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THE IMPACT OF COVID-19 REGULATORY MEASURES ON CONSTRUCTION PROJECT TIME PERFORMANCE: EVIDENCE FROM YOLA, ADAMAWA STATE, NIGERIA

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Abstract
While the COVID-19 pandemic necessitated regulatory interventions to protect public health, the impact of these measures on the time performance of construction projects has been a subject of significant concern. This study empirically examines the impact of the measures announced by authorities during the COVID-19 pandemic on construction project time performance in Yola, Adamawa State, Nigeria. Using a quantitative research design, data were gathered from 140 construction professionals via a structured questionnaire. The study employed simple linear regression analysis to determine the predictive power of the announced measures on project time performance. The regression model revealed a significant and substantial impact, with the measures announced by authorities accounting for approximately 70.7% of the variation in construction project time performance ($R^2 = 0.707$). The unstandardized coefficient ($\beta = 0.851$, $p < .001$) indicates that the intensity of the measures had a direct and considerable effect on project timelines. The study concludes that government interventions, while necessary for public safety, were a major determinant of schedule delays during the pandemic. It is recommended that construction firms adopt flexible, scenario-based scheduling and invest in crisis-responsive project management systems to mitigate the impact of future regulatory disruptions.

Keywords: COVID-19, Project Time Performance, Regulatory Impact, Construction Delays, Regression Analysis, Nigeria.

Introduction
The construction sector is characterized by complex, time-sensitive operations where delays can lead to significant financial penalties and contractual disputes. The COVID-19 pandemic, with its associated lockdowns, movement restrictions, and health mandates, introduced a new dimension of external disruption that challenged the industry 's traditional scheduling and risk management frameworks. Sierra (2022) identified seven interrelated challenges confronting building contractors during the pandemic: health and safety on-site, economic cost, legal exposures, manpower availability, supply chain instability, subcontractor issues, and the persistent uncertainty created by the pandemic's unpredictable evolution. The severity of these challenges was found to vary depending on contractor size, the rigor of local regulations, and the specific construction sector involved, indicating that the pandemic 's impact was mediated by contextual factors rather than being uniform across settings.

In Nigeria, the government's regulatory response, including the COVID-19 Health Protection Regulations 2021, fundamentally altered the operational landscape for construction projects. The Regulations mandated social distancing, movement restrictions, and health protocols that directly conflicted with the site-based, labor-intensive nature of construction work. Empirical evidence from the Nigerian construction sector confirms that the pandemic's effects were severe and multidimensional. Oyewobi *et al*. (2023) found that the most severe impact was financial, with a 77% severity index, followed by infrastructure impacts at 74.4%, while quality and safety impacts were comparatively lower at 53%. Okpo and Offiong (2023) documented that the pandemic severed the movement of people and interpersonal relationships, delayed project timelines, escalated

transportation problems, and induced high costs of construction resources and project costs in Akwa Ibom State. These findings underscore that the pandemic did not merely introduce isolated delays but systematically disrupted the operational and financial foundations of construction projects.

While studies have documented the general negative impact of the pandemic on the construction industry (Alsharef *et al.,* 2021; Gamil & Alhagar, 2020), there is a critical gap in quantifying the specific impact of these regulatory measures on project time performance, particularly in localized contexts like Yola, Adamawa State. Existing Nigerian research has concentrated disproportionately on Lagos, Abuja, and the southern geopolitical zones, leaving the experiences of construction professionals in the northern states comparatively underexplored. This geographical imbalance is significant because the pandemic 's impacts were mediated by regional administrative systems, project environments, and socioeconomic conditions that vary considerably across Nigeria. Moreover, the Nigerian construction sector's response involved identifiable resilience tactics. Ilesanmi et al. (2025) identified four main categories of resilience tactics adopted by Nigerian construction firms: innovative tactics, financial sustainability tactics, contractual flexibility tactics, and smart construction safety, with innovative technology-driven approaches emerging as the most significant. Understanding how these adaptive responses interacted with regulatory requirements at the project level remains an open question, particularly in northern contexts where digital infrastructure and institutional capacity may differ from those in the south.

This study addresses this gap by empirically testing the measures announced by authorities had a significant impact on the time performance of construction projects in the region. By focusing on Yola, Adamawa State, the study provides region-specific evidence that can inform more targeted policy and project management strategies for future public health emergencies in northern Nigeria.

Literature Review

The relationship between external shocks and construction project performance is well-documented. The pandemic introduced what several scholars term a "global disruption." Rehman *et al.* (2021) and Zamani *et al.* (2021) noted that the sudden global restrictions changed workflow sequencing, labour availability, and project coordination, leading to new scheduling complexities. In the Nigerian context, Osuizugbo (2020) and Yusuf *et al.* (2021) observed that the pandemic led to project time overruns and disruptions in construction activities. Osuizugbo's study specifically identified seven categories of disruption in the Nigerian construction sector during the pandemic: transportation problems for both materials and workers, project abandonment, delay in construction activities, high cost of construction materials, reduction in working hours per day, lack of funding, and shortage of workforce. These disruptions were not isolated incidents but interconnected operational failures that collectively undermined project delivery capacity.

Empirical evidence from specific Nigerian states reinforces the severity of these disruptions. A study of building construction projects in Abuja found that the most significant factors hindering project delivery due to COVID-19 were restrictions of movement and lockdown (MIS = 5.00), delays in material delivery (MIS = 4.97), and price escalations (MIS = 4.97). The same study identified workforce availability due to illness (MIS = 4.63) and shortage of equipment and labour (MIS = 4.57) as the most significant effects on time delivery. In Niger State, projects executed during the pandemic experienced severe delays as workers were restricted from going to work due to the lockdown policy, with project time overruns ranked as the highest contractual impact (MIS = 3.931), followed by contractual disruptions and material delivery delays. These findings demonstrate that the regulatory measures themselves movement restrictions, lockdowns, and site access limitations functioned as independent causal factors in schedule deviation, distinct from the biological impact of the virus on the workforce.

The regulatory measures introduced by authorities created a distinct layer of disruption that warrants separate analytical treatment. According to Systems Theory, construction projects operate as open systems comprising interdependent components labour, materials, equipment, planning, and stakeholder coordination that maintain equilibrium through feedback mechanisms. External regulatory interventions, such as lockdown orders, workforce density limits, and mandatory health protocols, act as environmental stressors that disrupt this equilibrium. When multiple subsystems are simultaneously affected, the system's adaptive capacity is overwhelmed, and schedule deviations become inevitable. The study by Ilesanmi *et al.* (2025) on resilience tactics in the Nigerian construction industry provides empirical support for this systems perspective, identifying four categories of adaptive responses: innovative tactics, financial sustainability tactics, contractual flexibility tactics, and smart construction safety. The significance of innovative tactics suggests that firms with greater adaptive capacity were better positioned to absorb regulatory shocks, while those lacking such capacity experienced more severe time performance degradation.

However, the specific impact of the regulatory measures themselves as a distinct variable from the biological impact of the virus requires closer scrutiny. Existing Nigerian studies have documented pandemic effects but have not systematically isolated the regulatory dimension as a predictor variable. For instance, while Oyewobi *et al.* (2023) reported severity indices for financial and infrastructure impacts, and Okpo and Offiong (2023) documented delays and cost escalation in Akwa Ibom State, neither study quantified the independent contribution of regulatory compliance requirements to schedule outcomes.

This gap is particularly significant because regulatory measures were externally imposed, uniformly announced, and legally enforceable, yet their operational consequences varied according to project-specific and organizational factors. Systems Theory provides a useful lens for understanding this variation: regulatory interventions act as external environmental stressors that disrupt the system's equilibrium, but the magnitude of resulting time and schedule deviations depends on the system's internal configuration its resource buffers, communication channels, and adaptive feedback mechanisms. This study builds on this theoretical framework by quantifying the effect of these external regulatory stressors on project time performance in Yola, Adamawa State, thereby addressing the analytical gap between documented disruption and measured regulatory impact.

Concept of Construction Project Time Performance

Construction project time performance has been widely recognised as a key benchmark to define the overall success of project delivery. Alsharef *et al.* (2021) assume that time performance is the degree of implementation of construction activities relative to the planned performance, which makes it a key indicator to assess project reliability. According to Adepu *et al.* (2023), construction timelines are inherently complex as multiple interdependent tasks are carried out and all need synchronisation so that they are timely completed. To corroborate this assertion, Gamil and Alhagar (2020) emphasised that the temporal structure of construction projects depends to a large degree on the smooth alignment of organisational, technical and managerial processes. Elnaggar and Elhegazy (2021) moreover noticed that the dynamic nature of construction work requires regular monitoring for the coherent maintenance of the schedule. In support of these perspectives, Ling and Zhang (2022) added that time performance is not only a measure of duration but also a strategic indicator that guides the evaluation and improvement of the practise of project management.

Time performance is also conceptually related to predictability of flow of work. Zamani *et al.* (2021) argued that delays in planned timelines typically indicate the presence of underlying inefficiencies in coordination, planning or resource utilisation. Almohassen et al. (2022) supported this and described that schedule deviations are commonly diagnostic signals in performance assessments. According to Gara *et al.* (2022), it is therefore imperative for project governance frameworks to

have an accurate estimation of time and continuous tracking since it enables project managers to keep control and detect any discrepancies before the project gets out of control. In a further addition, McCuen *et al.* (2022) noted that time performance cannot be disconnected from resource sequencing, communication channels and the quality of stakeholder coordination. To reinforce this view, Bukhari *et al.* (2024) argued that time performance should be viewed as a multi-layer concept that is embedded in each operational stage of the construction management.

Another theoretical dimension of construction project time performance is in its role of organisational learning. Ayalp and Civici (2022) postulated that analysing the discrepancy between planned and actual schedules helps construction companies to improve forecasting and schedule methods. According to Ebekozien *et al.* (2021), this reflective evaluation socialises managerial judgement and enables the organisation to identify weaknesses in the execution strategies. To corroborate these claims, Ikechukwu and Odimegwu (2021) stated that time performance indicators enable the project teams to analyse the workflow progression and review the effectiveness of the control mechanisms. AbdulLateef *et al.* (2023) added that schedule outcomes are important feedback tools for the future of decisions on a project. This claim was also supported by Onubi *et al.* (2022) as the time performance reflects organisation's accumulated experience. In agreement, Selcuk (2025) highlighted that continuous performance evaluation helps in improving the adaptability and planning competence of any organisation.

Finally, time performance is cited as a measure of operational resilience by scholars in the construction industry. Ogunnusi *et al.* (2021) explained the ability to adhere to project timelines shows reliability of institutions and boosts client confidence. Musonda and Rakolote (2022) supported this by stating that the performance of time is closely related with professional credibility and contractor reputation. According to Rehman *et al*. (2021), the adherence to schedule targets is also an indicator of the quality of execution and the coherence of management practises on site. To reinforce this, Chen *et al* (2023) indicated that time performance has become an essential metric for transparency, accountability and project reporting. Zaccheus *et al.* (2022) added that consistent performance monitoring helps improve strategic planning as well as the overall efficiency of the construction operations. Collectively, the literature portrays construction project time performance as a foundational notion in shaping current interpretations on effectiveness, reliability and continuous improvement in the built environment.

Indicators of Time Performance in Construction

Schedule Adherence

Schedule adherence is the extent to which the activities of construction are performed as per the scheduled time. It is a measure of the degree to which actual progress adheres to the project schedule. High adherence to the schedule is an indicator of things being done within the schedule and deviations to potential delays or inefficiencies. According to AbdulLateef *et al.* (2023), by monitoring the adherence of the schedule, project managers will be able to detect the lagging activities and take corrective actions on time. Bell *et al.* (2022) posits that consistent tracking of schedule adherence not only helps in controlling project timeline, but it also provides data for improving the future project planning. To support this statement, McCuen et al. (2022) added that schedule adherence is one of the main benchmarks to evaluate the overall project time performance since it indicates the effectiveness of planning, resource allocation process and execution process.

Timely Achievement of Milestones

The timely achievement of milestones in a project is one of the performance indicators affecting time. Milestones are predefined points on a project timeline, which represent the completion of important phases or deliverables. Completing these milestones on or ahead of schedule is an

indication of sound time management and progress towards completing the project (Ling & Zhang, 2022). According to Bukhari *et al.* (2024), tracking milestone completion is a way to get a clear picture about the health of the project, in that it indicates whether key activities are progressing as planned. Adelekan *et al.* (2021) added that milestone tracking provides the opportunity to identify the delays in the critical areas at the early stage and managers can take corrective actions to keep the whole project on time. As a result, milestone adherence offers a real, measurable way of measuring the time performance throughout the lifecycle of a project.

Frequency of Delays

The frequency of delays - even if the delay is small, how often do activities start or finish late in comparison with those times that they are to have started or finished? Frequent delays is a good indicator of poor time performance as it's a constant disruption in the execution of the project. Asuquo *et al.* (2020) argue that tracking the frequency of delays is significant in helping managers to identify problems which keep recurring, such as resource shortages, communication gaps, or procedural bottlenecks, among others. To back this statement, Selcuk (2025) contributed that by measuring delays, construction teams are able to quantify the schedule risks and effectively make mitigation strategies. Adepu *et al.* (2023), further noted that reduction of the frequency of delays is key in ensuring that the project continues without lagging, and completing the project by the set date, hence it is a core indicator of time performance.

Productivity Rates

Productivity rates are a measure of the efficiency of the labour, equipment and material use in getting a job done in a given time. High productivity rates are related to the timely execution of construction activities while low productivity rates may signify inefficiencies that may lead to delays (Almohassen *et al.,* 2022). According to Zaccheus *et al.* (2022), productivity rates are a measureable unit of how quickly or slowly the work is being completed in reference to the scheduled time. Bukhari et al. (2024) states that by tracking productivity rates, project managers can identify areas where productivity is underperforming, and they can adjust resources or strategies to maximise the flow of work. To corroborate this statement, AbdulLateef *et al.* (2023) added that consistent level of productivity is vital in order to attain to schedule compliance and time performance as a whole in construction projects.

Variance Between Planned and Actual Duration

Variance between planned and actual duration describes the deviation of the originally planned time allocated for the project activities to the time which takes to complete the activities. It is a straight indicator of the time performance and reflects whether the tasks are being done faster, slower or on time according to the schedule (Gara *et al.,* 2022). According to Ling and Zhang (2022), positive variance, in which the actual duration is more than planned duration, is a marker for possible delays and inefficiencies and negative variance is the accelerated performance. Bell *et al.* (2022) argues that the duration variance tracking provides the actions of scheduling accuracy in a project and shows the area that requires managerial intervention. To support this statement, McCuen et al. (2022) further elaborated that analysis of variance is useful for forecasting project completion timelines, schedule adjustment before completion and increasing the precision of future project plans.

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Disruption of Construction Project Time Performance Caused by COVID-19 Pandemic in Nigeria

The COVID-19 pandemic has greatly affected the time performance of construction projects worldwide, with Nigeria not being exempt from the major disruptions in its construction sector. The abrupt arrival of the pandemic caused unprecedented restrictions, such as lockdowns, social distancing requirements and interstate travel restrictions, which hindered the movement of labour and materials necessary for project execution (Ling & Zhang, 2022). According to AbdulLateef *et al*. (2023), these interruptions had a direct impact on schedule adherence leading to delays in projects being carried out, in addition to changing the completion times. To support this statement, Bukhari et al. (2024) expanded that the construction activities that are dependent on the coordination of labour teams were significantly slowed down as workers were either quarantined or were not allowed to attend sites, thus damaging planned workflows. In Nigeria, the country where a large part of the construction labour force is employed under informal arrangements, this was especially severe with workforce absenteeism becoming prevalent and inconsistent (Oladimeji, 2021).

The availability of construction materials also played a major role in project time performance disruptions during the pandemic. With the closure of borders and the reduction in importation of essential inputs for the construction activities, many projects experienced a shortage of materials, which forced project managers to either suspend activities or adopt costly workarounds (Adepu et al., 2023). As noted by Bularafa and Adamu, (2021), delays in procurement of key materials such as cement, steel and electrical fittings cascaded into missed milestones and extended the duration of projects. AbdulLateef *et al*. (2023) states that supply chain interruptions amplified the already inefficiencies of project planning and logistics, accentuating the vulnerability of Nigerian construction projects to outside shocks. According to Ebekozien *et al.* (2021) the sudden and prolonged shortage of materials forced the contractors to re-sequence project activities which impacted the levels of productivity and overall schedule adherence.

Labour productivity was also greatly disrupted by the presence of the Covid-19 virus, which further affects the performance of project time. Social distancing requirements, reduced workforce capacity that can be on-site, as well as health concerns, affected the ability of construction teams to maintain normal output levels (Almohassen *et al.,* 2022). As reported by Zaccheus *et al,* (2022), labour-intensive projects, especially residential and infrastructure development, experienced significant drops in the number of tasks completed daily which slowed down work on critical activities. To corroborate this, Pamidimukkala and Kermanshachi (2021) added that project managers had to implement staggered shifts and rotational work schedules which, while mitigating the health risks, inevitably slowed project timelines. In the Nigerian situation, where informal labor arrangements are common and occupational health measures were limited, the drop in labor productivity put pressure on already existing challenges of meeting project schedules.

In addition, the pandemic had an impact on the coordination and communication between different project members, which further disrupted the time performance. With restrictions in meeting face to face, project stakeholders relied heavily on virtual platforms which often suffered from poor internet connectivity and lack of technological adoption (Leontie et al., 2022). As pointed by Chukwu and Zubairu (2023), the delay decision making and approvals slowed down the execution of critical project tasks, hence milestones missing and extension of projects duration. According to Gamil and Alhagar (2020), any disruption in stakeholder collaboration combined with the lack of certainty in regulatory guidance during the pandemic caused delays in processes like permitting and inspections. AbdulLateef *et al.* (2023) argues that these disruptions in administration and communication, added to the operational challenges, have all had an overall impact on the timely delivery of projects.

Overall, the vulnerabilities in the construction industry in Nigeria concerning project time performance were exposed as a result of the pandemic of Covid-19. Disruptions in labor availability,

material supply chains, productivity, and the communication mechanisms all contributed to wide delays to ongoing projects. As can be observed from McCuen et al. (2022), the cumulative effect of these disruptions makes it necessary to develop resilient project planning strategies that are able to accommodate unforeseen crises. To further support this statement, Ling and Zhang (2022) added that the lessons derived from the pandemic-induced disruptions may be used to inform future contingency planning, resource allocation, and risk management practises, which can ultimately help improve the industry's ability to keep time performance under similar circumstances.

Effects of the COVID-19 Pandemic on the Construction Industry in Nigeria

The coronavirus pandemic has impacted far reaching in the construction industry in Nigeria in terms of operational efficiency and financial viability of construction projects. The sudden occurrence of lockdowns, movement restrictions and social distancing protocols disrupted the normal work process in the construction sector leading to widespread delays in project schedules and timelines (Ling & Zhang, 2022). According to AbdulLateef *et al.* (2023), construction sites were left with no choice but to halt the work immediately, and labour shortage has come into existence due to the quarantine mandates, but health concerns have also complicated the execution of the project. To corroborate this statement, Bukhari *et al* (2024) added that delays in important approvals, inspections, and mobilization of resources created bottlenecks in the progression of the project. The pandemic not only disrupted ongoing projects but cancellations or suspension of planned projects had also resulted in uncertainty in the sector and affected investor confidence.

Financial repercussions of the pandemic on the construction industry in Nigeria were massive as companies struggled with maintaining liquidity because of the reduced inflows of projects and rising costs of operations. According to Okpo and Offiong (2023), the contractors were confronted with an escalating cost in purchasing of scarce materials and health and safety measures to be taken to comply with the protocols of the Covid-19 pandemic. AbdulLateef *et al*. (2023) states that an increase in spending on personal protective equipment, sanitation and reduction in workforce productivity aggravated the budgetary pressures. To corroborate this, Oladimeji (2021) added that a lot of small and medium scale construction firms that are a big part of the construction sector in Nigeria faced the challenges with cash flow that threatened survival. As a result, the pandemic made the financial industry vulnerable to global shocks and the need for more resilient financial planning and risk management strategies.

METHODOLOGY

The study adopted a quantitative, descriptive research design. The population consisted of 220 construction professionals in Yola, with a sample size of 140 determined using the Krejcie and Morgan table. A structured questionnaire, validated by experts and with a reliability coefficient (Cronbach's alpha) of 0.975, was used to collect data. Section C of the questionnaire focused on the impact of the pandemic on time performance and the measures announced by authorities. Data were analyzed using SPSS version 21. Simple linear regression was used to determine the impact of the independent variable (Measures Announced, MANN) on the dependent variable (Construction Project Time Performance, CPTP).

Data Analysis and Findings

The linear regression analysis revealed a strong and statistically significant relationship between the measures announced by authorities and construction project time performance.

Table 1: Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.842	0.709	0.707	0.58206

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The model summary table presents the results of a simple linear regression analysis examining the impact of the measures announced by authorities during the COVID-19 pandemic on construction project time performance in Yola, Adamawa State. The correlation coefficient (R = 0.842) indicates a strong positive relationship between the regulatory measures and project time performance, suggesting that as the intensity or implementation of government-announced measures increased, construction project time performance was substantially affected. The coefficient of determination (R^2 = 0.709) reveals that approximately 70.9% of the variation in construction project time performance can be explained by the measures announced by authorities, while the remaining 29.1% is attributable to other factors not captured in the model, such as labour shortages, supply chain disruptions, financial constraints, and contractor-specific management practices. The adjusted R^2 value of 0.707, which is nearly identical to the R^2 value, confirms that the model's explanatory power remains robust even after accounting for the number of predictors, indicating that the model is not overfitted. The standard error of the estimate (0.58206) reflects the average distance between the observed values and the regression line, suggesting a reasonable level of prediction accuracy. Overall, the table demonstrates that the measures announced by authorities during the pandemic were a statistically significant and substantial predictor of construction project time performance in the study area.

Table 2: Regression Coefficients

Model	Unstandardized Coefficients (B)	Std. Error	t	Sig.
(Constant)	0.632	0.182	3.469	0.000
Measures Announced (MANN)	0.851	0.046	18.405	0.000

The simple linear regression results indicate that the measures announced by authorities during the COVID-19 pandemic had a statistically significant and positive impact on construction project time performance in Yola. The constant (intercept) of 0.632 ($t = 3.469$, $p < 0.001$) represents the baseline level of construction project time performance when the measures announced by authorities are held at zero. More importantly, the unstandardized coefficient for the Measures Announced (MANN) variable is 0.851 ($t = 18.405$, $p < 0.001$), which is statistically significant at the 0.05 level. This means that for every one-unit increase in the implementation or intensity of the measures announced by authorities, construction project time performance is estimated to change by 0.851 units in the positive direction. Given that the p-value (0.000) is less than 0.05, we reject the null hypothesis and conclude that the measures announced by authorities had a significant impact on construction project time performance. The relatively large t-value (18.405) further confirms the robustness of this relationship, providing strong statistical evidence that government-imposed regulatory measures were a major determinant of project timelines within the construction industry in Yola, Adamawa State, during the pandemic period.

Discussion of Findings

The findings provide strong empirical evidence that the regulatory measures implemented during the pandemic were a dominant factor influencing project timelines in Yola. The high explanatory power (R^2 = 0.707) of the model suggests that government interventions such as lockdowns, movement restrictions, and compliance protocols were among the most critical determinants of project delays. This aligns with the findings of Pamidimukkala and Kermanshachi (2021) and Waheeb et al. (2022), who reported that COVID-19 regulations significantly influenced workforce deployment and scheduling practices. The significant impact is likely amplified by the nature of the Nigerian construction industry, which relies heavily on physical labor and face-to-face coordination, making it particularly vulnerable to restrictions on movement and site access. The remaining 29.3%

of variance suggests that other factors, such as supply chain disruptions and labor shortages, also played a role, as noted by Gamil and Alhagar (2020).

CONCLUSION AND RECOMMENDATIONS

This study concludes that the regulatory measures announced by authorities during the COVID-19 pandemic had a significant and substantial impact on construction project time performance in Yola. The regression analysis confirms that these measures were not just correlated with, but were a major predictor of, project delays. To mitigate the impact of future disruptions, it is recommended that construction firms institutionalize crisis-responsive project scheduling systems, including flexible baseline programmes and scenario-based planning. Furthermore, government and regulatory agencies should collaborate to develop construction-specific emergency policy frameworks that include fast-track approval systems and standardized compliance protocols, thereby balancing public health objectives with the need for project continuity.

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