

# ***Efficient Management Model for FEMA Historic Revitalization Projects in the Southern Region of Puerto Rico***

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**Abstract** — *Federal post-disaster recovery projects involving historic and architecturally significant structures in southern Puerto Rico have experienced prolonged delays between fund obligation and construction. These delays are largely concentrated in pre-construction phases and are associated with scope uncertainty, sequential administrative reviews, inconsistent technical documentation, and the late integration of historic preservation requirements into project management processes. This study employs a qualitative, multi-case analytical approach grounded in Engineering Management principles to examine recurring delay patterns across federally funded historic revitalization projects. The analysis focuses on administrative workflows, documentation review cycles, interagency coordination, and compliance requirements under historic preservation regulations. Based on the identified patterns, the study develops and presents an Efficient Management Model that restructures pre-construction activities into a sequenced and time-bound process integrating scope validation, documentation coordination, historic preservation planning, and interagency alignment. The proposed model aims to reduce administrative rework, improve coordination among stakeholders, and enhance schedule predictability while safeguarding historic resources within post-disaster recovery contexts.*

**Key Terms** — *Interagency coordination, Pre-construction delays, Regulatory integration, Scope validation.*

## **INTRODUCTION**

In the southern region of Puerto Rico, particularly in the municipalities of Ponce, Yauco, Guayanilla, and Guánica, numerous public and institutional buildings remained in deteriorated

condition several years after the impacts of Hurricanes Irma and María in 2017 and the 2020 earthquake sequence. Despite the allocation of federal recovery funds through the Federal Emergency Management Agency (FEMA), many reconstruction and revitalization projects remained in planning or design stages with limited progress toward construction, revealing systemic inefficiencies in project coordination, approval processes, and interagency communication [1, 2].

These delays were driven by recurring revisions to project documentation, evolving federal review requirements, and inconsistencies in technical submissions. Sequential administrative reviews frequently resulted in redundant comment cycles, delayed procurement, and extended authorization-to-proceed timelines, creating uncertainty for municipalities and project stakeholders [1]. Rather than isolated project-level issues, these conditions reflect systemic coordination challenges concentrated during early project phases.

The objective of this study was to develop an Efficient Management Model to optimize the planning, coordination, and execution of FEMA-funded revitalization projects associated with historic or architecturally significant structures in southern Puerto Rico. By integrating Engineering Management principles with structured project management approaches, the proposed model seeks to reduce administrative delays, improve documentation accuracy, and strengthen interagency coordination. The study focuses on identifying recurring pre-construction delay factors and translating these findings into a structured management approach to improve efficiency and schedule predictability in federally funded historic revitalization efforts.

## **LITERATURE REVIEW**

### **Post-Disaster Project Management**

Post-disaster recovery programs funded through federal mechanisms are frequently characterized by scope uncertainty and extended implementation timelines. In long-term recovery contexts, initial damage assessments are often conducted under emergency conditions and with limited access to complete information. As recovery efforts progress, evolving site conditions, deferred maintenance, and previously undocumented damage frequently require scope modifications, resulting in additional reviews and administrative rework [1, 2]. In addition to scope-related challenges, the administrative complexity of federally funded recovery initiatives significantly influences project performance. Programs administered through FEMA are subject to multiple layers of oversight, documentation requirements, and sequential review processes, where repeated comment cycles, inconsistent technical submissions, and limited standardization across municipalities contribute to prolonged pre-construction phases and delayed procurement [1]. These conditions increase coordination demands among agencies and generate cumulative schedule impacts that extend beyond initial project timelines.

### **Historic Rehabilitation Projects**

Historic rehabilitation projects introduce additional constraints within post-disaster recovery environments due to the inherent sensitivity of historic structures. Prolonged exposure to environmental conditions, delayed intervention, and ongoing deterioration increase the vulnerability of historic buildings and amplify the consequences of implementation delays, particularly within traditional urban centers in southern Puerto Rico [3, 4].

Compliance requirements associated with historic preservation further intensify project complexity. Projects involving historic or architecturally significant structures are required to undergo Section 106 consultation, including the

definition of Areas of Potential Effects and coordination with preservation authorities. According to the Office of the State Historic Preservation Officer (OECH), limited staffing capacity, high consultation volumes, and inconsistent documentation quality contribute to delays in permitting, funding release, and project sequencing [5]. While these requirements are essential for resource protection, they extend pre-construction timelines when not efficiently integrated into project management processes.

### **Limitations of Existing Approaches**

A review of existing literature reveals a limited focus on management efficiency within the specific context of FEMA-funded historic revitalization projects. While disaster recovery, federal permitting, and historic preservation have been extensively studied as independent topics, fewer analyses address the intersection of these domains within a unified management model [6]. As a result, limited guidance is available for managing the compounded administrative and regulatory challenges present in historic post-disaster recovery projects.

Furthermore, existing studies place minimal emphasis on the development of structured and replicable management models tailored to early project phases. The lack of standardized approaches for scope validation, documentation coordination, and interagency alignment contributes to repetitive review cycles and schedule uncertainty across recovery programs. Management science literature supports the application of efficiency-oriented strategies, such as standardized documentation protocols and performance-based monitoring, to mitigate these challenges [7]. Addressing this gap underscores the need for an integrated management model that aligns historic preservation compliance with engineering management and project delivery practices in FEMA-funded revitalization efforts [8, 9].

## METHODOLOGY

This study employed a qualitative, multi-case analytical approach grounded in Engineering Management principles to examine systemic inefficiencies affecting FEMA-funded historic revitalization projects in the southern region of Puerto Rico. The methodological focus centered on understanding how projects progressed from fund obligation through pre-construction phases, with particular attention given to administrative workflows, documentation practices, and interagency coordination dynamics.

### Data collection and sources

Data collection relied on multiple sources to support analytical triangulation. Primary sources included publicly available FEMA administrative records; recovery reports issued by the Central Office for Recovery, Reconstruction, and Resiliency (COR3), the governmental entity responsible for coordinating FEMA-funded recovery efforts in Puerto Rico; and project documentation associated with historic revitalization initiatives. These materials provided information related to obligated scopes of work, documentation review cycles, and administrative timelines. In addition, professional observations derived from direct involvement in project management and coordination activities were incorporated to provide contextual insight into documentation practices and interagency coordination patterns observed across multiple projects.

### Analytical process and classification of delays

The analytical process focused on the classification of delays according to project phase. Pre-construction activities examined included scope validation, documentation review cycles, Section 106 coordination, and site condition reassessments. Each activity was evaluated to assess the frequency of revisions, the distribution of responsibilities among agencies, and the influence of review sequencing on overall project timelines.

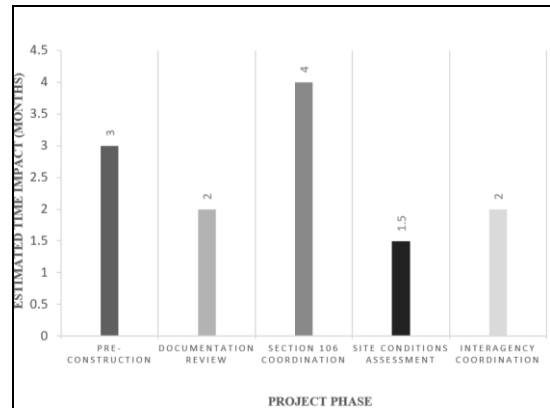
The classification of recurring pre-construction delay factors and their estimated timeline impact was organized by project phase, as summarized in Table 1. This classification supported consistent comparison across analysed cases and served as the analytical basis for identifying systemic inefficiencies affecting early project stages.

**Table 1**  
**Preliminary Identification of Delay Factors and Estimated Timeline Impact in FEMA Historic Revitalization Projects in Southern Puerto Rico**

Project Phase	Primary Issue Identified	Observed Impact on Project Timeline	Estimated Time Impact*
Pre-Construction	Incomplete or outdated scope validation	Multiple review cycles and re-submissions	2-4 months
Documentation Review	Inconsistent technical documentation across projects	Extended FEMA and COR3 approval timelines	1-3 months
Section 106 Coordination	Sequential review process among agencies	Delays prior to authorization to proceed	2-6 months
Site Conditions Assessment	Progressive deterioration not included in original scope	Scope revisions and cost re-estimation	1-2 months
Interagency Coordination	Limited standardization between municipalities	Unpredictable scheduling and approvals	1-3 months

### Comparative visualization of delay impacts

To complement this classification, a visual representation was developed to illustrate the relative magnitude of schedule impacts associated with each identified project phase. This comparative visualization, presented in Figure 1, was derived from preliminary midpoint estimates based on observed time ranges and was intended to support methodological comparison rather than definitive performance measurement.



**Figure 1**  
**Estimated Pre-Construction Delay by Project Phase**

### Conceptual orientation of the management model

Building on the analytical findings derived from the classification of delays, this study developed an Efficient Management Model oriented toward improving standardization, reducing administrative rework, and enhancing predictability during pre-construction phases. The model integrates principles from Lean Management, Engineering Management, and project management to address recurring inefficiencies identified across analysed projects.

The conceptual evaluation of the proposed management model was conducted through a qualitative analytical process that compared the model’s components against documented delay patterns observed during the pre-construction phase. This evaluation assessed whether each component directly addressed identified sources of inefficiency related to scope uncertainty, documentation rework, Section 106 sequencing, and interagency coordination. The evaluation criteria focused on logical alignment, internal coherence, and potential applicability within FEMA-funded historic revitalization contexts, rather than empirical performance testing or quantitative validation.

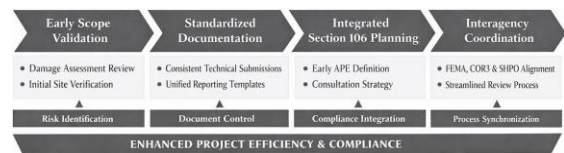
### Conceptual Structure of the Efficient Management Model

Based on recurring inefficiencies identified during the analytical phase, this study developed an Efficient Management Model for FEMA-funded historic revitalization projects designed to optimize pre-construction performance through a sequenced and time-bound management approach. The model is conceptual in nature and integrates historic preservation compliance directly into early project management processes rather than treating it as a sequential external requirement.

The proposed model, which is presented in Figure 2, is structured around four interrelated components executed progressively during pre-construction, with an estimated cumulative duration

of approximately 8 to 12 weeks, allowing for limited overlap to support parallel coordination.

The process begins with early scope validation (typically Weeks 1–2), which emphasizes systematic verification of damage assessments and current site conditions prior to design development to reduce late-stage scope revisions and re-costing. This is followed by standardized documentation coordination (approximately Weeks 2–4), which establishes consistent technical submission protocols, version control practices, and first-submission compliance targets to minimize repetitive review cycles across FEMA and COR3 processes. Integrated Section 106 compliance planning is then initiated concurrently with documentation development (generally Weeks 3–6), embedding historic preservation requirements—including early definition of Areas of Potential Effects and consultation sequencing—into initial project planning to reduce iterative reviews and late-stage design modifications. The sequence concludes with interagency workflow alignment (approximately Weeks 5–8), focusing on clarifying responsibilities and coordinating review timelines among FEMA, COR3, municipalities, consultants, and preservation authorities. Collectively, these components function as a proactive pre-construction management system that improves schedule predictability, reduces administrative rework, and supports regulatory compliance while safeguarding historic resources.



**Figure 2.**  
Efficient Management Model for FEMA-Funded Historic Revitalization Projects

## RESULTS

The analysis of FEMA-funded historic revitalization projects revealed consistent patterns contributing to extended pre-construction timelines. One primary finding was the prevalence of

incomplete or outdated scope definitions during initial damage assessments. As site conditions evolved and previously undocumented deterioration became evident, projects frequently required scope revisions that triggered additional administrative reviews and resubmissions, extending approval timelines.

A second key finding related to documentation quality and coordination. Inconsistent technical submissions across projects and municipalities resulted in repeated comment cycles during FEMA and COR3 reviews, increasing coordination demands among agencies and delaying procurement and authorization-to-proceed milestones. In addition, the analysis indicated that historic preservation compliance was often addressed late in the project development process. Section 106 coordination—including the definition of Areas of Potential Effects and consultation sequencing—frequently occurred after preliminary scopes had been established, increasing the likelihood of late-stage revisions. Collectively, these findings demonstrate that delays were not isolated events, but the result of systemic inefficiencies concentrated in early project phases, consistent with the phase-based impacts illustrated in Figure 1.

## CONCLUSION

This study demonstrates that extended delays in FEMA-funded historic revitalization projects are primarily driven by inefficiencies occurring during early project phases rather than by construction-related constraints. Incomplete scope validation, fragmented documentation practices, and the late integration of historic preservation compliance consistently emerged as critical factors affecting project timelines and schedule predictability.

The findings support the need for an Efficient Management Model that integrates historic preservation requirements into early project planning and documentation processes. By aligning regulatory compliance with engineering management and project delivery practices from

project inception, the proposed model reduces repetitive review cycles, improves interagency coordination, and enhances predictability without compromising preservation objectives. As a structured and replicable approach, the model provides a practical foundation for improving the execution of FEMA-funded historic revitalization projects and may be applicable to similar post-disaster recovery contexts where regulatory complexity and administrative fragmentation affect project performance.

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