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Simultaneous Operations and Environmental Controls in Phased Tourism Infrastructure Development: The Janadriyah Cultural Quarter Under Saudi Vision 2030

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Abstract: The provision of infrastructure, commissioning, and visitor services, as well as cultural programming and environmental protection, is a unique management challenge when phasing tourism development in a common destination. Considering that a nationally significant Saudi heritage-festival setting (Janadriyah) is examined in this article, it is worth considering how simultaneous operations (SIMOPS) and environmental controls can coexist with the goals of Saudi Vision 2030. The analysis creates an integrated framework that connects phase gates, work-area interfaces, environmental baselines, permit-to-work coordination, and visitor protection with adaptive monitoring. It outlines five key management principles: (1) every handover of work is an environmental and safety decision, not just a schedule milestone; (2) work permits should be coordinated through a shared SIMOPS register; (3) controls should be proportionate to dust, noise, waste, water, traffic and heritage sensitivity; (4) spatial and temporal separation should be applied to preserve cultural authenticity and public access; and (5) measurable indicators and corrective-action triggers should govern concurrent work. A transferable planning model for cultural-tourism districts in hot-arid environments is proposed. In the implementation of a particular Janadriyah development package, its applicability should be tested against the results of site surveys, environmental impact assessment conditions, and stakeholder interviews and operational data.

Keywords: *Simultaneous Operations (SIMOPS), Environmental Management, Phased Construction, Cultural Heritage Tourism, Janadriyah, Saudi Vision 2030, Environmental Compliance, Visitor Safety.*

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I. INTRODUCTION

Tourism and cultural infrastructure projects are more and more becoming evolving destinations, not just construction sites. Museums, public realm enhancements, transport nodes, event spaces and utilities/visitor facilities can be delivered as a series of overlapping packages, with finished areas being commissioned/opened before the end of the programme. This system can shorten the time from investment to public benefit, but it also generates "interfaces" between contractors, operators, visitors, cultural practitioners and environmental controls. The risk is not a mere sum of the construction risks: interactions between activities can result in conditions that are not under the control of any one contractor.

This issue is particularly pertinent to the context of cultural-tourism, where it is hoped that development will enhance the presentation of the culture and make it more accessible, while at the same time enhancing services and economic involvement. The cultural importance of Janadriyah has found its roots in Saudi public sources: the festival was launched in 1985, and gradually evolved into a national platform for cultural and traditional heritage and crafts, performance and regional culture (Ministry of Culture, n.d; National Platform, n.d). Protecting and advancing national heritage, cultural engagement, quality of life and developing the tourism sector are among the key strategic goals of Saudi Vision 2030 (Vision 2030, n.d.-a, n.d.-b). The policy context thus takes the environment or operation performance as a part of the quality of the destination and not as an exercise of compliance.

Meanwhile, Saudi Arabia has developed a national framework for environmental protection in the form of the Environmental Law and its related regulations, which are

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based on permits and compliance. Official sources say that activities that have an impact on the environment are subject to the relevant permit or licensing requirements, and the National Center for Environmental Compliance (NCEC) monitors compliance with environmental requirements (Bureau of Experts, 2020; NCEC, n.d.). This regulatory framework needs to be translated to practical controls that are effective as work fronts, companies and visitor flows evolve, in the context of phased tourism development.

This article questions: How to coordinate SIMOPS and environmental controls in a cultural-tourism context such as Janadriyah in the context of a series of staged investments for tourism infrastructure? Three objectives are used to guide the analysis: (i) identify the main interface risks generated by a construction process that overlaps with a public-facing operation; (ii) draw a phase-based environmental control model adapted to a heritage oriented destination; (iii) suggest a governance model and a system for performance monitoring that are aligned with the Saudi environmental compliance and Vision 2030 priorities.

It is a contribution both practical and conceptual. It blends the SIMOPS principles, especially the need to understand the interactions between the concurrent activities, with environmental management, and heritage-tourism governance. It also explicitly distinguishes documented context and proposed management model. The evidence available is public and cannot necessarily be used to describe what is currently the scope, design or construction status of a defined Janadriyah Cultural Quarter capital project; therefore, the case is not used as an audited description of a live project but rather as a context for applying the framework.

II. JANADRIYAH AND SAUDI VISION 2030

➢ *Cultural Significance and Destination Functions*

Janadriyah is linked to the National Festival for Heritage and Culture that has been organized since 1985. According to official Saudi cultural materials, the festival is a place for traditional crafts, folk performance, poetry, representation of the region and cultural exchange in general (Ministry of Culture, n.d.; National Platform, n.d.). This usage gives rise to a different management situation; built facilities are not just buildings, they are the means for the transmission of culture, for public assembly, for interpretation and collective memory. Planning for infrastructure should therefore take into consideration their physical infrastructure as well as continuity of cultural use.

In addition to exhibition and performances areas, public plazas, craft and food areas, landscape, access routes, utilities, back-of-house logistics and visitor amenities can be part of a ‘cultural quarter’. These are analytical categories in this article, and should not be interpreted as an inventory of existing or approved Janadriyah facilities. These functions can be at various points in design, construction, testing and operation in a phased programme. That's where interface management comes into the picture.

➢ *Strategic Alignment*

Vision 2030 is about a thriving economy and an ambitious nation and a vibrant society. Among its public goals are the strengthening of national identity, the conservation and promotion of heritage, the improvement of the urban quality and environmental sustainability (Vision 2030, n.d.-a). Cultural participation and tourism development are additional areas of strategic activity for the Quality of Life Program (Vision 2030, 2021). The success of infrastructure delivery should not only be judged according to time and cost but also the extent to which the destination remains safe, accessible, culturally significant and environmentally managed during the construction and operation.

The strategic alignment does not happen by itself. Quick delivery can lead to the pressure to overlap work packages and cultural programs as well as the expectations of visitors can lead to high occupancy rates and fixed dates. Environmental controls might be compromised when temporary controls are removed after a work area is turned over, or when work is transferred from contractor to operator. We therefore require a governance model to link programme milestones to environmental and public-use conditions.

➢ *Environmental Compliance Context*

In 2020, Saudi Arabia issued its Environmental Law, which outlines general responsibilities for environmental protection and includes provisions for permits, monitoring and compliance, and environmental assessment and controls. The executive rules of the environmental permits explains the permitting system for carrying out of activities having an environmental impact, (Ministry of Environment, Water and Agriculture, 2021). The NCEC's mandate is to establish environmental standards and monitor compliance with them (NCEC, n.d.). The specific conditions and assessment(s) for any particular development and the specific type of permit must be established by competent authorities and the project document, and not assumed from this article to apply to Janadriyah.

III. LITERATURE REVIEW

➢ *Simops and Interface Risk*

SIMOPS describes situations in which different activities or work groups take place in the same area or operational system at the same time. Its risk is due to interaction, because the lifting operations can cross paths with the pedestrian access route, hot work can cross paths with fuel handling, commissioning can cross paths with construction dust, and deliveries can cross paths with public access route. The AIChE Process Safety Beacon points out that permits for separate activities should account for interactions and that separation of activities in a schedule can sometimes be better if hazards cannot be controlled to a sufficient degree (AIChE, 2023). The concept behind this guidance comes from process-safety environments, but it is applicable here: The risk of multiple tasks being performed at the same time must be dealt with explicitly.

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SIMOPS is not just a question of occupational safety when it comes to tourism infrastructure. It covers the relationship between work activities and the environment of the visitors as well as cultural programming, emergency access, protection of completed assets and environmental monitoring. However if a permit-to-work system only shows the individual tasks then there is no indication of where and when they conflict. An interface register, daily coordination meeting, authority matrix and stop-work criteria are hence crucial to the proposed model.

Table 1 Simops and Interface Risk

Likelihood	**Consequence**				
	Insignificant (1)	**Minor (2)**	**Moderate (3)**	**Major (4)**	**Catastrophic (5)**
Almost Certain (5)	Medium	High	High	Very High	Very High
Likely (4)	Medium	Medium	High	High	Very High
Possible (3)	Low	Medium	Medium	High	High
Unlikely (2)	Low	Low	Medium	Medium	High
Rare (1)	Low	Low	Low	Medium	Medium

➢ *Construction Environmental Management*

Environmental management in construction is typically structured for prevention, monitoring, and corrective action and documentation. Dust control, storage of material, haul road management, water consumption, waste management, noise and vibration, and spill containment are likely to need careful planning in a hot-arid environment. The impact of each of the above will vary in importance based on the site-specific conditions and project activities, receptors, season and regulatory requirements; a generic list should not be used in lieu of a site-specific environmental impact assessment.

Construction noise literature emphasizes the need for assessing noise levels before and during construction, monitoring exposure levels and ensuring that appropriate noise control methods are matched to the noise source and the receptor. Construction noise management and a structured management process are reviewed by Mir et al. (2022) and worker-centred monitoring, modelling and control strategies are discussed by Huang et al. (2025). The receptor set should also encompass visitors, performers, neighbouring communities, heritage fabric and heritage events whose quality is influenced by sound or a quiet experience of the visitors.

Avoidance, reduction, containment, monitoring and remediation should be used in the hierarchy of environmental controls. Planning noisy activities to be away from public activities can be more effective than relying only on temporary barriers. Covered loads, speed limits, surface stabilization and fit for purpose suppression are effective methods for controlling dust, but must be weighed against the water restrictions and effectiveness of dust control in the area. Waste management involves specific storage, licensed collection if applicable, record keeping of transfer and windblown litter protection. The control plan should identify an individual named owner for each measure, and the frequency of inspections, and the evidence for each measure.

➢ *Heritage Tourism, Governance and Stakeholder Collaboration*

Cultural heritage tourism is multi-dimensional as it is related to conservation, visitor experience, community identity, institutional coordination and economic development. According to Mzembe et al. (2023), governance mechanisms, community agency and broader institutional factors play a role in sustainable development in cultural heritage tourism. Li and Hunter (2015) also call for cooperation, community participation, responsibility sharing and participatory decision making in sustainable heritage tourism. There is also growing emphasis on the need for collaboration between different stakeholders in improving the management and conservation outcomes (Jaafar et al., 2026).

This suggests that the client, designer and contractors are not the only ones that should be included on the project interface map. It must involve the destination operator, cultural programmers, heritage experts, environmental consultants, emergency services, vendors, transport companies, community representatives and relevant public bodies. The specific governance structure of a Janadriyah project has to be established and not assumed. The framework proposed here, provides a model for responsibility and facilitates coordination among such parties.

➢ *Research Gap and Conceptual Proposition*

There is literature to support SIMOPS and to support construction environmental controls and sustainable heritage tourism; these are often managed as separate workstreams. The practical gap is the lack of an operational model between phase transitions, simultaneous work, environmental performance and cultural functions for the visitors. This article suggests a common control cycle should be used to manage the interface between SIMOPS and environmental management: plan, authorize, monitor, intervene and learn. The idea is that the integration of these processes decreases the unmanaged interfaces and enables environmentally oriented decisions to be more sustainable in that they are handed over over a period of time.

IV. METHODOLOGY

➢ *Research Design*

The research approach is a qualitative study using a document analysis and case analysis that is conceptual. It is not a primary field study, comprehensive systematic review or quantitative impact assessment. The case context is Janadriyah as a Saudi heritage-festival setting and the

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analytical object is the management of phased tourism infrastructure for which construction and public use can occur simultaneously. This design is suitable for creating a transferable framework from public policy, regulatory material and peer-reviewed research; but, will require project-specific data for operational validation.

➢ *Evidence Base and Analytical Procedure*

The evidence base comprises official sources on Saudi Vision 2030 and cultural policy; Saudi environmental law and permit-related sources; and peer-reviewed publications on SIMOPS and construction noise management; and cultural heritage tourism and stakeholder collaboration. Sources were picked for being directly relevant to one of four themes: strategic objectives, regulatory obligations, concurrent-activity risk, and heritage-tourism governance. The analysis was carried out in three stages: (1) Identifying recurring obligations and management principles; (2) Linking those principles with the phases and interfaces in a notional cultural-tourism infrastructure programme; and (3) Compiling all the above into a control architecture with roles, indicators and escalation logic.

A focused narrative synthesis not a systematic review for replication. It is not claimed that a full search in Scopus was conducted or that all relevant publications were included. If the paper is to be reported as a systematic review, the author should record the final string of search terms, date of search, inclusion criteria, and the numbers of papers excluded and included.

➢ *Analytical Categories*

Five categories were used: (a) phase and handover readiness; (b) SIMOPS and spatial-temporal interfaces; (c) environmental aspect and receptor controls; (d) governance and accountability; and (e) performance measurement and learning. The framework was judged conceptually in four aspects: regulatory traceability, operational clarity, protection of visitors and heritage and adaptability during the project phases.

➢ *Limitations and Ethics*

Public documents and published literature are the only materials used in the study. No human participants, confidential records, environmental samples or site measurements were used. As such, the findings are not necessarily evidence of actual outcomes at Janadriyah but rather are proposals for implementation. The framework should be reviewed: prior to operational use with the site's environmental assessment, permit conditions, design documents, emergency plan, event calendar and stakeholder requirements.

V. FINDINGS: INTEGRATED SIMOPS AND ENVIRONMENTAL-CONTROL FRAMEWORK

➢ *Phase-Gated Delivery*

The first is that readiness, not completion rates, should be the evidence for determining control of phase transitions. Phased delivery allows for an area to be physically finished but with access, dust controls, waste systems, fire systems, emergency signage, utility isolation, environmental monitoring, etc., still to be finished. A formal phase-gate review should then ensure that the following activity is safe, compliant and compatible with neighbouring activities.

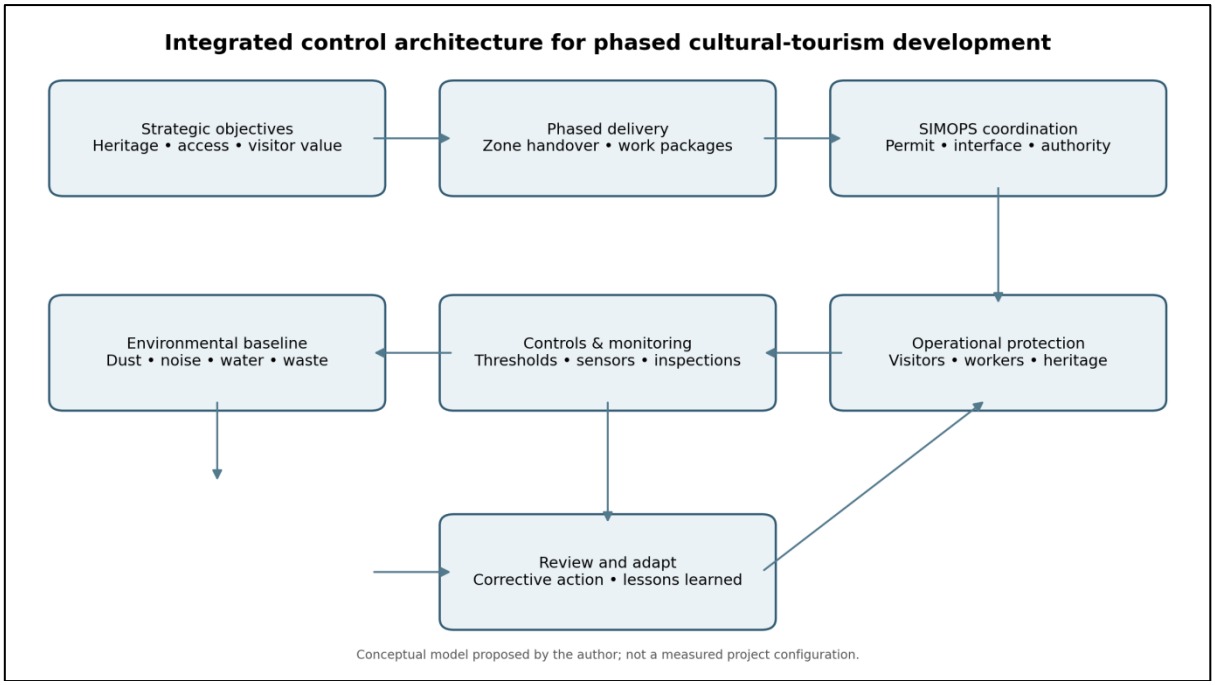


Fig 1 Integrated Control Architecture Linking Strategic Objectives, Phased Delivery, SIMOPS, Environmental Controls and Operational Protection.
Source: Author-Developed Conceptual Model.

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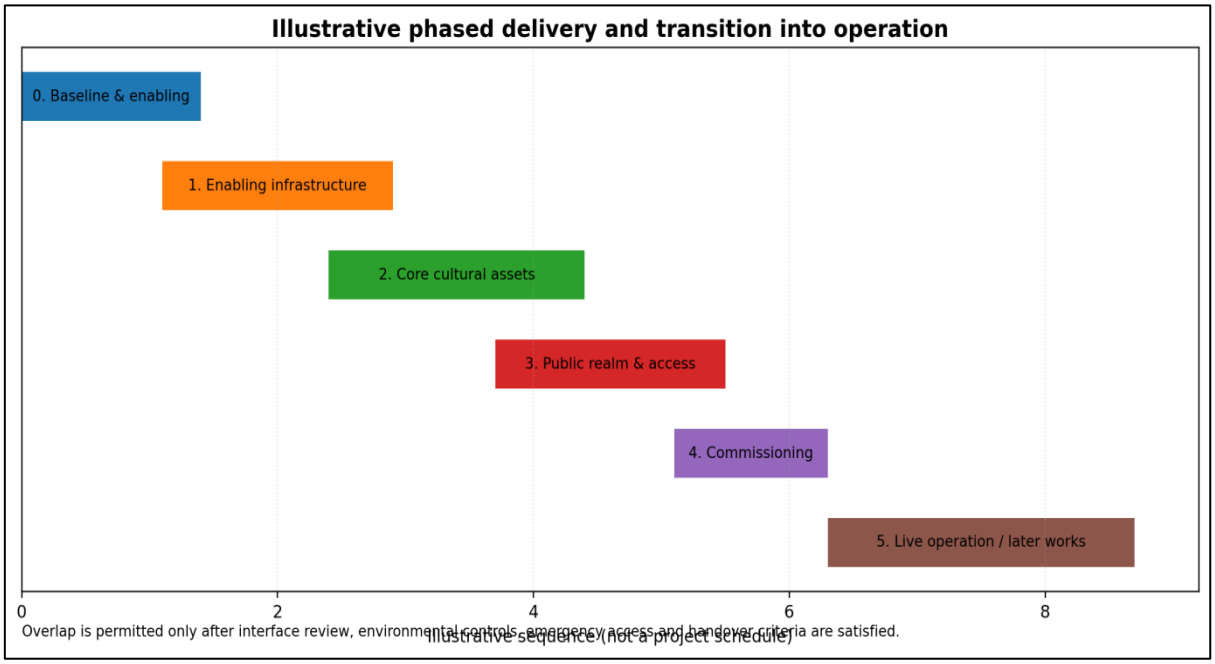


Fig 2 Illustrative Sequence of Phases and Potential Overlap. This is a Generic Planning Illustration, Not a Verified Janadriyah Construction Schedule.

A practical gate review should involve: scope and drawings approved; risk assessment and method statements; environmental control inspection; testing of emergency access; worker / operator briefing; segregation of visitors route; waste and spill readiness; monitoring equipment checks; and signed receiving operator acceptance. If a condition is not met, the handover should be limited or deferred, not accepted on the basis of an undocumented assumption.

The SIMOPS register and authorization 5.2 sets out the regulations for registering and authorizing the SIMOPS.

The second is that there needs to be a shared SIMOPS register to reveal interactions that are not apparent in individual contractor schedules. It should at least include the following information: Work package, Zone, Time window, Equipment, Hazard, Receptor, Permit requirements, Environmental controls, Responsible supervisor, Conflicting activities, Authorization status. The register should be reviewed at daily coordination meetings and updated if there are any changes to the weather, event programming, access arrangements or work methods.

A SIMOPS coordinator should not replace the legal or contractual duties of individual duty holders. The coordinator, rather, keeps an overview over the cross-package activities, makes sure that interfaces with conflicting activities are checked and escalates unsolvable interfaces to the project director / authorised body. Where there is a high consequence interaction that is not controlled, work should not proceed. These can involve vehicle traffic when an exhibition is open to visitors, dusty demolition work when another exhibition is going on, noisy work during another cultural event, or energization when other work is ongoing nearby an exhibition.

Table 2 Phase-Gated Delivery

Interface / scenario	Primary risk	Required coordination	Minimum release evidence
Construction traffic × visitor arrival	Collision, congestion, delayed emergency access	Time-windowed deliveries; segregated routes; marshal plan	Approved logistics plan; route inspection; marshal briefing
Dust-generating work × open public area	Exposure, poor visibility, contamination of exhibits	Physical separation; suppression; covered loads; wind trigger	Dust-control inspection; monitoring record; contingency
Noisy works × performance or interpretation	Loss of audibility and visitor experience	Event calendar integration; quiet periods; source controls	Approved noise window; baseline/monitoring plan
Commissioning × construction activity	Unexpected energization, leaks, access conflict	Isolation register; lockout/tagout; commissioning boundary	Isolation verification; permit coordination; sign-off
Waste removal × vendor / service operations	Litter, blocked access, pest or spill risk	Dedicated service route and collection window	Waste area inspection; transfer documentation
Excavation × buried utilities / heritage sensitivity	Service strike, damage to buried material	Permit to dig; utility survey; heritage escalation protocol	Survey clearance; marked exclusion zone; authorized permit

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➢ *Environmental Aspects and Controls*

The third finding is that controls for the environment should be connected to the activity and also the receptor. A control matrix should differentiate between the construction sources and the receptors to the public, and specify the frequency of inspections, measurable triggers and evidence. Table 2 offers a starting point for a site-specific environmental management plan. No universal threshold is recommended here; rather, the numerical limits are derived from applicable permit conditions and standards and/or baseline studies.

Table 3 Environmental Aspects and Controls

Aspect	Preventive controls	Monitoring / evidence	Escalation trigger (site-specific)
Dust and particulate matter	Cover loads; stabilize routes; maintain equipment; suppress dust; stop high-dust work during adverse conditions	Visual inspections; particulate monitoring where required; complaints log	Permit or project action level exceeded; visible plume beyond boundary; repeated complaints
Noise and vibration	Low-noise methods; maintain plant; acoustic barriers; schedule restrictions; protect event periods	Sound-level readings; work logs; event calendar; vibration monitoring where relevant	Applicable limit exceeded; vibration alarm; disturbance during protected programme
Water use and runoff	Meter use; use fit-for-purpose suppression; protect drains; segregate clean and potentially contaminated runoff	Water-use records; drain inspections; spill and discharge logs	Uncontrolled discharge; leak; water use exceeds approved allocation
Waste and materials	Segregate streams; covered storage; reuse where suitable; licensed collection where required	Waste transfer records; container inspections; housekeeping audits	Uncontained waste; unauthorized disposal; missed collection causing public risk
Fuel, chemicals and spills	Bunded storage; compatible containers; spill kits; trained handlers; refuelling controls	Inspection checklists; inventory; incident reports	Any uncontrolled release; damaged containment; missing spill response resources
Traffic and air quality	Route planning; delivery booking; idling controls; speed management	Delivery logs; queue observations; vehicle inspections	Emergency route blocked; queue spills into public circulation; unsafe crossing
Heritage fabric and cultural activity	Exclusion zones; vibration and dust precautions; specialist review; event-sensitive scheduling	Condition surveys; photographic records; stakeholder sign-off	Unexpected find, damage, or potential impact on significant fabric or practice

➢ *Environmental Monitoring as an Operational Feedback Loop*

Monitoring without feedback to decisions is useless. A sensor or inspection where no named recipient or response time or corrective-action process exists, does not provide administrative evidence or control. The suggested cycle is: baseline, limits/action levels, monitor, compare, investigate, corrective action, verify, and records. The Results should be considered at the same forum of co-ordination where the SIMOPS are considered; and the environmental performance should modify the work schedule and permit status.

A staged response is advised. Level 1 – Routine deviation corrected by the responsible supervisor. Level 2 will be when the deviation is repeated or the exceedance is exceeded, which will involve an assessment by the environmental manager and SIMOPS coordinator on the method, timing and controls. A serious incident, uncontrolled release, permit breach or imminent threat to people, heritage or the environment (level 3) is a cessation of work, making the area safe, required notification and restart requires formal authorisation. The actual reporting obligations and the reporting threshold shall be based on the applicable law permitting the conditions and the emergency procedures.

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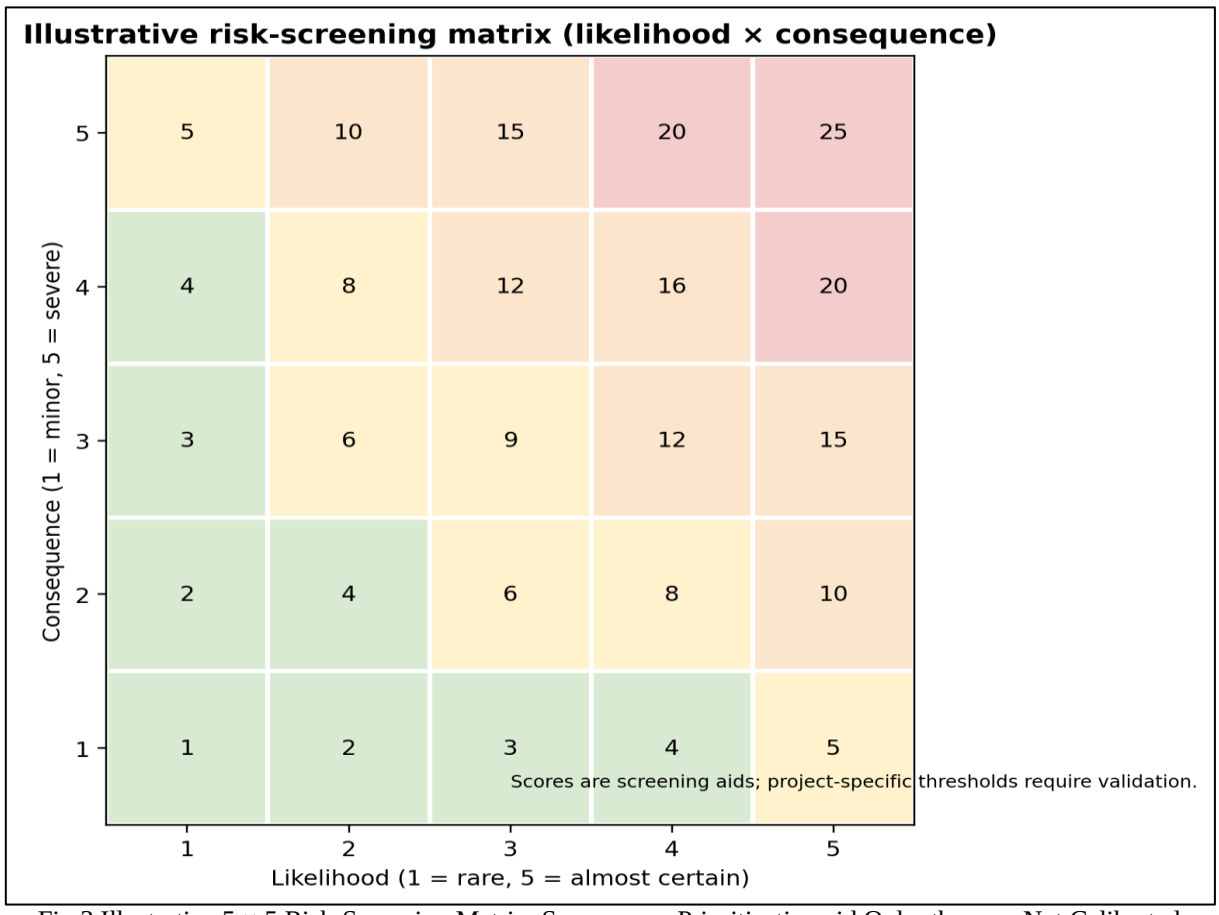


Fig 3 Illustrative 5 × 5 Risk-Screening Matrix. Scores are a Prioritization aid Only; they are Not Calibrated Janadriyah Risk Ratings.

➢ *Governance and Accountability*

The fourth is that inter-organisational responsibility is essential for environmental and operational performance. Policy, resource and escalation authority should be determined by the client/ program owner. Schedule, cost, safety and environmental goals should be part of the project director's integration. The environmental aspects register, compliance obligations, monitoring programme and corrective-action log should be kept by the environmental manager. The SIMOPS coordinator should keep an interface register and work windows coordination. The Contractors are still responsible for the way they work and exercise controls. The access of visitors, restrictions and handover requirements should be defined in cooperation with the destination operator and the cultural programme team. Where works may impact on significant fabric, setting or cultural practice, heritage specialists should be consulted.

Table 4 Governance and Accountability

Role	Core accountability	Key records
Client / programme owner	Set objectives; resource controls; accept residual risk; require independent assurance where appropriate	Project requirements; governance charter; gate approvals
Project director / construction manager	Integrate package schedules and resolve cross-package conflicts	Integrated programme; decision log; action tracker
SIMOPS coordinator	Review concurrent activities and maintain spatial-temporal interface register	Daily SIMOPS register; conflict matrix; permit coordination notes
Environmental manager	Translate permits and assessment commitments into controls; review monitoring and incidents	Aspect register; monitoring reports; compliance obligations register
Contractor supervisors	Implement task controls, brief crews and stop unsafe or non-compliant work	Risk assessments; method statements; toolbox talks; inspections
Destination operator / event lead	Protect public circulation, event schedules and operational readiness	Visitor plan; event calendar; access and handover checklist
Heritage adviser / curator	Advise on sensitive assets, cultural practice and unexpected finds	Condition surveys; exclusion plans; heritage clearance records
Emergency / security leads	Maintain emergency routes, incident response and crowd interfaces	Emergency plan; drills; route inspections; incident records

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➢ *Performance Indicators*

A fifth finding is that the programme should keep to a few leading and lagging indicators which are significant throughout the phases. The percentage of high risk interfaces reviewed prior to work, the percentage of environmental inspections completed, corrective action closure percentage, percentage of work permits checked against SIMOPS register and the availability of emergency access are all leading indicators. Lagging indicators are reportable incidents, environmental exceedances, spills, complaints, heritage damage and unplanned closure of visitor routes. Targets should be set following baseline review and regulatory confirmation, not in the manuscript.

Table 5 Performance Indicators

Indicator	Definition	Suggested review frequency	Interpretation
SIMOPS pre-start review rate	Reviewed high-risk concurrent activities ÷ identified high-risk concurrent activities	Daily / weekly trend	Low coverage indicates unmanaged interface exposure
Environmental inspection completion	Completed inspections ÷ planned inspections	Weekly	Shows whether controls are being checked as planned
Corrective-action closure time	Median time from assignment to verified closure	Weekly	Long duration may indicate weak ownership or resource constraints
Permit / SIMOPS alignment	Relevant permits cross-checked against interface register ÷ relevant permits	Daily	Detects isolated permit decisions
Environmental exceedances	Count and duration of exceedances against applicable limits or action levels	Daily / monthly	Requires context on severity, duration and receptor
Public-route availability	Time critical visitor and emergency routes remain available as planned	Daily / event-based	Captures the operational consequences of work-zone planning
Waste traceability	Waste loads with complete transfer records ÷ total regulated loads	Monthly	Tests control over off-site waste movement
Heritage / community complaints	Number, type, response time and recurrence	Weekly / monthly	A signal for impact, trust and control effectiveness

VI. DISCUSSION

➢ *Why Phase Boundaries Are Environmental Boundaries*

The analysis shows that it is a critical control point that will determine who is in charge of where, which systems are energized, which routes are open and which environmental measures still must be implemented. Conventional progress reporting can be expressed as a percentage, whereas for environmental readiness, evidence of controls installation and testing, and transfer to a named owner is required. There is a need for documented transition from construction housekeeping to operational maintenance for a construction area that becomes a visitor area, including waste, drainage, air quality, signage, access and incident reporting.

This discovery takes the idea of SIMOPS beyond the worksite. An area can be physically separated, but still interact with each other in a cultural quarter, by dust drift, noise transmission, logistics routes, shared utilities, crowd movement. Pathways, timing and operational dependencies should therefore be considered, as well as adjacency, during an interface review.

➢ *Cultural Programming as a Planning Constraint*

The cultural programme should not be a last moment notification to stakeholders, it should be treated as a design input to the construction programme. Predictable sensitivity windows can occur during performance periods or craft demonstrations, school visits, high attendance events, or religious or national occasions. This can be answered with a temporal separation, less noisy techniques, and/or new delivery times or temporary access restrictions. These decisions should be agreed in advance and communicated to contractors and translated into work permits and look-ahead schedules.

This is in line with the concept of heritage-tourism scholarship which focuses on community agency, collaboration and governance (Li & Hunter, 2015; Mzembe et al., 2023). It also prevents a definition of environmental performance which is limited to emissions or waste and excludes any disruption of the cultural experience that is the purpose of the destination.

➢ *Arid-Climate Considerations and Resource Efficiency*

Dust control, heat exposure and water efficiency and material logistics are explicit topics of interest in hot-arid environments. The use of water spraying for dust control can result in high water use, muddy surfaces or muddy run-off if not managed well. When a site is identified for using alternative or complementary measures, the following options should be considered: surface stabilization, covered loads, reduced vehicle speeds, enclosed transfer points, wheel cleaning (where appropriate), and scheduling around wind conditions. Heat also impacts on the productivity of workers, visitor comfort and the time of the outdoor work. These factors reinforce the need for integrated planning and don't look at environmental controls as a stand-alone option.

No quantitative performance claims are attributed to any control because effectiveness depends on a number of factors that include source, weather, material, equipment and maintenance. A real project should test measures, document results and make changes based on the data that is monitored.

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➢ *Regulatory Compliance and Beyond-Compliance Performance*

Adhering to the requirements of the Environmental Law and other relevant requirements as well as the applicable executive regulations and environmental permits is a minimum condition. But it is possible to have technically compliant and yet poor housekeeping, inconvenience for visitors and/or avoidable cultural disruption. The framework thus takes a legal traceability approach in conjunction with operational indicators and stakeholder feedback. It is not a replacement for regulation, it is a way of making obligations visible in day to day decisions.

Each compliance obligation in a compliance obligations register should be listed with the source of the compliance obligation, the owner of the obligation, evidence required, review date, and consequences of non-compliance. Project specific environmental assessment commitments should be converted to Method Statements, Inspection Forms, procurement specifications, handover documents. This minimises the chance of commitments being in specialist reports but not in the contractor process.

➢ *Implications for Saudi Vision 2030*

The framework provides a pathway for cultural infrastructure delivery that can support the objectives of Vision 2030 for heritage promotion, tourism development, quality of life and environmental sustainability. When the destination is managed as a socio-technical system (culture, visitor flow, physical infrastructure, contractor processes, utilities, environmental receptors etc. are coordinated with a shared governance model) the alignment is greatest. It can help build a more resilient destination and mitigate the public value of investments being adversely affected by construction.

Programme owners should consider environmental and SIMOPS aspects in procurement and in evaluating contractors. Bid requirements may include interface-management capability, event-sensitive logistics, monitoring plans, heritage protection procedures and proof of management of corrective actions. A suspension of work clause should also be included in the contract to outline the authority to halt work when the controls are not successful and what is required to resume work.

➢ *Theoretical Contribution*

The article conceptually integrates three strands of literature. SIMOPS brings the interaction between concurrent tasks, environmental management brings baseline-control-monitoring-correction logic, and heritage-tourism governance brings in stakeholder participation and cultural-value protection. This integration results in a phase-based control model where the same governance loop is followed from enabling works to construction, commissioning and operation of an area. The proposed contribution is consequently not a new environmental threshold, nor an assertion of measurable improvement; rather, it is a comprehensive, integrated management structure which can be tested empirically.

➢ *Practical Implementation Roadmap*

The implementation should start prior to the procurement or at the next formal phase review of an ongoing project. The following is a proposed roadmap for adaptation to a real project, and should be aligned with contractual and regulatory conditions.

Table 6 Practical Implementation Roadmap

Step	Action	Deliverable	Owner (proposed)
1. Establish baseline	Confirm project boundary, receptors, cultural calendar, environmental aspects, existing access and permit obligations	Baseline and obligations register	Client + environmental manager
2. Map interfaces	Map work packages, zones, contractors, public routes, utilities and operational dependencies	SIMOPS interface map and register	Project director + SIMOPS coordinator
3. Set control standards	Define work windows, monitoring, thresholds, inspection routines, stop-work triggers and escalation	Environmental control plan and SIMOPS protocol	Environmental manager + HSE lead
4. Embed in procurement	Include controls in scopes, method statements, logistics plans and contractor performance requirements	Contract clauses and approved method statements	Client / procurement
5. Pilot and train	Test coordination meetings, reporting, monitoring and visitor segregation in a limited work zone	Pilot review and training records	Construction manager + operator
6. Gate each handover	Verify environmental, safety, access, heritage and operational readiness	Signed phase-gate checklist	Receiving operator + project director
7. Review performance	Analyze trends, incidents, complaints and corrective-action closure; revise controls	Monthly dashboard and lessons log	Programme governance board

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VII. CONCLUSION

This article explored the possibility of combining simultaneous operations and environmental controls in the context of the heritage-festival of Janadriyah and Saudi Vision 2030 as the strategic framework of the phased development of tourism infrastructure. The analysis indicates that it is not only a management problem of individual construction activities, but also one of governing interactions between concurrent construction activities, public use, cultural programming, environmental receptors and shifting operational boundaries in the centre of management.

Five conclusions follow. First, handover needs to be viewed as an environmental and operational gate, in which there is explicit acceptance evidence. Second, it requires a joint SIMOPS register so to make conflicts between contractors, public access, events and commissioning, visible. Thirdly, environmental controls shall be based on the receptor and measurable and named to an individual. Fourth, the thrust of cultural programming and cultural sensitivity should be built into the schedule and permit process. Fifth, monitoring shall be linked to escalation, corrective action and verified close out. All these measures provide a practical structure for the building to operation transition and do not consider environmental compliance an independent workstream.

The main constraint is lack of project specific primary data. The article does not detail the current status or process of a Janadriyah Cultural Quarter project, nor its environmental performance. Future studies should validate the framework using site observations, document audits, environmental monitoring data, with stakeholders and comparing across phases. A mixed methods evaluation could be used to test the effectiveness of integrated SIMOPS-environmental governance on completion of control; reduction of exceedances and complaints; and protection of visitor access during phased delivery. The framework should be viewed as a research informed project adaptation proposal, not as reporting outcomes of what has been measured, until such evidence is collected.

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