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Escalation Mechanism in Project Management

A Framework for Effective Resolution in Metro Infrastructure Projects

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Abstract **- Escalation Mechanisms are vital in project Management because they provide a formal, time bound pathway to elevate unresolved issues and risks to higher authority before they cause major cost and schedule overruns. In large infrastructure, operational teams often lack the mandate to resolve systemic obstacles, so escalation ensures timely intervention, resource reallocation and strategic decision making at senior levels.**

Metro Rail projects are especially vulnerable to escalation due to their long durations, dense urban settings, complex approvals and high technical interfaces. They face recurring challenges in land acquisition, environmental and statutory clearances, utility shifting, contractor performances and multi package coordination, leading to frequent and significant overruns compared to many other project types.

The study develops a structured escalation framework specifically for metro projects across the phases of construction. Though Literature review, case studies of DMRC, BMRCL, MMRDA and a stakeholder questionnaire, it identifies key escalation drivers. The study of existing escalation frameworks, revealing gaps as delayed escalation, unclear roles and thresholds and weak documentation. The proposed framework responds with phase wise measures in different phases of construction, indicates the potential to shorten the duration by 10 months and reducing the escalation in each phase by more than half, strengthening governance and delivery reliability in metro projects.

Keywords - Escalation, Issue Resolution, Metro Projects, Cost Overrun, Schedule delay

I. INTRODUCTION

Effective decision-making and timely issue resolution are critical for successful construction project delivery. Escalation is a structured process to raise unresolved issues, risks, or delays to higher authorities when they cannot be addressed at operational levels. Throughout a project's lifecycle—mobilization, procurement, execution, and handover—unresolved challenges lead directly to schedule overruns, cost escalation, and client dissatisfaction. (planta, 2025)

A defined escalation framework assigns responsibility, sets authority thresholds, and ensures that issues receive attention at the right managerial level, enhancing transparency, accountability, and responsiveness. Metro rail projects in rapidly urbanizing countries such as India are especially exposed, as they depend on complex approvals and interfaces yet are expected to deliver rapid, sustainable urban mobility and economic benefits. (Insights, 2025)

A. Escalations

Project escalation is widely recognized in project management literature as a formal mechanism for addressing unresolved issues, risks, or bottlenecks that cannot be effectively managed at the operational or team level. It serves as a critical control to ensure that problems threatening project success receive timely attention from higher authority levels, thus safeguarding project objectives such as cost, schedule, and quality. (Project Management .com , n.d.) (planta, 2025)

The primary purpose of escalation is to accelerate problem resolution and prevent adverse outcomes such as cost overruns, schedule delays, and quality degradation. Escalation helps to address barriers that lower management cannot overcome due to limitations in authority, resources, or expertise. According to Indeed.com and IPMA, an effective escalation process enhances transparency, accountability, and communication among stakeholders, supporting more informed and timely decisions (Indeed) (IPMA, n.d.)

B. Triggers & types of Escalations

- Unresolved risks or issues affecting scope, schedule, cost, or quality.
- Resource shortages, communication breakdowns, contractual disputes, or external shocks.
- Missed milestones and supplier performance problems. (Project Management .com)

Common Escalation Types:

- Formal: Structured, documented escalation for serious issues that exceed operational authority.
- Informal: Early attempts via discussion within the team or with immediate management.
- Time based: Triggered by missed deadlines or slippage against the baseline schedule.

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- Quality based: Related to non conformance with agreed specifications and deliverables.
- Person related: Linked to conflicts, performance problems, or team breakdowns that need higher level intervention.

C. Existing Framworks

Framework	Description	Key Features	Applications
PRINCE2 Escalation Framework	PRINCE2 (Projects IN Controlled Environments) is a widely adopted structured project management methodology emphasizing clear governance and control.	Establishes tolerances for time, cost, quality, scope, risk, and benefits at project initiation and at each stage boundary. When these tolerances are forecasted or breached, it triggers escalation to the next management level (e.g., Project Manager to Project Board). Defined roles and responsibilities create a transparent chain of command for rapid decision-making.	The framework facilitates early warning and manages deviation through formalized escalation routes, enabling timely corrective measures. (Liz Gallacher, 2012)
PMBOK (Project Management Body of Knowledge) Escalation Process	Developed by PMI (Purchasing Managers Index), PMBOK integrates escalation within its risk and issue management knowledge area.	Risk thresholds and triggers pre-defined in the risk management plan guide when escalation is necessary. Issues are categorized by severity, and escalation levels and handling procedures are documented in the project's communication and risk plans. Use of issue logs and registers to track escalation status, ensuring visibility and accountability.	Enables structure and consistency in elevating issues, ensuring relevant stakeholders are informed to support effective resolution. (A guide to the Project management Body of Knowledge, 2023)
Agile Frameworks (Scrum, Safe) for Escalation	Agile methods prioritize flexibility and rapid response, influencing how escalation is handled in dynamic project environments.	Scrum teams utilize daily stand-ups to surface issues early, escalating impediments that cannot be resolved within the team to Scrum Masters or Product Owners. The Scaled Agile Framework (Safe) introduces an Escalation Pathway from Agile Teams to Release Train Engineers and Portfolio Management for cross-team or systemic issues. Emphasizes collaborative problem-solving and utilizes digital tracking tools for transparency.	Particularly effective in software and IT projects where iteration speed demands swift escalation to maintain delivery momentum. (htt1) (Sutherland, 2017)
Industry-Specific Frameworks in Infrastructure Projects	Major infrastructure projects often deploy tailored escalation frameworks addressing domain-specific risks.	Define escalation avenues for technical, contractual, economic, and environmental issues specific to construction and infrastructure sectors. Formal escalation matrices link levels of authority to types and severity of issues, incorporating stakeholder representation from government, contractors, and clients. Use of project management information systems (PMIS) to monitor thresholds and automate alerts for trigger events.	Such frameworks have proven effective in large-scale projects like metro rail development, highway construction, and energy infrastructure, promoting interdisciplinary coordination and expedited decision-making. (planta, 2025)
Enterprise Risk Management (ERM) Integrated Escalation	ERM frameworks incorporate change and issue escalation as part of wider organizational risk governance.	Integrate escalation processes with enterprise risk appetite, policies, and reporting channels. Utilize key risk indicators (KRIs) monitored continuously to pre-emptively identify issues requiring escalation. Promote risk culture, encouraging proactive escalation and minimizing organizational inertia.	Ensures alignment between project-level escalations and corporate risk management approaches for cohesive strategy execution. (ISO 31000, 2018)

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Table 1 Existing Escalation Frameworks (source- Author)

D. Gaps Found

GAPS	Description
Delay in Escalation Initiation	Many projects suffer from delayed escalation, where issues are either not recognized early or are managed at inappropriate levels for too long, leading to aggravated cost and schedule overruns. (Chandrashekar Iyer, 2016)
Ambiguity in Roles and Responsibilities	Lack of clarity in who should escalate, when, and to whom often results in inconsistent escalation practices, causing confusion and delayed resolutions.
Inadequate Threshold Definition	Some frameworks lack clearly defined quantitative trigger points (e.g., specific cost percentage overrun or days delayed), making it difficult to objectively decide when escalation is warranted.
Insufficient Documentation and Follow-up	Poor record-keeping of escalated issues and inadequate tracking of resolution actions undermine accountability and learning from past experiences. (planta, 2025)
Limited Integration with Risk Management	Escalation processes are sometimes not fully integrated into the overall risk management framework, leading to fragmented approaches in handling emerging threats.
Lack of Real time Monitoring and Tools	Many projects do not use Real time analytics, dashboards, or automated alerts to fast track risk identification and escalation (Consulting, n.d.)
Cultural and Communication Barriers	Organizational culture that discourages reporting problems, fear of blame, or poor communication channels limit effective escalation.
Over-escalation and Escalation Fatigue	Some projects experience excessive or unjustified escalations, leading to management fatigue and reduced responsiveness to genuine critical issues.
Inadequate Tailoring for Project Complexity	Generic escalation frameworks often lack customization based on project size, complexity, stakeholders, or sector-specific challenges, reducing applicability. (planta, 2025)
Post-escalation Monitoring is Weak	Follow-through mechanisms to ensure that escalated issues are resolved effectively and lessons learned are not systematically executed.

Table 2 Gaps found from the Existing Frameworks (source- Author)

Major reference frameworks—PRINCE2, PMBOK, Agile/SAFe, industry-specific infrastructure models, and ERM-based escalation—provide structured escalation paths, defined tolerances, and clear roles. They use tools such as stage tolerances, risk thresholds, escalation matrices, issue logs, and integrated PMIS or KRI dashboards to trigger escalation and maintain visibility.

However, literature and practice reveal recurring gaps: delays in escalation initiation, ambiguous roles, and poorly defined quantitative thresholds. Documentation and follow-up are often weak, integration with risk management and real-time monitoring is limited, and cultural barriers discourage timely escalation. Over-escalation, insufficient tailoring to project complexity, and weak post-escalation monitoring further reduce effectiveness.

E. Synthesis of Previous Work

Recent research on escalation in construction and infrastructure projects reveals that cost and schedule overruns are caused by a wide variety of interrelated factors. Studies compare escalation provisions across countries, highlight contract flexibility and risk sharing as essential for handling economic shocks, and show that poorly managed scope changes and inadequate early risk controls are common triggers.

Delay-induced escalations are often linked to employer actions, planning failures, and late claims processing, underscoring the importance of clear contracts and timely interventions. Change orders resulting from design modifications or planning errors also feature as major

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escalation drivers, and their impact can be mitigated through structured procedures, technology adoption, and improved coordination.

Analyses from Indian infrastructure case studies underscore the significance of upfront planning, detailed documentation, and the use of escalation logs in reducing budget and schedule overruns. Reviews and literature syntheses consistently identify scope creep, tendering delays, and client-driven changes as important contributors to escalation. Overall, the studies advocate for robust planning, active monitoring, and proactive contract management to curb overruns and improve project outcomes.

II. CASE STUDIES

A. Parameters for selection of case studies:

- Scale & Project Maturity
- Data Depth & Availability
- Governance & delivery Model System
- Performance Impact Magnitude
- Chronological Breadth for Comparative Analysis

B. Case studies Identified

- Delhi Metro
- Mumbai Metro
- Bengaluru Metro Project

Project Name	Delhi Metro	Namma Metro	Mumbai Metro
Owner	DMRC, Joint venture of Govt. of India and GNCTD	Bangalore Metro Rail Corporation Limited (BMRCL), Govt of India & Karnataka	Mumbai Metropolitan Region Development Authority (MMRDA)
Project Start	Construction started in 1998	Construction began around 2006	Construction initiated in 2008; first line operational from 2014 with continuous expansions ongoing
Phases	Phase 1: 65.1 km network with 59 stations - Phase 2: Expanded network completed by 2017 - Phase 3: Further expansions completed by 2018 - Phase 4 ongoing (new corridors and extensions)	Phase 1: 42.3km network with 40 stations Phase 2: 72km network with 62 stations expected to be completed by 2-26 Phase 3:44l=km yet to start	Phase 1: ~11.4 km (Versova-Andheri-Ghatkopar), operational - Phase 2: ~124 km planned, multiple lines under construction - Additional extensions in progress
Network Details	Covers Delhi and adjoining satellite cities like Noida, Gurgaon, Faridabad, Ghaziabad; multi-modal integration	175 km (planned), major urban & suburban corridors	Connectivity across densely populated suburban and urban centres to reduce traffic congestion
Technology	Advanced tunnelling (TBMs), signalling, rolling stock by Hyundai Rotem, Bombardier (The Delhi Metro:Effective Project Management in Indian Public sector, 2017)	Modern signalling and communication systems, use of Tunnel Boring Machines (TBM) for underground sections, elevated & underground lines, integrated ticketing system	Modern steel-wheeled metro technology, combination of underground and elevated sections, advanced signalling and security systems
Funding	Central and State Government funds, Japanese International Cooperation Agency (JICA) loans, fare revenues (The Delhi Metro:Effective Project Management in Indian Public sector, 2017)	Combination of equity from Government, loans from Asian Development Bank (ADB), European Investment Bank (EIB), Japan International Cooperation Agency (JICA), and fare revenue	Government equity, Asian Development Bank (ADB) loans, central and state funding, land monetization
Key Contractors	Larsen & Toubro, Afcons Infrastructure, Hyundai Rotem, Bombardier, and multiple joint ventures	Larsen & Toubro, Afcons, ICML, HCC	Larsen & Toubro, Simplex Infrastructure, Tata Projects, Reliance Infrastructure, and others
Challenges	Land acquisition, coordinating multiple contractors, environmental clearances, resettlement	Land acquisition delays, funding issues, regulatory approvals, coordination among multiple agencies	Land acquisition, legal disputes, coordination between multiple agencies, delay in project clearances
Escalation	PRINCE2 tool for escalation process	PRINCE2 tool for escalation process	PRINCE2 tool for escalation process

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Table 3 Case Study Analysis

(The Delhi Metro:Effective Project Management in Indian Public sector, 2017)
(Annual report on delhi metro project, 2022)
(Annual report of Namma Metro 2023-2024, 2024)
(DPR of mumbai metro , 2018)

C. Escalations in Case Studies

Delhi Metro

- Phase-IV corridors construction costs escalated by nearly 15%, increasing total costs from around Rs 10,479 crore to over Rs 12,048 crore.
- Major escalation cause: Delays in environmental clearances and permissions to fell/translocate trees, which caused project delays up to 30 months in sections.
- Other issues include contractor delays, TBM procurement and operation problems, and frequent management changes impacting tunnelling and excavation schedules.
- Supreme Court acknowledged probable escalation but refused to halt ongoing Phase-IV work due to cost impact. (India Today, 2023) (TOI, 2023)

Bengaluru Metro

- Phase-2 project (75 km approx.) cost escalated about 52% from initial ~Rs 26,405 crore (2014) to nearly Rs 40,000 crore due to delays, pandemic impacts, and increased land acquisition costs.
- Initial completion deadline of 2019 shifted to expected 2026.
- Key drivers of escalation included land acquisition delays, pandemic-induced work stoppages, currency fluctuations, and scope extensions such as new depots and route extensions.
- Funding approvals delays further exacerbate cost escalation risks. (Indian Express, 2024) (Swarajya, 2024)

Mumbai Metro

- Metro 3 project's cost revised upward by more than Rs 10,000 crore, from approximately Rs 23,000 crore to Rs 33,000 crore due to delays in work, especially around the car shed dispute at Aarey Milk Colony.
- Project stall lasting around two and a half years caused significant time and cost escalation.
- Issues with depot relocation and repeated project deadlines push add to escalation pressures (Devagtha) (Mumbai Mirror, 2021)

Phase	Escalation Factors	Description and impacts	Type of escalation
Pre-Construction phase	Environmental clearances and legal approvals delays (Delhi Metro)	Delays in tree felling and environmental permissions led to project start delays, affecting overall timeline and costs	Regulatory/Legal Escalation
	Land acquisition delays (Bengaluru Metro)	Significant delay in acquiring land properties pushed back mobilization and led to scope changes and cost escalation	Administrative/Economic Escalation
	Depot location disputes (Mumbai Metro 3)	Legal and political disputes over depot sites caused pre-construction standstills, delaying project kick-off and inflating costs	Legal/Political Escalation
	Funding approval delays (Bengaluru Metro)	Delay in receiving governmental funds and sanction caused schedule slippage and increased financing costs	Financial/Administrative Escalation
During Construction	Contractor performance and delays (Delhi Metro)	Problems in tunnelling, TBM procurement, and contractor management led to schedule slips and cost growth	Operational/Contractual Escalation
	Work stoppages due to pandemic (Bengaluru Metro)	COVID-19 lockdowns halted site work, delaying progress and increasing overhead costs	External/Force Majeure Escalation
	Scope changes and extensions (Bengaluru Metro)	Addition of new depots, extended routes, and design changes added to cost overrun during construction	Scope/Design Change Escalation
	Prolonged depot work delays (Mumbai Metro 3)	two and half years of stoppage in car shed construction directly escalated project cost and time	Operational/Contractual Escalation
Post Construction	Project handover delays affecting operations (general)	Delays in finalizing system commissioning and operational clearances can push cost escalation in post-completion phase. Specific data limited but common in large metros.	Operational/Administrative Escalation
	Legal disputes over project scope and contracts (all metros)	Post-construction contract disputes relating to changes and escalation claims sometimes inflate final costs or cause payment deferments.	Legal/Contractual Escalation

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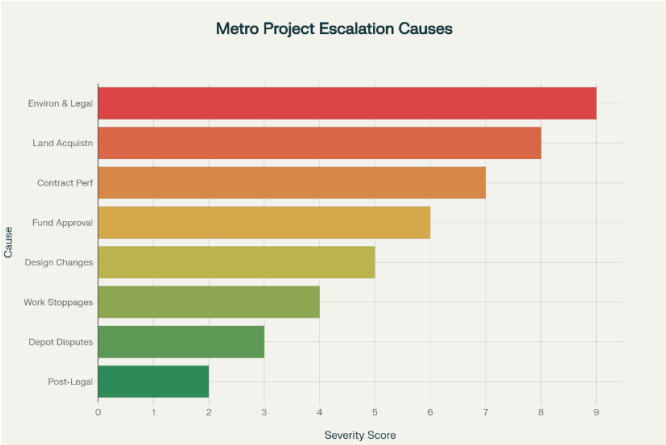
Table 4 Escalation observed in Case Studies

The case studies of Delhi, Bengaluru, and Mumbai Metro show that escalation in metro projects is largely driven by a common set of issues across all phases: land acquisition delays, environmental and legal clearances, and depot location disputes in pre-construction; contractor performance problems, scope and design changes, and depot/structure delays during construction; and handover delays and legal/contract disputes in the post-construction stage. Together, these lead to significant cost overruns and time extensions—often well beyond original baselines—demonstrating that the absence of timely, structured escalation, clear thresholds, and coordinated decision-making allows local issues to grow into major project-wide escalations

III. KEY FINDINGS

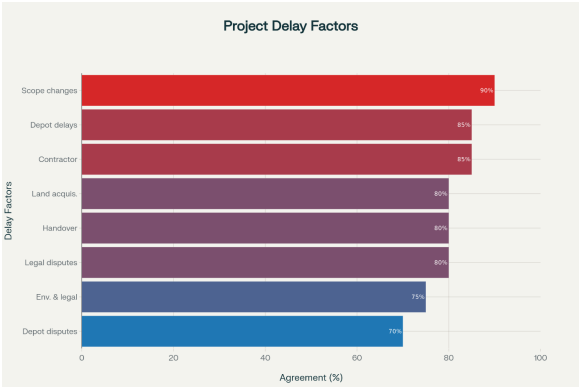
A. Risk Severity Score Matrix



B. Result of questionnaire floated

Factor	Dominant Response	Approximate Agreement Level
Environmental & legal delays	Yes / Maybe	75%
Land acquisition	Yes / Maybe	80%
Depot disputes	Yes	70%
Scope/design changes	Yes	90%
Depot/structure delays	Yes	85%
Contractor issues	Yes	85%
Handover delays	Yes	80%
Legal disputes	Yes / Maybe	80%

Table 5 Result from Questionnaire



C. Escalation Heirarchy

Analysing the data from questionnaire and the research,

Rank	Factor	Chart 1	Chart 2	Score
1	Environmental & Legal Approvals	Environ & Legal	Env. & legal	9 (severity) / 75% (agreement)
2	Land Acquisition	Land Acquisn	Land acquis.	8 / 80%
3	Contractor Performance	Contract Perf	Contractor	7 / 85%
4	Scope/Design Changes	Design Changes	Scope changes	6 / 90%
5	Depot/Structure Delays/Disputes	Depot Disputes	Depot delays/disputes	3 / 85%/70%
6	Legal Disputes/Handover	Post-Legal	Legal disputes/ Handover	2 / 80%/80%

Table 6 Escalations Hierarchy

Unified Interpreted ranking of major delay and escalation factors in metro projects, blending both agreement and severity scores from Research and Questionnaire Data:

- Scope/design changes (90%) — highest contributor to cost and schedule escalation.
- Depot/structure delays and contractor performance issues (85%) — critical challenges during construction.
- Land acquisition, handover delays, and legal disputes
- (80%) — administrative and approval-related constraints.
- Environmental clearances (75%) and depot disputes (70%) — still relevant pre-construction hurdles but relatively lower ranked.

IV. FRAMEWORK DEVELOPMENT

A. Existing Framwwork

The PRINCE2 (Projects IN Controlled Environments) framework is a leading project management methodology designed to provide a structured approach across the full project lifecycle. It is widely used for complex projects, especially in infrastructure, and emphasizes clear governance, stage-wise control, and defined responsibilities

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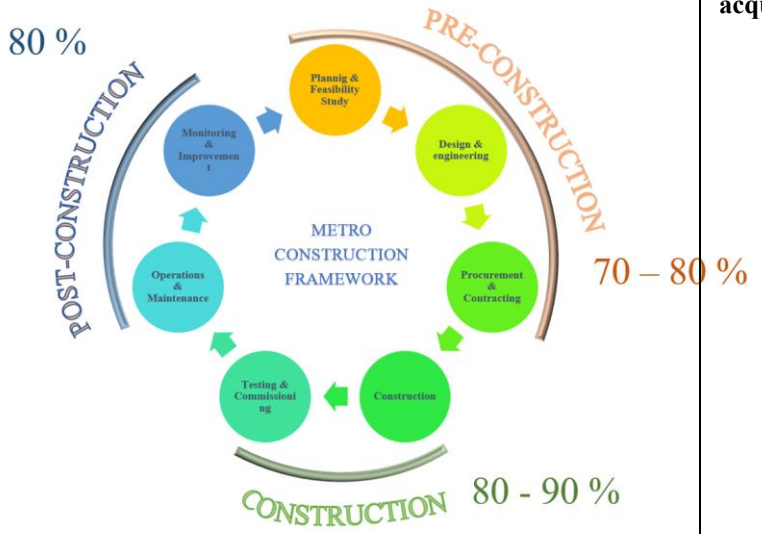
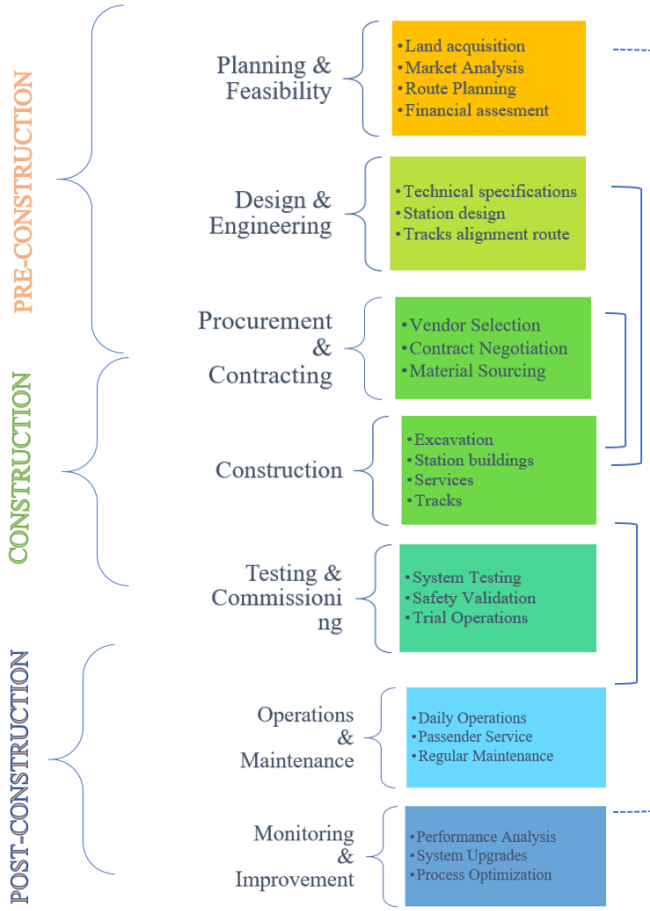
B. Proposed Framework





PRE CONSTRUCTION		
Issue	**Cause**	**Mitigation Measure**
Land acquisition	is inherently unpredictable due to its dependence on individual willingness and various social and financial factors. The timelines and costs for acquiring land can vary widely, often because delays in compensation or legal approvals occur when these steps are managed one after the other.	**Parallel approval** process for land acquisition—where legal clearances and compensation negotiations are conducted simultaneously rather than sequentially—can significantly compress the overall timeline. This approach ensures that delays in one stream do not hold up the entire process, ultimately leading to faster acquisition and project progress. Adopting parallel tracks for clearance and negotiation enables more efficient coordination among legal, administrative, and compensation teams, reducing unnecessary bottlenecks and improving stakeholder satisfaction.
Legal Clearances	are often a major source of uncertainty and delay in infrastructure projects due to complex regulations, multi-level approvals, and overlapping authorities. The impact of these delays is compounded when clearances are pursued sequentially or if documentation is incomplete.	**Single Window Clearance Units**, unified approval frameworks that bring environmental, traffic, and municipal permits into a single coordinated portal, bottlenecks are dramatically reduced. Single-window clearance reports a 40% reduction in approval timelines, injecting speed, predictability, and investor confidence into project delivery. This not only accelerates project launches but also minimizes cost overruns and fosters a culture of transparency and trust at every stakeholder level.
Depot Disputes	Critical facilities such as depots and viaducts are interdependent and cause cascading scheduling impacts.	**Early involvement of Legal & Urban Planning Department** & Rapid ADR Mechanisms. conceptual planning stages, can ensure statutory

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		compliance and alignment with city masterplans before advancing to expensive design development.

Table 7 Pre Construction Phase Escalations & Mitigation Measures

Situation- Land Acquisition for a metro Depot is planned for 24 months, and the project cost to be 10,000 crores and expected pre construction escalations 20% with delays in mind.

Under the proposed framework, could run a compensation negotiations and legal clearances in parallel using Single-Window Clearance, the Acquisition time can be cut down to 16 months and escalation can fall to 8% saving us 1200 crores and 8 months of time window.

BMRCL might have adopted these techniques.

CONSTRUCTION		
Issue	**Cause**	**Mitigation Measure**
Scope & Design changes		a **Design Freeze** milestone before procurement ensures that all scope and design parameters are locked and approved. **Change Control Board** centralized review authority for design and scope changes creates accountability and control. Every modification request is reviewed against its cost and schedule implications, ensuring that only justified and beneficial changes are approved.
Contractor Performance	Irrespective of qualification standards, and scrutiny, the performance of the contractor on site at later stages can be seen a major drawback.	**Real Time Monitoring Systems**, Digital dashboards that track workforce output, equipment utilization, and progress metrics create a transparent construction environment. **Regular Joint Progress Reviews**, integrated feedback loop promotes prompt conflict resolution over scope, funding, or logistics, ensuring that project momentum remains uninterrupted and aligned with targets
Structure Delays		**Segmented Scheduling**, micro-schedules dedicated to depots and structural tasks ensures that parallel workflows remain efficiently coordinated.
		Digital Construction Controls, Drone-based progress tracking, combined with 4D scheduling tools, provides real-time visibility into onsite progress and spatial alignment of structures. The integration of 3D design with live progress data allows project teams to visually identify delays, validate work quantities, and automate reporting. These digital tools transform reactive supervision into proactive control by offering evidence-based tracking of construction milestones.

Table 8 Construction Phase Escalations & Mitigation Measures

Situation where tunnelling package of 5000 crores is planned for 30 months, due to changes and poor contractor monitoring, construction escalation reaching 12% and duration to be extending up to 36 months.

If the project declares a design freeze before TBM launch, routes all further changes through Change control board, and tracking daily progress through digital dashboards, 4D models, stoppages of work are minimized, and cycle time per ring remains stable, but the escalation will drop to 6%, saving 6 months' time line and 300 crores on package

DMRC could have adopted these techniques.

POST CONSTRUCTION		
Issue	**Cause**	**Mitigation Measure**
Handover Delays		**Progressive Commissioning** - Initiating testing and certifications for completed sections early This approach allows seamless integration between construction and operations teams, shortens commissioning durations, and enhances overall project readiness. **Integrated Documentation System** digital repository for all Operation & Maintenance (O&M) manuals, inspection reports, and certifications creates a single source of truth throughout the project lifecycle. This centralized system enhances traceability, simplifies audits, and supports long-term asset management by ensuring

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		every stakeholder has access to up-to-date, verified project data in one platform

Table 9 Post construction Phase Escalation & Mitigation Measures

Situation of an elevated metro line, civil works may finish but opening to public gets delayed because of O&M manuals, test certificates and safety approvals which are scattered across departments, which adds several months of Overhead and about 20% extra post construction cost.

With the proposed framework, the operator would start progressive commissioning section wise and maintain a centralized digital repository of all manuals, test reports and certificates, which brings the post construction time line to save up to 2months and 5% of additional cost.

C. *Expected Results*

Phase	Timeline (Typical)	Timeline (Mitigation)	Cost Overrun (Typical)	Cost Overrun (Mitigation)
Pre-Construction	24 months	15–16 months	+15–20%	+5–10%
Construction	+25–30%	+10–15%	+10–15%	+5–10%
Post-Construction	6 months	3–4 months	+20%	+0–5%

V. CONCLUSION

A robust escalation framework is essential for metro projects due to their scale, complexity, and multi-agency interfaces. The study confirms that timely, structured escalation with clear roles, thresholds, and real-time monitoring strengthens project governance and protects cost and schedule targets.

Case evidence from Indian metros and literature synthesis show that major escalation drivers—land acquisition, environmental and legal approvals, contractor underperformance, design changes, depot disputes, and handover and legal bottlenecks—can be mitigated through parallel approvals, early authority involvement, digital coordination, and disciplined change control. Embedding escalation as a proactive control across all phases makes metro delivery more resilient, cost-efficient, and timely, enabling these systems to better support urban transformation and sustainable development.

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