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Role of Project Development & Management Consultants in Urban Water Supply Projects under AMRUT 2.0.- A Review

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Abstract: ***Urbanization in India has accelerated at an unprecedented pace, creating exponential demand for sustainable and resilient infrastructure that can cater to the needs of growing urban populations. To address this challenge, the Government of India has launched several national programs, among which AMRUT 2.0 (Atal Mission for Rejuvenation and Urban Transformation) plays a pivotal role in reshaping urban development strategies. Within this framework, Project Development and Management Consultants (PDMCs) emerge as key facilitators in bridging the gap between policy formulation and on-ground execution. Their responsibilities extend beyond traditional consultancy, encompassing holistic project planning, innovative design solutions, robust monitoring mechanisms, and streamlined implementation processes that align with time, cost, and quality parameters. Moreover, PDMCs contribute significantly to institutional strengthening and capacity building, thereby empowering Urban Local Bodies (ULBs) to adopt modern project management practices and enhance service delivery standards. This review paper critically examines the evolving role of PDMCs in urban infrastructure delivery under AMRUT 2.0 by synthesizing insights from existing literature, government guidelines, and selected project case studies. It highlights the tangible impact of PDMC involvement on ensuring transparency, accountability, and efficiency in project execution, while also identifying persistent challenges such as coordination gaps, capacity constraints, and resource limitations. Finally, the study outlines the scope for further strengthening PDMC engagement through innovative practices, technology integration, and policy interventions, thereby reinforcing their role as indispensable partners in achieving sustainable urban transformation in India.***
Keywords: PDMC, AMRUT 2.0, Urban Infrastructure, Project Management, Capacity Building, Smart Cities.

I. INTRODUCTION

A. Background

Urban infrastructure development in India has undergone a transformative journey, evolving from basic municipal service provision to complex, integrated development initiatives aligned with national economic goals. Historically, Indian cities grew rapidly without proportionate investment in infrastructure, leading to severe strain on services such as water supply, sewerage, solid waste management, roads, transport, and housing. With increasing urbanization—where over 34% of the population now resides in urban areas—the demand for robust and sustainable urban infrastructure has intensified. The Government of India recognized the critical role urban centers play in driving economic growth and social development, leading to the formulation of numerous policy initiatives and investment programs. The first major nationwide urban development mission was the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) launched in 2005, which marked a shift from fragmented sectoral interventions to a more holistic city-centric approach. JNNURM focused on strengthening urban local bodies (ULBs), improving service delivery, and ensuring planned urban development through reforms and financial incentives. Post-JNNURM, the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) was launched in 2015 with a renewed emphasis on infrastructure creation, water supply, sewerage networks, non-motorized transport, and green spaces in 500 cities. It introduced the concept of Service Level Improvement Plans (SLIPs) and State Annual Action Plans (SAAPs) to guide investments and implementation. AMRUT emphasized capacity building, citizen engagement, and performance-based funding, laying the foundation for a structured and accountable urban development framework. However, despite these efforts, challenges such as delayed project implementation, capacity constraints at the ULB level, and lack of integration among agencies persisted.

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To address these gaps and scale up the impact, AMRUT 2.0 was launched in October 2021 with a vision of providing universal coverage of water supply and sanitation services across all urban areas, including smaller towns and peri-urban regions. AMRUT 2.0 focuses on leveraging technology, private sector participation, and innovative financing mechanisms such as public-private partnerships (PPPs). It integrates the principles of sustainable development, climate resilience, and inclusive growth, aiming to make Indian cities "water-secure and self-sustainable." In this evolving landscape, the role of Project Development and Management Consultants (PDMCs) has become increasingly vital, acting as technical and managerial partners to ULBs and state missions, ensuring efficient and timely delivery of infrastructure projects. Their involvement bridges the gap between policy intent and ground-level execution, making them a key enabler in India's urban transformation journey.

B. Background Of Amrut 2.0 Programme

AMRUT 2.0 is an initiative focused on making Indian cities "water secure" and providing all households with functional tap water connections. It aims to achieve this through a circular water economy, involving water conservation, rejuvenation of water bodies, reuse of treated wastewater, and rainwater harvesting, with community participation and a "Jan Aandolan" (people's movement) approach. The mission also targets 100% sewage/septage management in 500 AMRUT cities. The Atal Mission for Rejuvenation and Urban Transformation (AMRUT) was initially launched in June 2015 by the Government of India with the primary objective of ensuring basic civic amenities such as water supply, sewerage, and urban transport to improve the quality of life in cities, especially for the poor and disadvantaged. Building upon the achievements and learnings of AMRUT 1.0, the government introduced AMRUT 2.0 on October 1, 2021, with a broader vision and enhanced scope. AMRUT 2.0 aims to make Indian cities 'water secure' and 'self-reliant' through a systematic and integrated approach to urban water management. The mission emphasizes universal coverage of water supply and improved sewerage services across 4,700 towns and cities, focusing on sustainability through the promotion of circular economy principles, such as reuse and recycling of treated wastewater, rainwater harvesting, and rejuvenation of water bodies. AMRUT 2.0 is aligned with the Government's commitment to achieve Sustainable Development Goal (SDG) 6, which pertains to clean water and sanitation for all. The mission promotes reforms such as the reduction of non-revenue water, energy efficiency in water operations, and adoption of smart technologies for real-time monitoring. It also encourages public-private partnerships (PPPs), innovative financing, and active citizen participation to enhance transparency and accountability. The mission is designed as a centrally sponsored scheme with funding from both central and state governments and adopts a project-based approach to planning and implementation. By emphasizing both infrastructure creation and institutional strengthening, AMRUT 2.0 represents a shift from conventional project execution toward long-term urban water security and resilience. In this context, the role of professional agencies such as Project Development and Management Consultants (PDMCs) becomes crucial, as they are tasked with providing end-to-end support to Urban Local Bodies (ULBs) in achieving the mission's objectives efficiently and effectively.

1) AMRUT Mission

The AMRUT Mission was launched as a follow-up to the earlier Jawaharlal Nehru National Urban Renewal Mission (JNNURM). It was introduced with a fresh focus and a wider scope to better meet the needs of growing cities. JNNURM had some limitations, and with the fast rise in urban population, there was an urgent need for a more planned and effective urban development policy. To tackle issues like lack of clean drinking water, poor sewerage systems, and weak urban infrastructure, the AMRUT Mission was started. It aims to improve living conditions in 500 cities with a population of over 1 lakh, as well as selected cities in special category states. This mission focuses on providing basic services and making cities more livable, green, and sustainable.

Objectives of the AMRUT Mission:

The main goals of the AMRUT (Atal Mission for Rejuvenation and Urban Transformation) Mission are:

a) Continuous Water Supply:
- To provide regular and clean water to every household.
- This helps in improving health and the overall well-being of people.

b) Better Sewerage Facilities:
- To improve systems for collecting and treating sewage and waste water.
- This reduces pollution and keeps cities clean.

c) Stormwater Drainage:
- To build proper drainage systems to prevent waterlogging and urban flooding during rains.

d) Improved Urban Transport:
- To encourage walking and cycling by building footpaths and cycle tracks.
- Also, to make public transport better and more efficient.

e) More Green Spaces:
- To develop and maintain parks, gardens, and playgrounds.
- This helps people relax, improves the environment, and adds beauty to cities.

2) AMRUT 2.0 Mission

AMRUT 2.0, launched in October 2021, was conceptualized as a more refined and ambitious version of its predecessor, AMRUT 1.0, drawing upon the lessons learned and the experiences gained during the implementation of the earlier mission. The program aims to transform urban landscapes by achieving the broader objective of creating 'water-secure cities' through the integration of sustainable and inclusive water management strategies. Central to its vision is the adoption of circular economy principles, promoting efficient use, reuse, and recycling of water resources while minimizing wastage and environmental degradation. Unlike its previous version, AMRUT 2.0 places greater emphasis on developing resilient and adaptive urban infrastructure that can withstand the growing challenges posed by climate change and extreme weather events. Furthermore, the mission underscores the incorporation of digital technologies and smart solutions in urban governance and service delivery, aiming to enhance transparency, efficiency, and citizen participation. By aligning urban development goals with sustainability, resilience, and innovation, AMRUT 2.0 marks a significant leap forward in India's urban transformation journey.

a) Features of AMRUT 2.0

AMRUT 2.0 introduces several upgraded and innovative features aimed at enhancing urban infrastructure, with a primary focus on strengthening the water supply and sewerage sectors in Indian cities. The mission emphasizes a holistic and reform-oriented approach, structured around four core pillars—comprehensive reforms in drinking water supply, universal access to sewerage and septage management, promotion of water conservation and reuse, and a rationalized tariff structure for sustainability. One of the most significant features of AMRUT 2.0 is its goal of ensuring 100% coverage of potable water supply to every urban household, backed by a metered and continuous 24x7 distribution system to improve service quality and accountability. It also mandates universal coverage of sewerage and septage services across all cities, aiming to eliminate untreated waste discharge, thereby curbing urban water pollution and promoting hygienic waste disposal practices. To further strengthen water sustainability, the mission emphasizes water conservation through techniques like groundwater recharge, large-scale rainwater harvesting, and the reuse of treated wastewater for non-potable purposes. AMRUT 2.0 also integrates advanced technologies and infrastructure solutions to address urban flooding, ensuring better resilience during extreme weather events. In addition, the mission supports the promotion of solar energy usage in urban utilities, expansion of urban forestry to enhance green cover, and the implementation of scientific waste management systems, collectively aimed at reducing the ecological footprint of urban areas. Through these features, AMRUT 2.0 sets the foundation for sustainable, inclusive, and future-ready urban development.

b) Significance of the AMRUT Mission:

The reasons that underline the significance of the AMRUT mission are as follows:
- Higher Degree of Urbanization: Provides better infrastructure to the cities, thereby increasing the level of urbanization.
- Improved Health Status for the Public at Large: Access to clean water and proper sanitation has substantial health benefits.
- Economic Growth: The well-planned urban area helps promote economic development and consequently improves the standard of life and employment opportunities.
- Sustainability of Environment: It promotes water conservation, waste management, and the development of green spaces, thereby leading to environment-friendly sustainable cities.
- Resilience to Climate Change: Resilient infrastructure enables cities to adapt better to the impacts brought in by climate change.
- Social Equity: Ensures access to basic urban services for all citizens, including marginalized communities.
- Technological Integration: Smart technologies are adopted for improved urban management and citizen services.
- Scalability and Replicability: It provides a framework that can be scaled to other urban centers and replicated for several urban development plans.

1.2.2.1 Components of AMRUT 2.0

Project: The mission under AMRUT 2.0 will primarily focus on achieving tangible and sustainable functional outcomes through effective project implementation, utilizing AMRUT 2.0 as a strategic means to this end. While formulating these projects, it is imperative to ensure that equitable attention is given to the needs of households residing in informal settlements and those belonging to economically weaker sections and low-income groups.

Inclusive development must remain at the core of all planning efforts, guaranteeing that no section of the urban population is left behind in the process of urban transformation. These projects, once deemed admissible, must be prioritized based on the functional outcomes outlined in the prescribed framework, ensuring alignment with national urban development goals and maximizing impact on service delivery and infrastructure quality. The prioritization should be guided by the functional outcome indicators, ensuring that resources are allocated efficiently and efforts are directed toward measurable improvements in urban living standards.

Table 1.1: Functional Outcomes and Admissible Elements of Projects under AMRUT 2.0

SN	Functional Outcomes	Admissible Elements of Projects
1	Providing universal piped water supply with household water tap connection.	• Water source improvement and augmentation in the city. • Fresh water treatment. • Water distribution system in uncovered areas. • Augmentation of existing water distribution system. • Sustainability of quality and quantity of water supply. • Reuse of treated used water. • Provision for 24x7 water supply. • Smart solutions like SCADA. • Last mile connectivity to households (Not exceeding ₹3,000 per HH).
2	Providing universal coverage of sewerage and septage management in 500 AMRUT cities and promoting circular economy of water.	• Sewerage network. • Interception and Diversion (I&D) infrastructure. • Sewerage Treatment Plants (STPs). • Tertiary treatment with end-to-end reuse plan (preferably in PPP mode). • Faecal Sludge and Septage Management (FSSM cum STP Plant & collection mechanism). • Provision/augmentation and rehabilitation of sewerage systems with end-to-end treatment and reuse. • Tapping of used water for recycling. • Identifying bulk users of recycled used water and facilitating sale of treated used water to potential users (e.g. textile/leather/paper/power plants/railways, etc.). • Smart solutions like SCADA. • Last mile connectivity to households (Not exceeding ₹3,000 per HH).
3	Rejuvenation of water bodies to augment water supply, enhance amenity value and development of green spaces.	• Rejuvenation of wetlands, water bodies by desilting, strengthening the embankments, and stone packing. • Diverting polluting drains to treatment plants - Harvesting rainwater through storm water drains into water bodies (which do not receive sewage/effluent). • Strengthening/rejuvenation of aquifers/community wells. • Creation/strengthening of stormwater drains around water bodies. • Provision of STP to treat inflow into water bodies. • Development of community green spaces linked to clean water bodies. • Projects of this sector shall not exceed 5% of total project allocation (4% for rejuvenation of water bodies and 1% for development of green spaces & parks).
4	Outcome-based funding.	• Functional outcomes in terms of functional water tap and sewer connections to households beyond base line and not covered by AMRUT, implemented on or after 1st Nov, shall be considered for funding (Note 3).

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c) Special Guidelines and Notes for AMRUT 2.0 Water Supply & Sewerage Projects

24x7 Water Supply with Drink from Tap Facility:

- In AMRUT cities, projects aimed at providing 24x7 water supply with drink-from-tap facility may be undertaken.
- Such projects should cover at least one ward or District Metering Area (DMA), ensuring a minimum of 2,000 households in a contiguous manner.
- Funding of these projects may be up to 20% of the total allocation for water supply projects under AMRUT 2.0 for each city.
- Additional funding shall be admissible as a reform incentive, encouraging cities to adopt this higher service level benchmark.

d) Key Notes

- Note 1: All admissible projects must ensure at least five years of Operation & Maintenance (O&M) for the infrastructure created. This should be clearly incorporated in the tender process to ensure sustainability and accountability.
- Note 2: All water supply and sewerage projects must incorporate smart elements, such as SCADA, IoT-enabled monitoring, and data analytics for real-time performance and system optimization.
- Note 3: Outcome-based funding will be provided for projects achieving measurable outcomes after the launch of AMRUT 2.0. This includes:
    - Water and sewerage connections provided beyond the baseline as of 1 November 2021.
    - Only those projects taken up by States/UTs after this date will be eligible for funding linked to achieved outcomes.

Table 1.2: Tentative Distribution of Central Fund Allocation under AMRUT 2.0

SN	Project Component Description	Central Share (₹ Crore)
1	Water Supply Projects	35,250
2	Rejuvenation of Water Bodies and Development of Green Spaces & Parks Projects	3,900
3	Sewerage and Septage Management Projects	27,600
	Total	66,750

Table 1.3: Funding for projects

SN	ULBs	Central share
1	Union Territories	100% project funds by Centre
2	North eastern States and Himalayan States	90% of the project funds by Centre
3	With less than one lakh population	50% of the project funds by Centre
4	With population one lakh to ten lakh (both included)	1/3rd of the project funds by Centre
5	With population more than ten lakh	25% of the project funds by Centre (except for projects taken up under PPP mode)

e) Monitoring of Projects

The achievement of mission objectives will be continuously monitored through an online module, which will play a critical role in the disbursement of funds for the project. This module will serve as the primary tool for tracking progress and ensuring the timely allocation of resources.

Consequently, it is essential that the portal be consistently updated by State, Union Territory (UT), and Urban Local Body (ULB) functionaries to ensure a smooth flow of information and the efficient sanctioning of funds. The updates required on the portal will encompass a range of fields, including physical progress, financial progress, supporting documents for seeking central assistance, photographs, videos, third-party reports, and any other relevant materials. The information provided on the portal will be subject to random verification through feedback from citizens and third parties to ensure accuracy and accountability. In addition, the implementing agencies and community stakeholders will be given access to the portal to upload progress reports and feedback. This collaborative approach will not only ensure transparency but also enable a comprehensive overview of the project's status, fostering effective management and timely adjustments where needed.

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3) Role of PDMC of AMRUT 2.0 Projects

Role of Project Development and Management Consultants (PDMC) in AMRUT 2.0 Projects:

Introduction to AMRUT 2.0: The Atal Mission for Rejuvenation and Urban Transformation (AMRUT) 2.0 is an ambitious initiative by the Government of India aimed at transforming urban areas across the country. It focuses on improving basic infrastructure and ensuring better service delivery to urban citizens, with an emphasis on water supply, sewage management, stormwater drainage, green spaces, and sustainable urban development. AMRUT 2.0 seeks to build upon the successes of AMRUT 1.0 while addressing the evolving needs of urban areas through new strategies and initiatives that align with sustainable development goals (SDGs). Project Development and Management Consultants (PDMC) play a pivotal role in ensuring the success of AMRUT 2.0 projects by providing technical, managerial, and administrative support throughout the project lifecycle. Their role spans from the planning phase to the completion of projects, ensuring that all aspects are completed efficiently and in accordance with the set standards, timelines, and budgets.

1) Key Responsibilities of PDMC in AMRUT 2.0 Projects

a) Project Preparation and Planning: One of the initial and most critical tasks of PDMC is to assist urban local bodies (ULBs) in project preparation and planning. This includes conducting feasibility studies, preparing Detailed Project Reports (DPRs), and carrying out site assessments. The PDMC helps identify the key infrastructure requirements based on the needs of the urban area, aligning these needs with the objectives of AMRUT 2.0. In the planning phase, PDMCs are responsible for ensuring that the projects meet the technical, environmental, social, and financial requirements. They assist in choosing appropriate technologies and solutions, considering sustainability and long-term feasibility.

b) Design and Engineering Support: After project approval, PDMC consultants provide essential design and engineering expertise. They help ULBs in preparing detailed designs for infrastructure projects such as water treatment plants, sewage treatment systems, drainage systems, and public parks. The PDMC's role extends to ensuring that these designs are technically sound, cost-effective, and compliant with national standards and guidelines. In the context of AMRUT 2.0, the PDMC also ensures that all designs are resilient to climate change and promote sustainability. The incorporation of green infrastructure, efficient water management, and energy-saving technologies are examples of how PDMCs contribute to the overall vision of the program.

c) Procurement Assistance: Procurement is a crucial part of project implementation. The PDMC supports the ULBs in the procurement process, including the preparation of tender documents, bidder evaluation, and contract management. They ensure that the procurement process is transparent, follows government guidelines, and promotes competitive bidding. Proper procurement practices help ensure that the projects are completed on time and within the approved budget.

d) Project Implementation and Monitoring: During the implementation phase, PDMCs are responsible for monitoring the progress of the projects. This includes tracking construction activities, ensuring that contractors adhere to timelines, and addressing any deviations from the original plans. PDMCs also oversee the quality of materials and workmanship, conducting regular inspections and tests to confirm compliance with technical specifications. Additionally, PDMCs help in managing the risks associated with large-scale infrastructure projects, such as cost overruns, delays, and environmental concerns. By providing regular progress reports, they keep all stakeholders informed, and they coordinate with various government agencies and local bodies to ensure smooth project execution.

e) Capacity Building and Training: Another key aspect of the PDMC's role is to support the capacity building of ULBs and other stakeholders. This involves training local staff, engineers, and project managers in the latest technologies, project management practices, and regulatory frameworks. The goal is to enhance the overall effectiveness of local agencies in managing and operating the infrastructure projects post-implementation. The PDMC also plays a role in fostering community participation and stakeholder engagement, ensuring that the public is kept informed about project goals, progress, and benefits.

f) Project Closure and Handover: Upon the completion of AMRUT 2.0 projects, the PDMC is responsible for ensuring that all deliverables are met according to the agreed specifications. They verify the completion of all project phases, conduct final inspections, and ensure that all documentation is completed. PDMCs also facilitate the smooth handover of the completed infrastructure to the local bodies or management entities for operation and maintenance.

g) Post-Implementation Support: Post-project completion, PDMCs often remain involved in providing ongoing technical and managerial support for the operation and maintenance of the infrastructure. This ensures that the systems function optimally and that any issues encountered during the initial phase of operation are addressed promptly. They also help in monitoring the long-term performance of the projects, ensuring that sustainability goals are met and that the infrastructure continues to provide benefits to the urban population.

2) Challenges Faced by PDMC in AMRUT 2.0 Projects

While the role of PDMCs is vital to the success of AMRUT 2.0, they face several challenges:

a) Coordination with Multiple Stakeholders: AMRUT 2.0 projects involve multiple stakeholders, including central and state governments, ULBs, contractors, and the community. Managing the coordination among these parties can be challenging, as each has its own priorities and processes.

b) Compliance with Regulations: The PDMCs must ensure strict compliance with government regulations, which can sometimes be complex and time-consuming. They need to navigate through various legal, environmental, and procedural requirements, which can delay the project timeline.

c) Sustainability and Climate Resilience: As AMRUT 2.0 places a significant emphasis on sustainable and climate-resilient infrastructure, the PDMCs must adopt innovative and future-proof solutions. This may require additional research and development, along with the integration of new technologies that may not yet be widely available or tested in the Indian context.

d) Budget and Timeline Management: Given the scale of AMRUT 2.0, there is always pressure to complete projects on time and within budget. Unforeseen challenges, such as delays in procurement or unforeseen site conditions, can result in cost overruns or project delays, which PDMCs must proactively manage.

The role of Project Development and Management Consultants (PDMC) in AMRUT 2.0 projects is integral to ensuring that urban infrastructure projects are well-planned, efficiently executed, and sustainable. From project preparation to post-implementation support, PDMCs provide essential expertise in design, procurement, monitoring, and capacity building, thereby ensuring the success of the mission's objectives. While there are challenges, the impact of PDMCs in ensuring quality, timely, and effective project outcomes is undeniable, ultimately leading to the transformation of urban spaces in line with AMRUT 2.0's vision for better infrastructure and enhanced quality of life for citizens.

II. LITERATURE REVIEW

A. Previous Research Studies

Rathore et al. (2016) conducted a comprehensive study to explore the critical role of Project Management Consultancy (PMC) in infrastructure development, particularly in road construction projects. The study emphasizes that infrastructure is a vital driver of economic growth in India and requires efficient execution strategies due to its large scale and complex nature. PMC firms are seen as professional bodies possessing specialized knowledge and experience to ensure time-bound completion of projects by optimizing resources and maintaining quality. The paper categorizes the involvement of PMC across three core phases: pre-tendering, tendering, and post-tendering. In the pre-tendering stage, PMCs are involved in identifying client requirements, exploring conceptual alternatives, and conducting surveys and investigations. During the tendering phase, they assist in preparing estimates, documentation, and evaluating bids. In the post-tendering stage, PMC manages execution, monitors progress, controls cost and time overruns, and ensures adherence to quality standards. The study presents a role matrix that outlines PMC responsibilities throughout the project life cycle—from inception to closure. The authors argue that PMC involvement across the entire project cycle improves coordination and performance, thereby delivering functionally and financially viable infrastructure projects. With India's rapid infrastructure growth and increasing government investments, the role of PMC becomes even more critical to mitigate risks and improve project outcomes.

Kamat et al. (2024) conducted an interpretive qualitative study to explore the impact of Project Management Consultancy (PMC) on construction projects, particularly within the commercial real estate sector. The study addresses a key gap in literature by emphasizing the experiences of various project stakeholders—including clients, contractors, project managers, and consultants—to assess the effectiveness and challenges of PMC engagement in large-scale infrastructure projects. Through thematic analysis of in-depth interviews with 15 strategically selected participants across three major construction projects, the study revealed that PMC services significantly influence project planning, risk management, and integration of sustainability elements. One of the critical contributions of PMCs was aligning diverse stakeholder interests to achieve common project goals. However, the research also highlighted that poor collaboration and communication between PMCs and internal project teams often led to misunderstandings and limited the effectiveness of consultancy services. The findings underscore the dual nature of PMC involvement: while offering strategic benefits and specialized expertise, their success largely depends on how well they integrate with client organizations and project ecosystems. The paper concludes by advocating for improved engagement frameworks and communication protocols to enhance the value addition of PMCs in construction projects.

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Ahuja (2016) provides a critical evaluation of project management practices in urban infrastructure projects in India, with a focus on both new developments and urban renewal initiatives. The paper highlights a prevalent issue in the Indian context—government-owned urban infrastructure projects, especially renewal projects, often suffer from poor execution in terms of time, cost, quality, and stakeholder coordination. While individual projects may have modest financial value, their cumulative impact on public expenditure is substantial. Inefficiencies in these projects can thus lead to significant economic strain on national resources. To address these challenges, the Government of India introduced the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), aimed at enforcing statutory reforms and implementing structured project management methodologies. Ahuja's paper evaluates the parameters outlined under this mission, including timelines, transparency, stakeholder engagement, and quality assurance mechanisms. Despite these structured approaches, the paper notes that project outcomes remain inconsistent due to systemic issues such as bureaucratic delays, fragmented responsibilities, and limited technical expertise at the municipal level. This study provides important insights into the administrative and operational constraints of managing urban infrastructure projects in India, emphasizing the need for integrated project delivery models, accountability frameworks, and capacity building within local government bodies.

Atli and Krystallis (2025) explore the increasingly important concept of design flexibility in managing infrastructure projects, particularly under uncertain and dynamic conditions. Through a systematic literature review of 50 selected articles from an initial pool of 11,443, the authors identify three core dimensions of design flexibility—individual, organizational, and inter-organizational—which influence infrastructure project adaptability. These dimensions are further analyzed through the lens of Herbert Simon's design theory, framing flexibility not just as a technical capability but as a strategic managerial asset. The study emphasizes that traditional views of flexibility, often confined to engineering and technical design, must evolve to incorporate managerial, procedural, and relational flexibility. Factors affecting design flexibility were categorized at the micro (individual decision-makers and stakeholders), meso (organizational structures and workflows), and macro (cross-organizational coordination and governance) levels. By doing so, the authors propose an integrated framework that enables project teams to maintain control while accommodating necessary adjustments throughout the project life cycle. The paper contributes significantly to modern project management discourse by highlighting how a balance between flexibility and control can enhance project resilience, stakeholder alignment, and ultimately, project success in the face of uncertainties. It also opens avenues for future research into embedding flexible design practices within project delivery models.

Molokanova et al. (2020), in their paper presented at the IEEE 7th International Conference on Energy Smart Systems, investigate the application of project management methodologies in implementing sustainable urban development, especially in the context of smart cities. The study emphasizes that project management not only enables systematic implementation but also ensures a balance between technological oversight and individual privacy—key challenges in the modern urban ecosystem. The authors analyze various international frameworks and tools employed in the design and management of smart cities, including components such as digital economy, urban operating systems, green energy models, transport standards, and urban ecology. They argue that project management offers a structured methodology to coordinate these diverse elements and provides a bridge between technical efficiency and socio-political considerations in urban development. The paper also highlights how information technologies and automated systems—leveraging machine learning and big data analytics—can contribute to predictive governance and infrastructure optimization. Importantly, the authors caution against complete delegation of urban management to AI systems, underscoring the need to safeguard human agency and privacy in the process of smart city evolution. The study ultimately positions project management as a critical tool in achieving sustainable and ethically guided urban growth.

Koirala (2018) provides a comprehensive study on the challenges and risk factors associated with urban infrastructure development in newly emerging cities of Nepal, highlighting the systemic issues impeding efficient project execution. With 6 metropolitan cities, 11 sub-metropolitan cities, and 276 emerging municipalities, Nepal faces pressing demands for affordable housing, healthcare, education, water supply, sanitation, and transportation infrastructure. The research, based on literature reviews and on-the-ground surveys, identifies multiple barriers including ineffective coordination between government ministries, outdated procurement policies, underqualified professionals, and inadequate budget allocation. A key observation is the lack of integrated planning—evident when infrastructure built by one agency is disrupted by another soon after. Furthermore, the absence of a professionalized project management framework and the lack of long-term, globally-aligned urban vision from leadership exacerbate infrastructure inefficiencies. Koirala advocates for integrated urban infrastructure planning backed by a comprehensive risk management strategy as essential for sustainable development in Nepal's rapidly urbanizing regions. The study serves as a crucial reference for policymakers and urban planners in the Global South, underscoring the importance of inter-agency coordination and strategic foresight in managing urban growth.

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Kothandath explores the success factors in infrastructure project planning with a novel focus on the user perception, particularly in the Indian urban context. The study addresses a gap in existing literature where most prior research has centered on stakeholder perspectives—such as that of developers, contractors, or government agencies—mainly during the construction phase. In contrast, this research emphasizes the planning phase and integrates the end-user's viewpoint, which is crucial but often overlooked. Set in Thiruvananthapuram, the research investigates planning-related factors and associated risks in sectors such as water and sanitation and transportation infrastructure. Kothandath notes that despite the advancement in project management tools, infrastructure projects in India continue to fall short of delivering user-centric benefits. Contributing issues include insufficient stakeholder engagement during planning, resource constraints, and conflicting policy priorities. The study's proposed methodology aims to collect, analyze, and interpret user feedback to evaluate how planning decisions directly impact project success or failure. This approach underscores the need for early integration of user needs and risk assessments into the planning phase. It also highlights that project success cannot be measured solely by completion metrics, but must consider long-term utility and satisfaction from the perspective of end-users.

Shah, Bhatti, and Ahmed (2023) present a comprehensive review on the intersection of project management practices and sustainability objectives in construction projects. Their study, based on literature from the last decade and framed in the post-COVID-19 context, emphasizes the evolving role of project management in achieving not only efficiency and cost-effectiveness but also environmental and social responsibility. The paper identifies inadequate scope definition, poor communication, resource mismanagement, and regulatory barriers as key challenges across all phases of project management. These barriers significantly hinder the delivery of sustainable outcomes. The review underscores the importance of aligning project execution with specific sustainability targets such as energy efficiency, waste reduction, water conservation, and social inclusion. The authors advocate for an integrated project management-sustainability model, which incorporates elements like green building design, sustainable materials, smart technologies, biodiversity preservation, and performance metrics. This approach ensures that sustainability is embedded into the core project management lifecycle rather than being treated as an add-on. Moreover, the study encourages future research to delve deeper into the context-specific implications of these barriers, particularly in developing regions, and suggests that successful construction outcomes must be measured by economic viability, social equity, and environmental responsibility.

Kumari Anamika, Heena Shrimali, Dr. M. P. Punia, and Subham Sadhu (2016) in their study published in the International Journal of Engineering Research & Technology (IJERT) present a geo-spatial approach to infrastructure planning in urbanizing regions, using Zone 16 of Jaipur as a case study. This zone, located along the heavily trafficked NH-8 (Ajmer Road), faces rapid urban development pressure due to its strategic location.

The study highlights the challenge of identifying suitable land for development in and around metropolitan cities like Jaipur, where urban sprawl has left minimal open land. To address this, the researchers employ Remote Sensing (RS) and Geographic Information System (GIS) technologies to analyze land use, identify patterns of urban growth, and support decision-making for infrastructure planning. The integration of satellite imagery and spatial analysis tools to generate accurate land use/land cover (LULC) maps. Identification of urban expansion trends, providing a basis for strategic zoning, transport planning, and service distribution. Demonstration of how GIS-based spatial planning enhances objectivity and precision in infrastructure development.

Davidson Rajan Philip and Ashok Kumar (2018) in their study published in the International Journal of Engineering Research & Technology (IJERT), delve into the challenges of maintenance management in public infrastructure, particularly in the context of aging civil structures. They emphasize the difficulty and costliness of maintaining and rehabilitating these infrastructures, especially as they age and deteriorate over time. The paper emphasizes the essential components of maintenance management systems, which include the systematic planning, coordination, and allocation of resources to enhance the longevity of infrastructure. These systems aim to prevent structural failures due to deterioration or decay, ensuring that buildings continue to serve their intended purpose over time. The authors highlight the significant challenges and costs associated with maintaining public infrastructure. They stress that building maintenance is not solely about repairs but also about optimizing the functional lifespan of the building. Effective maintenance requires a comprehensive approach that balances short-term repairs with long-term sustainability, which is especially difficult in the context of aging infrastructure. A major focus of the paper is the integration of structural strength monitoring into maintenance management systems, illustrated through case studies from Chennai. This approach enables more informed decision-making and better resource allocation for public construction projects. By proactively monitoring the structural health of buildings, maintenance actions can be taken at the right time, minimizing costs and improving the efficiency of the maintenance process. This becomes particularly crucial in situations where resources are limited and must be managed wisely.

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B. AMRUT 2.0 Guidelines

Under the AMRUT 2.0 guidelines, Project Development and Management Consultants (PDMCs) play a pivotal role in the successful implementation of urban infrastructure projects. Their primary responsibility is to assist Urban Local Bodies (ULBs) in planning, developing, and executing various infrastructure projects, including water supply systems, sewerage networks, stormwater drainage, and urban transport. PDMCs are responsible for identifying project needs, preparing comprehensive feasibility reports, and ensuring that the designs meet technical, financial, and environmental standards. This involves conducting detailed studies, cost estimations, and risk assessments, ensuring that each project aligns with the overarching goals of AMRUT 2.0, such as enhancing basic urban services, improving the quality of life, and fostering sustainable urban development.

In the implementation phase, PDMCs ensure that urban infrastructure projects proceed according to the prescribed timelines, budgets, and specifications. They manage procurement processes, oversee contract management, and ensure that all construction activities meet the set quality standards. Additionally, they provide continuous monitoring and evaluation of the projects, offering real-time solutions to any emerging issues. This active role ensures that projects remain on track and compliant with AMRUT 2.0 guidelines. Furthermore, PDMCs facilitate coordination between different stakeholders, including ULBs, contractors, technical experts, and government agencies, ensuring smooth communication and collaboration throughout the project lifecycle.

A significant aspect of PDMC's role is capacity building and technical support. They offer training programs, workshops, and on-the-job support to enhance the capabilities of ULBs and other stakeholders involved in the execution and operation of urban infrastructure projects. This is crucial to ensuring the long-term success and sustainability of the infrastructure. PDMCs help local bodies and authorities build the necessary skills to maintain the infrastructure post-completion, which aligns with the AMRUT 2.0 goal of promoting sustainable urban development. Additionally, they focus on adopting cost-effective and environmentally sustainable solutions, ensuring that the projects not only meet the immediate urban needs but are also future-proof and resilient to challenges like climate change and urbanization.

Through their comprehensive oversight, PDMCs ensure that AMRUT 2.0 projects are executed efficiently, ensuring long-term benefits to urban populations. Their role is instrumental in creating an environment where urban areas can thrive sustainably while offering enhanced services to citizens. The AMRUT 2.0 guidelines emphasize the need for a holistic approach to urban infrastructure development, and PDMCs are key players in ensuring that these goals are met effectively and efficiently.

III. PROPOSED METHODOLOGY

The methodology adopted for this project involves a comprehensive approach that integrates secondary data collection, qualitative analysis, and case study evaluation to assess the role of Project Development and Management Consultants (PDMCs) in urban infrastructure projects under AMRUT 2.0. Initially, secondary data will be collected from a variety of sources, including government reports, official guidelines, PDMC Terms of Reference (TOR), academic papers, and published case studies. This will provide a foundational understanding of the scope of PDMC responsibilities, as outlined by the Ministry of Housing and Urban Affairs (MoHUA) and other relevant authorities. In addition, key interviews with ULB officials, PDMC representatives, and contractors involved in AMRUT 2.0 projects will be conducted to gather firsthand insights into the challenges and successes associated with PDMC engagement. The analysis will focus on several parameters, including the efficiency of Detailed Project Report (DPR) preparation, the bid process, project monitoring mechanisms, quality assurance procedures, and capacity-building initiatives undertaken by PDMCs. A comparative case study analysis of five cities (Pune, Surat, Nagpur, Indore, and Nashik) where PDMCs have been actively involved will be performed to assess their effectiveness in managing projects under AMRUT 2.0. Additionally, a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis will be conducted to evaluate the performance of PDMCs in relation to their role in project delivery. Finally, based on the findings, a recommendations framework will be developed to suggest improvements in the engagement process, performance evaluation metrics, and capacity enhancement strategies for both PDMCs and ULBs.

IV. CONCLUSION

PDMCs play a pivotal role in transforming urban infrastructure planning and execution under AMRUT 2.0. Their involvement ensures professional oversight, timely delivery, and better governance. However, to harness their full potential, there is a need for clearer guidelines, performance evaluation mechanisms, and stronger coordination frameworks. Continuous capacity building for both PDMCs and ULBs is vital to sustain the urban transformation envisioned under AMRUT 2.0.

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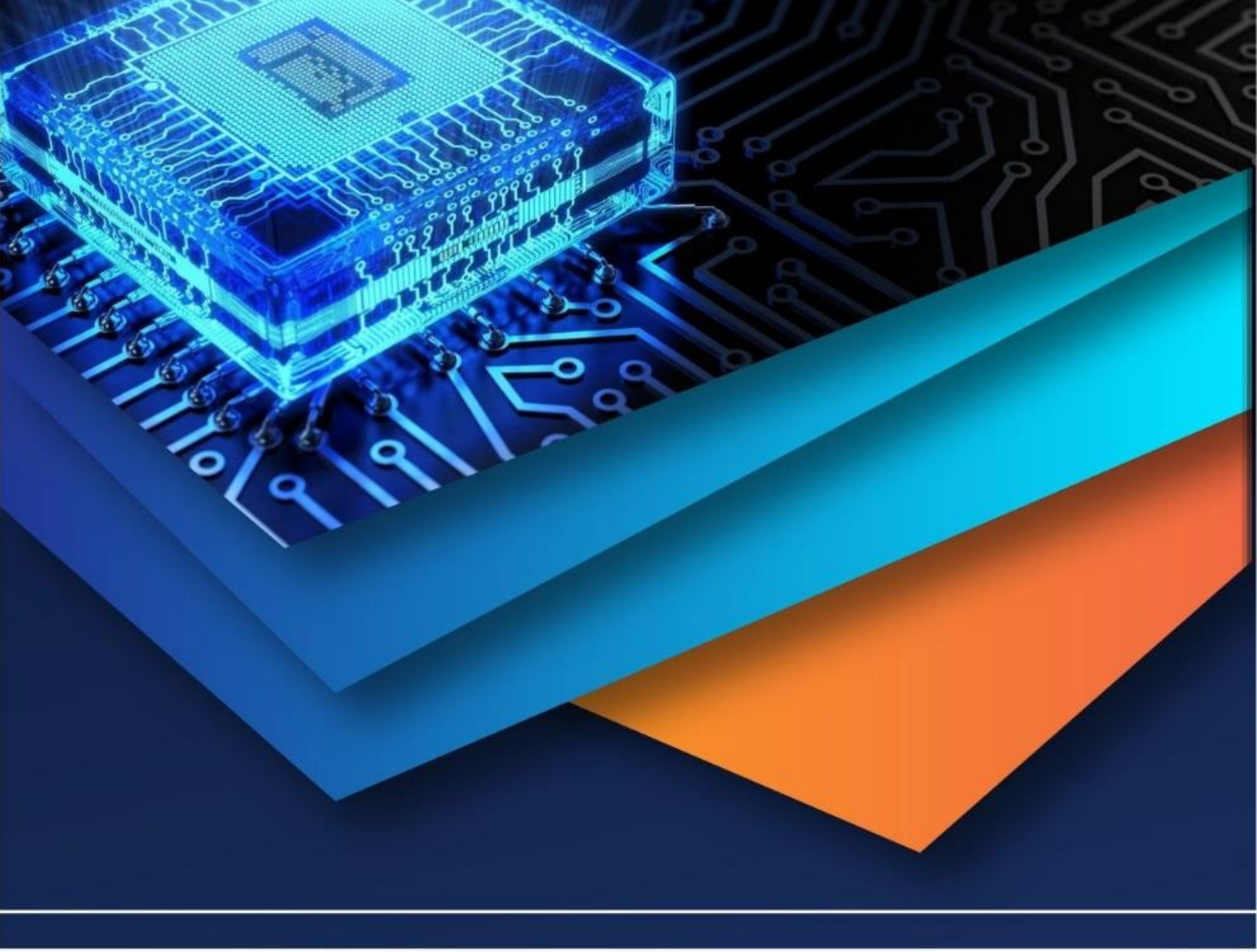

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