

ABSTRACT

Urban road rights-of-way (RoW) function as critical corridors accommodating multiple public utilities such as water supply, electricity, telecommunications, gas pipelines, and digital infrastructure. In rapidly urbanizing cities, the growing density and interdependence of these utilities generate complex challenges for planning, coordination, and maintenance. In cities such as Delhi, public utility works within road corridors are often characterized by fragmented institutional arrangements, reactive project practices, and limited coordination among multiple agencies. These conditions frequently cause repeated road excavations, project delays, cost overruns, service disruptions, and significant safety risks for road users, particularly vulnerable road users (VRUs). Despite the significant impact of these issues, researchers have relatively underexplored utility coordination in urban right-of-way management within the context of infrastructure governance and urban systems.

This thesis investigates the institutional, operational, and socio-technical dynamics of public utility coordination in urban road rights-of-way, using Delhi as a case study. The study aims to find important problems related to how different groups work together, look at how lack of coordination among utilities affects project time, cost, and road safety, analyze the relationships and conflicts between the involved parties, and create a plan to enhance coordination in complicated urban areas in terms of complicated underground utility space. The research adopts a mixed-methods approach combining narrative literature review, case studies, work-zone site assessments, newspaper content analysis, stakeholder and expert interviews, and survey-based data collection. A vulnerable road user perception survey involving 198 respondents was conducted to assess safety conditions around utility work zones, while 22 expert surveys and interviews provided insights into institutional practices and coordination challenges among agencies responsible for utility works. A global narrative review of utility coordination practices forms the conceptual foundation of the study and leads to the development of a 6C coordination framework—Communication, Configuration, Coordination, Compliance, Conflict Identification, and Conciliation—which synthesizes key dimensions of effective coordination identified in international literature. This framework provides an analytical lens for examining coordination practices in the Delhi context.

The empirical findings indicate that coordination failures in Delhi's utility sector are shaped by fragmented governance structures, dispersed and poorly integrated data systems, and limited

adoption of digital permit and asset management platforms. Coordination among agencies is often reactive rather than proactive, with planning frequently occurring only after operational conflicts emerge. Conventional excavation practices, particularly open-trench methods, contribute to repeated disruptions and increase the risk of utility strikes. Unclear restoration responsibilities, cascading dependencies among permits and project stages, and weak accountability mechanisms frequently lead to project delays and cost overruns. Work zone safety was found to be inadequate in several cases, often exposing pedestrians and other vulnerable road users to hazardous interactions with vehicular traffic.

The study points out the problems and describes Delhi's utility system as a complicated network made up of various groups that work together, such as government agencies, utility providers, contractors, regulators, and road users. Through agent mapping, the research identifies the principal actors involved in utility coordination and documents their roles and decision-making interfaces. The study further maps interdependencies and conflicts among these agents across different stages of utility projects. By layering agents, interdependencies, and conflicts, the research shows how these factors create patterns of coordination that affect the results of projects and the performance of infrastructure. These insights are combined into a simplified model of Delhi's utility system, showing how the interactions between different groups lead to issues like project delays, problems with infrastructure, and risks to road safety. The analysis also adopts a Pyrrhonian perspective to examine how different stakeholders interpret problems, responsibilities, and risks within the system, highlighting the contested and uncertain nature of coordination processes.

The thesis argues that utility coordination is not just a technical issue to solve but a complicated mix of social, technical, and institutional factors that are part of Delhi's flexible right-of-way system. Based on these insights and the 6C framework, the study suggests a combined coordination method that focuses on central utility records, digital permit systems, organized excavation schedules, improved restoration checks, systematic incident logging, and work-zone designs that consider risks.

Urban Right-of-Way (RoW) Management, Public Utility Coordination, Complex Adaptive Systems, Agent-Based Modelling, Work Zone Safety, Vulnerable Road Users, Utility Infrastructure Planning, Pyrrhonism.