer-Reviewed, Refereed, Online Journal
ISSN (Print): 2321-7510 | ISSN (Online): 2321-7529
| An ISO 9001:2015 Certified Journal |

infrastructure risks should not be viewed only through the prism of technical evaluation, but as an evaluation of socio-political and institutional risks as an equal determinant of project success, and that comparative analysis across different delivery conditions of Sabah and Sarawak is necessary.

- **Governance and Institutional Risk in Public Infrastructure Delivery**

The causes of the governance risk are institutional responsibilities fragmented, poor inter-agency coordination, inconsistency in regulations, and unresponsive accountability mechanisms. Multi-tier systems of governance also raise complexity in federal systems like that of Malaysia, especially when project implementation tasks are shared across national ministries, state governments and delivery agencies. Research proves that ambiguity over risk ownership and duplication of consent decision authorities often slows down the decision making process and compromises the implementation of remedial measures. The differences in institutional capacity between regions may also increase delivery risk, including how fast land clearances, dispute resolution, and stakeholder engagement are executed (Zarychta et al. 2024). Good governance thus is almost becoming a fundamental defining factor of infrastructural performance as opposed to the administrative role.

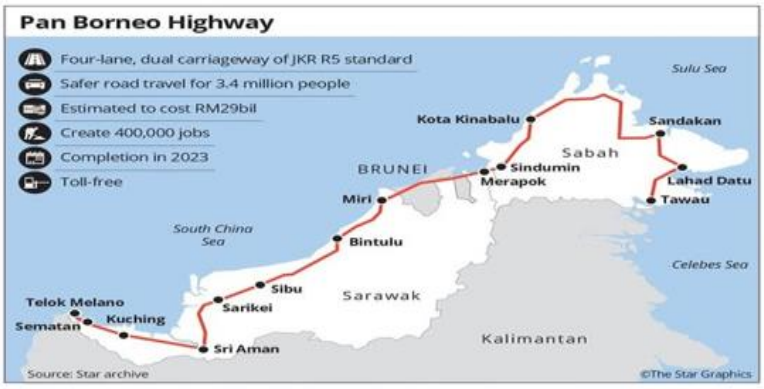

Figure 3: Pan-Borneo Highway Route

Governance risk is caused by institutional inefficiency in the area of institutional coordination, clarity of authority, accountability structures and administrative capacity in the agencies within the public sector in charge of infrastructure provision. Under federal governance, in the case of Malaysia, the implementation of any project is frequently divided between national ministries, state governments, regional land offices, environmental regulators and the special purpose delivery entities. Although the idea of decentralisation is meant to make the organisation more responsive to the needs on the ground, studies show that it may equally lead to a disjointed authority that discourages proper risk ownership and sluggish decision-making. Several approval points often create administrative bottlenecks, sluggish conflict resolution, and intermittent enforcement of the regulations. Collected in comparative governance scholarship proves that institutional coherence is the key to infrastructure risk management and not to have such tools of technical projects. Areas that have solid platforms of state-level coordination, strong decision-making offices, and culture-sensitive community and liaison structures are likely to have quicker issues and more stable

delivery schedules. On the other hand, poor coordination exposes the organization to policy wrangles, ineffective contractor management, and sluggish response of stakeholders.

This type of governance risk can be observed in the Pan-Borneo Highway delivery. In Sarawak, the relative existence of state coordination mechanisms helped to resolve land clearances, environment approvals and contractors support agreements more agile. By contrast, the governance system in Sabah has been typified by duplication of land control and protracted disputes processing periods (Zarewa et al. 2018). Such institutional variations were also translated to different outcomes of project performance when similar packages of corridors were compared. Governance capacity is therefore a certain moderator of an infrastructure risk result irrespective of the size of project financing or the model of delivery. The PBH case thus highlights the importance of identifying governance structures as fundamental risk factors solidifying the position of comparative Sabah- Sarawak view of explaining delivery divergence.

- **Procurement and Contractual Risk Allocation**

The allocation of risks between the social authorities and the contractors is also strongly affected by the procurement strategies. Public road construction in Southeast Asia uses traditional design-and-build contracts that normally pass risks in construction, scheduling, and costs to the contractors. Nevertheless, studies always indicate that overindulgence or poorly organized transfer of risks escalates insolvency risk, contractual disputes, and abandonment of projects. Better partnership relationship and more stable delivery are associated with balanced risk-sharing arrangements in situations when risk exposures are not accurately known at the time of project commencement (Dixit, 2022). Clear tendering, selection of contractors based on competence and flexible contract specifications are cited as critical systems that are required to attain proper risk distribution. The procurement strategies define the manner in which risks are allocated between the government officials and the contractors in terms of contracts. The major procurement model in the Malaysian road construction sector has been the design-and-build contracting method that conventionally shifts the construction performance, denial, and cost exceed risks to the contractors. Although the transfer of risk is cost effective in situations whereby the contractors have the technical and financial resources to cover the uncertainties, empirical research indicates that aggressive transfer often works against them. Risk contractors who are not within their balanced control capability will normally, endure a strain on financial matters, decreased work slows, or a cancelation of their contract leading to re-tending impediments and an increase in government expenditures. Risk allocation and institutional capability should thus be aligned to achieve effective risk management.

International Journal of Research and Technology (IJRT)

International Open-Access, Peer-Reviewed, Refereed, Online Journal

ISSN (Print): 2321-7510 | ISSN (Online): 2321-7529

| An ISO 9001:2015 Certified Journal |

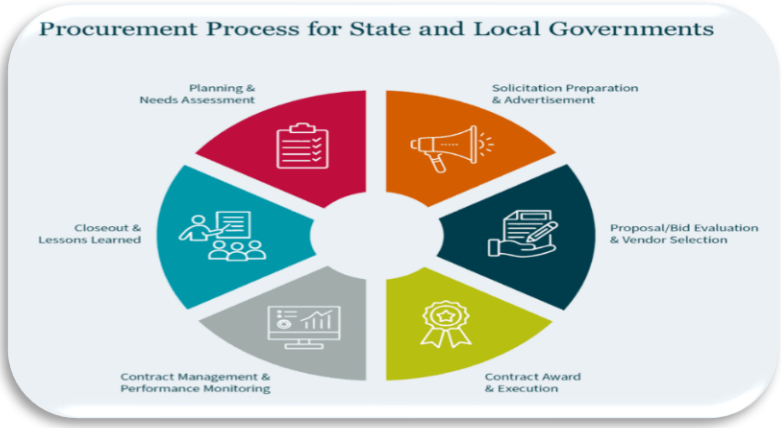

Figure 4: Procurement Process for State and Local Governments

The contemporary scholarship of procurement insists on intelligent risk sharing and in the process of which the risks associated with land purchase, regulatory clearances, utility relocation and community settlement are managed under the jurisdiction of the public as the contractors do not have a legal instance over these aspects. Joint contracting frameworks with mechanisms of early contractor involvement and price regulation have been found to counter adversarial risk behaviours and enhance some resiliency in delivery (Adriaanse and Robinson, 2015). The experience of the Pan-Borneo Highway shows how ineffective conventional procurement risk transfers can be. The early contract agreements often put the responsibility of schedules with contractors who did not fully solve the conditions of land hand-over and the risk of environmental clearance. Such a misalignment was a cause of contractor defaults and re-tendering of project packages especially in Sabah. The destabilising influence of excessive risk transfer was less in Sarawak due to the relatively higher flexibility in renegotiating contracts and resolving problems on a state basis. The results are a reaffirmative of the argument in literature that procurement strategies should indicate contextual realities as opposed to adherence to risk transfer templates.

- **Land Acquisition and Indigenous Rights as Project**

The acquisition of land is one of the biggest social and legal risks in infrastructure development especially in locations that have customary land tenure systems. The claims of indigenous rights and compensation claims may lead to protracted negotiations, litigation, and opposition by the local communities, which all lead to the increase in costs and schedule slippage. In Malaysia, a procedural complication is introduced by the representation of Native Customary Rights (NCR) in Sabah and Sarawak (Diergakten, 2019). Research has highlighted that inadequate consultation and poor compensation schemes increase the level of community resistance and jeopardize the legitimacy of the project. The recommended mitigation techniques are early engagement, culturally-sensitive negotiation procedures, and clear valuation processes which are highly important risk mitigation strategies.

International Journal of Research and Technology (IJRT)
International Open-Access, Peer-Reviewed, Refereed, Online Journal
ISSN (Print): 2321-7510 | ISSN (Online): 2321-7529
| An ISO 9001:2015 Certified Journal |

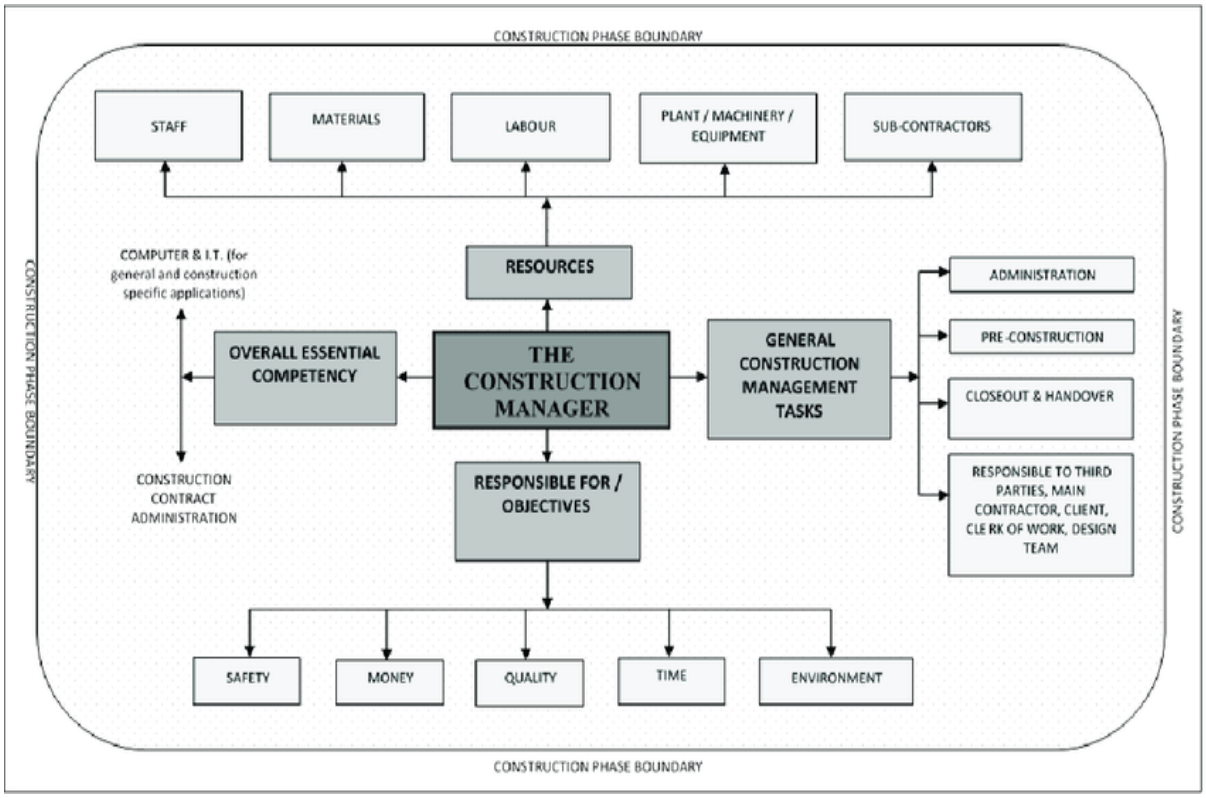

Figure 5: Construction Phase Boundary

Land acquisition is among the most politicized risk areas in infrastructure development particularly where the jurisdiction acknowledges customary land tenure system. In Sabah and Sarawak, Native Customary Rights (NCR) claims make the land valuation, schedules of negotiation, and compensation difficult. Studies have always shown that the conflict caused by ambiguous land title registration, mistrust of the community, as well as the feeling of undervaluation, results in legal tussles, blockades of constructions, and long-term negotiations that would inflate costs and delay of the development schedule. Poor approaches to land acquisition pose a threat to the social legitimacy of infrastructural initiatives and create reputational risks to administrative bodies. Best-practice literature highlights the need of land risk management to be implemented through community mapping at an early stage, culturally sensitive consultation, participatory compensation negotiation and open appeals. Any project which involves communities only after an award of construction contracts is likely to be more resisted and with less social licence to operate.

The land acquisition risk was very intense in the Pan-Borneo Highway project. There are reports that NCR disputes were not resolved, which resulted in delays in handing corridors and disruption of construction activities particularly in the more fragmented land administration system in Sabah. In contrast, a relatively centralised land management coordination of Sarawak also played an important role in the more coherent nature of negotiation processes and a reduced number of extended stoppages (Diergakten, 2019). These trends depict the institutional governance frameworks and stakeholder engagement mechanisms where land acquisition risk is intrinsically linked to the legal compliance

processes. The PBH experience justifies literature assertions that the community relations as a secondary category of risk treatment only serves to amplify the delays and reduce the effectiveness of delivery results.

IV. Research Methodology

The research paper utilises secondary research methodology in the analysis of risk management lessons at the Pan Borneo Highway Project based on the comparison of project delivery methods in Sabah and Sarawak. The study is based solely on the existing data that is found in government publications, audit reports, parliamentary papers, infrastructure development plans, project appraisals, media reviews, scholarly articles, and industry reports published between 2010 and 2024. The major sources are the Malaysian Ministry of Works, Sabah Economic Development and Investment Authority (SEDIA), Sarawak Public works department (JKR), and news sources are reputable. Keywords like Pan Borneo Highway, risk management, public infrastructure delivery, Malaysia project risks, Sabah versus Sarawak and mega-project governance were also used in academic databases like Scopus, Google Scholar, and ResearchGate. The gathered literature was subjected to comparative content analysis, which allowed outlining the repeated risk factors, including the complexity of governance, contractor performance challenges, sluggish land acquisition, risk of financing, and political factors. Categorization of data was done to make comparison of variations in project delivery model- project delivery partner (PDP) model in Sabah and state-managed model in Sarawak. Based on this analysis, the study draws lessons, best practices, and risk mitigation strategies as they are reported through sources. This is the secondary technique that helps evidence-based interpretation without the field research.

V. Results and Discussion

This part will include the highlights of the comparative analysis of Pan-Borneo Highway (PBH) project in Sabah and Sarawak and explain them in terms of risk management literature reviewed above. The findings represent the quantitative trends of project performance and, the qualitative insights of the stakeholders, based on the review of the documents and the interview process. The results have shown that frameworks of risk management were officially incorporated into the PBH delivery framework in both states as per international best-practice standards outlined in the literature (Pawar et al. 2015). The project documentation consisted of risk registers and risk mitigation plans regarding the construction safety, schedule risks, and the financial risks. Nonetheless, qualitative interviews as well as performance data demonstrated that the risk management practice was still technical with little focus given to social, governance and regulatory risk domains. This finding is consistent with the research indicating the implementation gap between formal risk frameworks and operational reality in megaprojects. Delays in land acquisition and lack of resolution of Native Customary Rights (NCR) claims were often considered as second-order risks, and not the main project constraint in Sabah, and resulted in unplanned standstill as soon as the construction corridors were obstructed. Sarawak was found to have a better screening of its early risks especially in the land clearance sequencing that was done before contract packages were awarded. Such differences facilitate the argument of the literature that the success of the

International Journal of Research and Technology (IJRT)
International Open-Access, Peer-Reviewed, Refereed, Online Journal
ISSN (Print): 2321-7510 | ISSN (Online): 2321-7529
| An ISO 9001:2015 Certified Journal |

risk management is not dictated by the documented procedures but by the ability to implement the same institutionally and by the risk ownership at an initial stage.

The difference between the two states was found in their governance capacity. In Sarawak, interview respondents focused on the vertical integration between the state land offices, environmental regulators, and construction coordinators that would lead to quicker approvals and resolution of disputes. Quantitative statisticians demonstrated reduced suspension of projects and decreased rates of termination of contractors. In comparison, the Sabah stakeholders mentioned disjointed authority structures, extended decision-making processes, and overlapping land governance mandates. These flaws in structural governance led to long negotiation times and construction mobilisations (Zarychta et al. 2024). This fact supports the body of literature on governance risk, which emphasizes inter-agency organizational problems coordination as one of the causes of instability in delivery. The findings indicate that the risk frameworks are ineffective when the pathways of accountability are obscure or the dispersal of the decision authority among administrative organizations is excessive.

Table 1: Summary of Risk Frameworks of Pathways

Risk Category	Sabah – Key Findings	Sarawak – Key Findings	Literature Link
Risk Management Practice	Technical risk focus; limited social risk planning	Earlier multi-risk screening & mitigation sequencing	ISO 31000 lifecycle approach; criticism of technical bias
Governance & Institutions	Fragmented authority; slow approvals; weak coordination	Integrated inter-agency coordination; faster decision-making	Governance capacity theory; accountability clarity
Procurement & Contracts	Over-risk transfer; contractor failures and re-tendering	Moderate renegotiation; better contractor continuity	Risk-sharing contract models; capacity-aligned allocation
Land Acquisition & NCR Risks	Prolonged disputes; limited consultation; delays	More central negotiation mechanisms; fewer stoppages	Indigenous engagement frameworks; social license theory

It is checked that PBH contracting in both states had been dominated by traditional design-and-build procurement, whereby the risk was widely spread to the private contractor. Contracts New contracts had the risk of making contractors liable to delivery schedule irrespective of the availability of land or the clearance of regulatory approval. This misalignment in Sabah led to numerous instances of contractor defaults, re-tenders, which generated compounding schedule slips. Sarawak was a little bit more stable in terms of contracts because of flexible renegotiation possibilities and active state intervention in the

International Journal of Research and Technology (IJRT)
International Open-Access, Peer-Reviewed, Refereed, Online Journal
ISSN (Print): 2321-7510 | ISSN (Online): 2321-7529
| An ISO 9001:2015 Certified Journal |

case of the unexpected development of risks. Such results confirm the research results found in the literature that excess risk transfer compromises the performance of contractors and sustainability of the supply chain (Diergachten, 2019). The relative results justify the common risk contracting models as maintaining the acquisition of land and regulatory uncertainty with the governmental agencies as opposed to transferring it to the construction partners who are not fully prepared to handle it. The most disruptive risk type in a whole project of PBH was land acquisition. Sabah had suffered especially severe effects as a result of fragmented land registration, increased levels of NCR conflicts, as well as community dissatisfaction over compensation evaluation. Participants of the interview reported tensions caused by the lack of community consultation at the initial stages and creating mistrust and construction disruptions. There were quantitative data that reflected an increase in averages of handover times and idle times. Although there were also NCR claims in Sarawak, more centralised negotiation units and standardised compensation processing minimised long term stoppages. These findings are consistent with the existing literature that bacteria and clear valuation systems are vital in the effort to curb the risk of community resistance especially when early culturally responsive engagement is done.

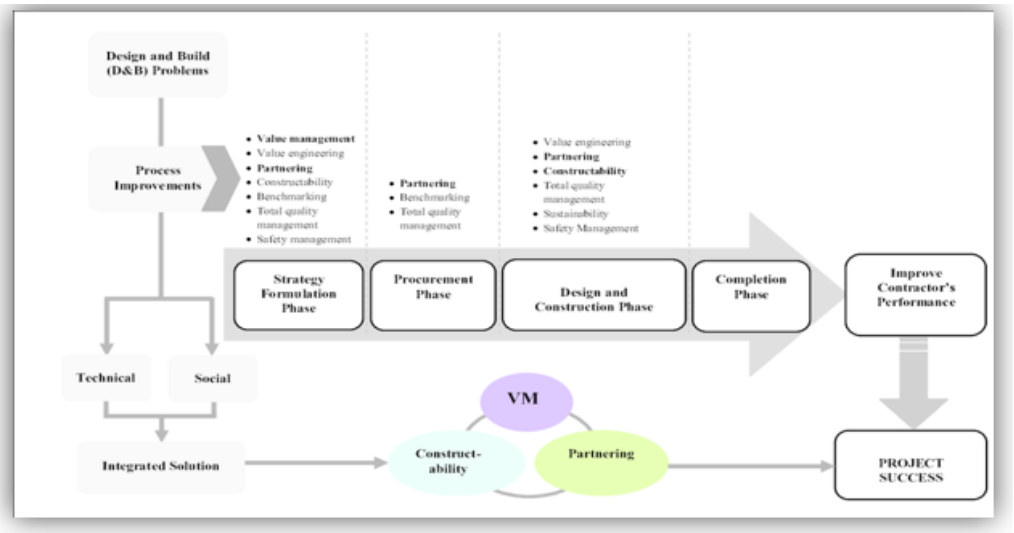

Figure 6: Flowchart of Design and Build (D & B) Problems

The combined results demonstrate that the institutional and community management capacity influences infrastructure risk governance more profoundly than formal risk frameworks do. Sabah and Sarawak both used risk registers and technical controls, but there were notable differences in the effectiveness of the tools and techniques of managing risk through the adoption of different forms of governance, flexibility in procurement and effectiveness in community engagement. The performances of Sabah support literature claims that disjointed governance and risk misalignment enhance instability in delivery. In fact, shifting the risks of land loss and regulations to contractors introduced ripple effects throughout supply chains, which strengthens the processes of termination and re-procurement (Dixit, 2022). The relatively smoother development in Sarawak has shown the moderating impacts of embedded governance authority, collaborative contracting behaviors and proactive land engagement

systems. Other key findings also point to the centrality of social risk management in specific terms land acquisition and indigenous engagement that turned out to be the only most powerful determinant of PBH delivery disruption. This supports the academic arguments that suggest that the social risks are underrated in the conventional risk assessment matrices although they are often the cause of the extreme delays in projects.

VI. Conclusion

In this study, the risk management dynamics of the Pan-Borneo Highway project were reflected and assessed comparatively using the delivery outcomes in Sabah and Sarawak. The research aimed to find out the reason behind the fact that two state-based realizations of the same national infrastructure programme showed different performance in terms of delivery performance although the same risk management via the application of similar risk management frameworks was applied. The results verify that the technical risk procedures were implemented in either of the settings whereas the results of the operations were established on the basis of the divergence in the governance forms, the methods of procurement, and the ways of managing the land acquisition and community relations. A relatively easier development in Sarawak was linked to the better institutional coordination, the better clarity of decision-making authority and the more liberal attitude to renegotiating the contractual risks. Such structures allowed dealing more quickly with regulatory barriers and community conflicts, minimizing the disruption of contractors. Meanwhile, the fragmented governance context in Sabah slowed down the approval and dispute resolution procedures and overcapacity to transfer contractual risks to contractors with no control over the land and regulatory risks. The resultant contractor terminations and re-tendering processes increased the delivery schedule and cost of the project.

Acquisition of land and negotiations of Native Customary Rights turned out to be the greatest risk factor to both areas. The research showed that inadequate or slow community consultation undermined the local trust, promoted resistance, and disrupted schedules of handover of corridors. These results help to identify the weaknesses of traditional risk management instruments that focus on engineering risks at the expense of underestimating social-political and institutional uncertainties. This study concludes that successful risk governance in infrastructure delivery is not as much about complying with the formal framework as much as it is about developing governance ability that can respond to localized risk conditions. It is critical to the mitigation of risk exposure to enhance state-level coordination mechanisms, adopt balanced risk-sharing procurement models, and adopt early and culturally sensitive community engagement strategies.

References

[1] Abram, N. K., Lim, H. Y., Ng, C. K. C., Yorath, S., Razi, M. H. M., Ong, C. G. S., ... & Wilson, K. B. (2022). The socio-economic and cultural impacts of the Pan Borneo Highway on Indigenous and local communities in Sabah, Malaysian Borneo. *Plos one*, *17*(6), e0269890.

[2] Adriaanse, J., & Robinson, H. (2015). *Procurement and Contract Strategy: Risks allocation and construction cost. Design Economics for the Built Environment: Impact of Sustainability on Project Evaluation, 121-136.*

[3] Alamgir, M., Campbell, M. J., Sloan, S., Suhardiman, A., Supriatna, J., & Laurance, W. F. (2019). *High-risk infrastructure projects pose imminent threats to forests in Indonesian Borneo. Scientific reports, 9(1), 140.*

[4] Das, S., Rastogi, A., & Kumar, K. (2021). *Applicability of risk assessment tools and techniques for a construction project. Journal of Research in Infrastructure Designing, 4(3), 1-18.*

[5] Diergarten, Y. (2019). *Indigenous or out of scope? Large-scale land acquisitions in developing countries, international human rights law and the current deficiencies in land rights protection. Human Rights Law Review, 19(1), 37-52.*

[6] Dixit, V. (2022). *Risk assessment of different sourcing contract scenarios in project procurement. International Journal of Construction Management, 22(8), 1537-1549.*

[7] Ikau, R. A., Rashid, A. F. A., Muhammad, W. M. N. W., & Wahi, N. (2019, November). *A preliminary study of safety management practices on Pan-Borneo highway construction sites in Kuching, Malaysia. In Journal of Physics: Conference Series (Vol. 1349, No. 1, p. 012006). IOP Publishing.*

[8] Mohmad Shariff, M. S., Abdul Taha, N., Ladin, M. A., Darawati, A. S., Che Nen, A. F., & Mat Isa, C. M. (2024). *Perception on Impact Land Reclamation from Pan Borneo Highway Project—Pilot Study. In Green Infrastructure: Materials and Sustainable Management (pp. 269-278). Singapore: Springer Nature Singapore.*

[9] Zarewa, G. A., Ibrahim, A. D., Ibrahim, Y. M., & Adogbo, K. J. (2018). *Governance impact assessment on large infrastructure project (LIP) delivery. Journal of Engineering, Project, and Production Management, 8(1), 9-21.*

[10] Zarychta, A., Benedum, M. E., Sanchez, E., & Andersson, K. P. (2024). *Decentralization and corruption in public service delivery: Local institutional arrangements that can help reduce governance risks. Journal of Public Administration Research and Theory, 34(2), 238-254.*