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From the Ma'rib Dam to Megaprojects: Qur'anic Insights on Infrastructure, Economics, Sustainability, and Resilience

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Abstract

Throughout history, infrastructure has been more than just a tool for development—it has represented both material prosperity and a society's sense of responsibility. The Maʿrib Dam in ancient Yemen, regarded as one of the greatest engineering feats of pre-Islamic Arabia, captures this duality. Its eventual collapse, mentioned in the Qur'an (Sūrah Sabaʾ 34:15–19), was not simply a technical failure; it marked the beginning of economic decline and social fragmentation, brought about by neglect and weak governance. This study explores the Maʿrib Dam through historical records, archaeological findings, and

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Qur'anic perspectives to draw insights for today's large-scale projects, including the Three Gorges Dam, the Grand Ethiopian Renaissance Dam, and Saudi Arabia's NEOM. By integrating textual analysis, historical interpretation, and comparative case studies, the research identifies recurring challenges: governance, sustainability, environmental balance, and social justice. The findings suggest that the endurance of infrastructure depends less on engineering expertise alone and more on long-term planning, inclusive decision-making, and a commitment to ethical responsibility. The Qur'anic principles of mīzān (balance), shukr (gratitude), and khilāfah (stewardship) provide a moral framework for aligning ecological preservation with financial strategy. In this light, megaprojects are not merely feats of construction—they are tests of integrity, equity, and foresight. When guided by sustainability and fairness, they can secure lasting prosperity; but when driven by vanity or short-term gains, they risk ecological harm, economic instability, and eventual collapse. Revisiting the story of the Maʿrib Dam reminds us of the enduring relevance of Qur'anic wisdom in shaping societies that are resilient, just, and economically sound in the twenty-first century.

Keywords: Maʿrib Dam; Qur'anic Perspectives; Infrastructure Governance; Sustainability And Resilience; Environmental Balance; Social Justice; Megaprojects (Three Gorges, GERD, NEOM); Ethical Responsibility; Islamic Principles (Mīzān, Shukr, Khilāfah)

Introduction

Civilization has always been reflected in infrastructure. These enormous projects, which ranged from canals and road networks to dams and aqueducts, had deeper significance than merely being physical constructions. They sustained daily life by supporting agriculture, boosting trade, and connecting communities, while also standing as symbols of prosperity, authority, and shared human creativity. In many

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ways, such projects were the economic backbone of societies, helping them grow, flourish, and secure their place in history. At the same time, they embodied questions of sustainability, as societies confronted the challenge of balancing resource use with long-term ecological resilience. The Maʾrib Dam in ancient Yemen exemplifies this dual role. Widely regarded as one of the most sophisticated engineering achievements of pre-Islamic Arabia, the dam transformed an arid landscape into fertile valleys, irrigating nearly 10,000 hectares of farmland and sustaining agricultural prosperity and trade networks for centuries (Brunner 1983: 74; Schmidt 1987: 62). Archaeological evidence places its earliest hydraulic works in the 7th–6th centuries BCE under the Sabaean rulers Sumhuʿalī Yanūf and Yathaʿʾamar Bayyīn (CIH 622–623; Darles et al. 2014). Over time, the structure evolved into a massive levee—650 meters long, 15 meters high, and nearly 100 meters wide at its base—flanked by complex stone-built intakes that regulated water flow to the northern and southern oases of Maʾrib (Vogt et al. 2003; Hehmeyer 1991). Repairs and extensions were repeatedly undertaken, most notably under the Himyarite kings between the 4th and 6th centuries CE. Inscriptions record successive breaches and large-scale restorations, with rulers such as Thaʾrān Yuhanʿim, Shuriḥbiʾīl Yaʿfur, and Abrahā mobilizing vast resources—grain, livestock, wine, and labor—to preserve the system (CIH 540–541; Nebes 2004, 2005). Despite this resilience, sedimentation, ecological strain, and political decline eventually culminated in its final collapse in the late 6th century CE (Robin 1988; Vogt 2004).

The Qur'an recalls the collapse of the Maʾrib Dam in Sūrah Sabaʾ (34:15–19), referring to it as the "flood of al-ʿArim." This event is remembered not only as an engineering failure but also as a consequence of moral decline and ingratitude. Once-flourishing villages and lush gardens were reduced to barren land, forcing

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tribes to scatter across Arabia. The dam's destruction became a powerful story within Arab-Islamic heritage, used to explain both Yemen's arid landscape and the historic migrations that shaped the region (Darles et al. 2014). Its memory lived on in classical and pre-Islamic poetry, which celebrated the dam as both a cultural symbol and an extraordinary feat of engineering (El Maṣrī in Darles et al. 2014). The Maʾrib Dam, therefore, stands at a crossroads of meanings: a reminder of the dangers of neglecting stewardship, a testament to human ingenuity, and a cornerstone of past prosperity.

Seen from this perspective, the story carries lessons for the era of modern megaprojects. Today, ambitious infrastructure developments promise modernization, energy security, economic growth, and national prestige. Landmark projects such as Saudi Arabia's NEOM, Ethiopia's Grand Renaissance Dam, and China's Three Gorges Dam showcase remarkable technological achievements while offering significant economic benefits—ranging from renewable energy and job creation to global competitiveness. Yet, they also raise pressing questions about equity, sustainability, and long-term resilience. Ecosystems are upset, communities are uprooted, governance is disputed, and sometimes decision-makers' euphoria about technology causes them to ignore more serious threats. These conflicts reaffirm Maʾrib's teachings: wealth can easily fall apart if it is not accompanied by appreciation, moderation, and accountability.

However, a large portion of the research on contemporary megaprojects is still fragmented. Economists analyze costs, revenues, and investments; political scientists research conflict and governance; while engineers concentrate on structural performance and outputs. Comparably, studies of the Maʾrib Dam have mostly focused on its hydrology, inscriptions, and archaeology (Glaser 1897;

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Müller & Rhodokanakis 1913; Schmidt et al. 1982, 1986; Schaloske 1995), but they seldom ever relate its past to issues of sustainability or ethics. By combining technological, financial, and ethical viewpoints, this research seeks to close such gaps and demonstrate how traditional knowledge and contemporary issues may benefit from one another. This aspect is specifically added by the Qur'anic viewpoint, which views collapse as a moral and technical failure and views infrastructure as a trust (amānah) that needs appreciation, care, and balance. By emphasizing this viewpoint, the current study aims to contribute to current discussions by offering a normative framework that is both historically significant and very pertinent to discussions of resilience today.

The significance of this inquiry is threefold. Academically, it advances an interdisciplinary dialogue between Qur'anic studies, sustainability science, economics, and engineering, thereby broadening the conceptual foundations of infrastructure research. From a policy perspective, it demonstrates that resilience is not merely a matter of financial resources or technological innovation but depends equally on governance ethics, participatory stewardship, and ecological sensitivity. At a broader civilizational level, the study underscores the continued relevance of ancient lessons for contemporary societies, highlighting the fragility of prosperity when economic ambition is pursued without sustainability or moral responsibility.

The objectives of this study are therefore fivefold: (1) to analyze Qur'anic references to the Maʾrib Dam (Sūrah Sabaʾ, 34:15–19) and interpret them through classical and contemporary exegesis; (2) to contextualize the dam historically and archaeologically; (3) to conduct a comparative analysis of the Three Gorges Dam, GERD, and NEOM across dimensions of economics, governance, environment, and equity; (4) to synthesize thematic lessons linking ancient and modern cases;

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and (5) to propose policy implications that embed ethical responsibility and sustainability into infrastructure planning. These objectives align with the broader aim of constructing a framework where technological achievement, economic prosperity, and moral responsibility are not competing concerns but mutually reinforcing dimensions of sustainable development.

The Maʾrib Dam thus serves not only as an archaeological monument but also as a moral and economic compass. Its rise and fall illustrate how material prosperity is inseparable from ethical responsibility and ecological care. Modern megaprojects, despite their technological sophistication and economic promise, confront the same fundamental challenge: whether ambition will be balanced by stewardship, and whether progress will be pursued with justice, sustainability, and gratitude. By placing Qur'anic insights in dialogue with contemporary infrastructure dilemmas, this study argues that resilience demands more than engineering innovation and financial investment; it requires a renewal of moral, institutional, and ecological responsibility.

Literature Review

Qur'anic Insights on the Maʿrib Dam and the People of Saba

Surah 34 Saba, Ayat 15-21

لَقَدْ كَانَ لِسَبَإٍ فِيْ مَسْكَنِهِمْ اٰيَةٌ ۚ جَنَّتٰنِ عَنْ يَّمِيْنٍ وَّشِمَالٍ ؕ كُلُوْا مِنْ رِّزْقِ رَبِّكُمْ وَاشْكُرُوْا لَهٗ ۗ بَلْدَةٌ طَيِّبَةٌ وَّرَبٌّ غَفُوْرٌ ﴿34:15﴾ فَاَعْرَضُوْا فَاَرْسَلْنَا عَلَيْهِمْ سَيْلَ الْعَرِمِ وَبَدَّلْنٰهُمْ بِجَنَّتَيْهِمْ جَنَّتَيْنِ ذَوَاتَيْ اُكُلٍ خَمْطٍ وَّاَثْلٍ وَّشَيْءٍ مِّنْ سِدْرٍ قَلِيْلٍ ﴿34:16﴾ ذٰلِكَ جَزَيْنٰهُمْ بِمَا كَفَرُوْا ۗ وَهَلْ نُجٰزِيْٓ اِلَّا الْكَفُوْرَ ﴿34:17﴾ وَجَعَلْنَا بَيْنَهُمْ وَبَيْنَ الْقُرَى الَّتِيْ بٰرَكْنَا فِيْهَا قُرًى ظَاهِرَةً وَّقَدَّرْنَا فِيْهَا السَّيْرَ ۗ سِيْرُوْا فِيْهَا لَيَالِيَ وَاَيَّامًا اٰمِنِيْنَ ﴿34:18﴾ فَقَالُوْا رَبَّنَا بٰعِدْ بَيْنَ اَسْفَارِنَا وَظَلَمُوْٓا اَنْفُسَهُمْ فَجَعَلْنٰهُمْ اَحَادِيْثَ وَمَزَّقْنٰهُمْ كُلَّ مُمَزَّقٍ ۗ اِنَّ فِيْ ذٰلِكَ لَاٰيٰتٍ لِّكُلِّ صَبَّارٍ شَكُوْرٍ ﴿34:19﴾ وَلَقَدْ صَدَّقَ عَلَيْهِمْ اِبْلِيْسُ ظَنَّهٗ فَاتَّبَعُوْهُ اِلَّا فَرِيْقًا مِّنَ الْمُؤْمِنِيْنَ ﴿34:20﴾ وَمَا كَانَ لَهٗ عَلَيْهِمْ مِّنْ سُلْطٰنٍ اِلَّا لِنَعْلَمَ مَنْ يُّؤْمِنُ بِالْاٰخِرَةِ مِمَّنْ هُوَ مِنْهَا فِيْ شَكٍّ ۗ وَرَبُّكَ عَلٰى كُلِّ شَيْءٍ حَفِيْظٌ ﴿34:21﴾

For the people of Sheba, there was a clear sign in their homeland: two gardens, one on the right and one on the left. They were told, "Partake of the sustenance your Lord has provided and be grateful to Him. A good land is yours, and a Lord Most Forgiving." But they turned away from this gratitude. So, we unleashed a devastating flood upon them, which broke through the dams and ruined their gardens. In place of the lush gardens, only bitter fruit, thorny bushes, and a few sparse lote trees

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remained. This was how We repaid them for their ingratitude, for we only repay in such a way those who are utterly thankless. We had also established other thriving towns in the region, towns that We had blessed. We made the travel between these settlements easy and secure, with well-measured distances, so that people could journey between them by night and by day in complete safety. Yet, they pleaded, "Our Lord, lengthen the distances between our journeys!" In doing this, they wronged none but themselves. So, we caused them to become mere tales of the past and scattered them completely. Surely, in this are profound lessons for everyone patient and thankful. Iblis (Satan) saw his prediction about them come true, and they followed him—all except a group of true believers. He had no power over those believers. All of this happened so that we could distinguish those who truly believe in the Hereafter from those who are in doubt about it. And your Lord is watchful over all things (Qur'an, 34:15–21).

Classical exegetes interpret this passage as both historical testimony and divine lesson. Al-Ṭabarī (1987), Ibn Kathīr (2003), and al-Qurṭubī (2006) all identify the *sayl al-ʿarim* (flood of ʿArim) with the bursting of the Maʿrib Dam, which had enabled large-scale agricultural prosperity in Yemen. Ibn Kathīr emphasizes that divine punishment manifested through the collapse of human-built infrastructure, illustrating the consequences of arrogance and neglect. Al-Qurṭubī describes the shift from abundance to deprivation as a clear warning against mismanagement and ingratitude. Modern thinkers such as Nasr (2007) expand this idea with an ecological perspective, seeing the Qur'anic account as a reminder of how fragile prosperity becomes when stewardship, gratitude, and sustainability are abandoned. In this light, the collapse of infrastructure is not only a technical failure but a deeper breakdown of governance, ethics, and ecological balance.

Archaeological and Historical Perspectives on the Maʿrib Dam

Archaeology affirms the central place of the Maʿrib Dam in the history of pre-Islamic Arabia. First built around the 8th century BCE, it was expanded and repaired over centuries under Sabaean and later Himyarite rulers (Schippmann, 1998). At its peak, the dam stretched nearly 600 meters and was equipped with sluices, spillways, and a sophisticated canal network that turned desert land into

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fertile fields. This system not only secured local prosperity but also supported long-distance trade, making the region a hub of cultural and economic exchange. UNESCO (2023) and related studies continue to highlight how the dam sustained an entire civilization—an achievement that still captures the imagination today. Archaeological evidence indicates at least two major breaches, with the final collapse occurring in the 6th century CE, broadly aligning with Qur'anic references to the *sayl al-ʿarim* (Breton, 1998; Robin, 2012). Scholars debate precise timings, but consensus points to inadequate maintenance, ecological pressures, and weakening political authority as decisive factors. The collapse triggered mass migrations of South Arabian tribes, reshaping the demographic and political fabric of Late Antiquity Arabia (Robin, 2012). Thus, archaeological, historical, and Qur'anic evidence converge to emphasize a dual lesson: technical ingenuity is essential, but without governance and ecological stewardship, material prosperity remains fragile.

Figure # 1: Ancient Dam of Ma'rib

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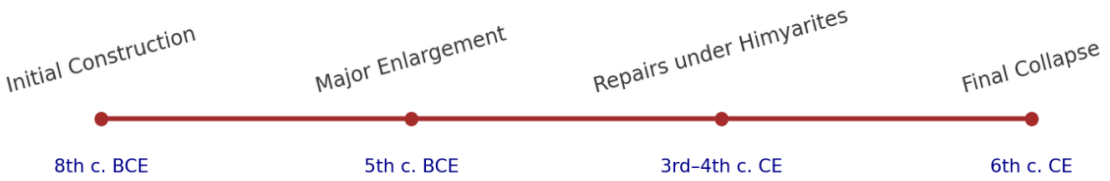

Table # 1: Timeline of Marib Dam Construction and Collapse

Figure # 2: Ancient Dam of Ma'rib – aerial photo

Infrastructure Economics and Sustainability Perspectives

From the standpoint of infrastructure economics, the Maʿrib Dam illustrates both the transformative potential and systemic vulnerability of large-scale public works. Infrastructures such as dams, transport corridors, and energy grids function as public goods, marked by high fixed costs, long lifespans, and network externalities. Their resilience depends not only on initial investment but on

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sustained maintenance, effective institutions, and collective responsibility (Gramlich, 1994). Olson's (1971) theory of collective action explains the risk of underinvestment: when incentives for maintenance falter, shared assets deteriorate. This economic reasoning is supported by the Qur'anic portrayal of ingratitude and neglect, which emphasizes the need of stewardship in preventing systemic collapse. This lesson is echoed in contemporary sustainability paradigms. Strong governance, ecological protections, and community involvement are all important components of resilience, according to the World Bank's (2019) principles and the UN's (2015) Sendai Framework for Disaster Risk Reduction. These concepts closely resemble the Qur'anic values of balance (mīzān) and stewardship (khilāfah) (Nasr, 2007). Inderst (2016) also emphasizes the importance of life-cycle planning, intergenerational equity, and openness in infrastructure funding. Even the most sophisticated technological accomplishment can turn into a weakness if it is not accompanied by consistent care and competent governance, as the Maʿrib Dam tale demonstrates.

Modern Megaprojects and Qur'anic Lessons

Many of the elements mentioned in the Qur'anic story of Sabaʾ are echoed in today's megaprojects. With a 22,500 MW output, China's Three Gorges Dam, which was finished in 2012, is the biggest hydroelectric project in the world and is hailed as a testament to the country's development. Yet this achievement came at a heavy cost: more than a million people were displaced, cultural heritage sites were lost beneath the reservoir, and new ecological risks such as sediment buildup and seismic instability emerged (Stone, 2011). The story reflects the same lesson drawn from Maʿrib—that engineering triumphs, no matter how impressive, cannot secure lasting prosperity if they overlook ecological balance and the human communities they affect. Similarly, Ethiopia's Grand Ethiopian

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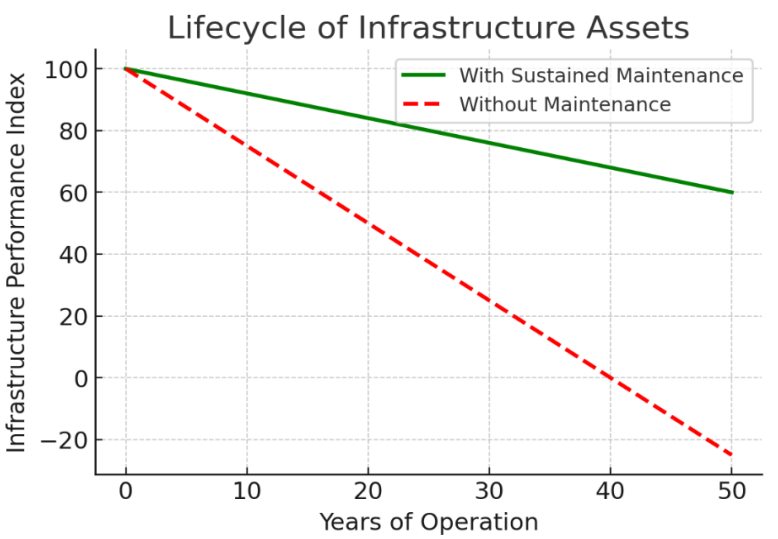
Renaissance Dam (GERD), initiated in 2011, promises economic transformation and regional energy sovereignty. However, it has ignited geopolitical disputes with Egypt and Sudan over water rights, alongside concerns about downstream ecological impacts (Cascão & Nicol, 2016). Ambitious projects like Saudi Arabia's NEOM and its centerpiece, The Line, also capture this tension between aspiration and risk. Marketed as bold models of diversification and sustainability, they promise cutting-edge innovation and global prestige. Yet critics point to ecological disruption, the displacement of indigenous communities, and doubts about long-term feasibility (Elsheshtawy, 2022). These projects, much like Maʿrib in its time, remind us that visionary ambitions must be grounded in ecological care, social equity, and responsible governance if they are to endure. Without inclusive governance and ecological sensitivity, such ventures risk repeating the imbalance warned against in the Qur'anic account of Sabaʾ. Across these examples, consistent themes emerge: infrastructure endurance requires governance and maintenance; ecological balance is indispensable; and social equity is central to resilience. The Qur'anic narrative provides a unique interpretive framework that integrates moral, economic, and sustainability dimensions. Despite the parallels, few scholarly



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works explicitly connect Qur'anic insights with infrastructure economics and sustainability science. Archaeological and exegetical studies of the Maʿrib Dam are well established, while analyses of modern megaprojects are robust within technical and policy domains. However, comparative studies that foreground ethics, resilience, and sustainability remain limited. This research seeks to bridge that gap by placing the Qur'anic narrative of the Maʿrib Dam in dialogue with modern megaprojects, thereby illuminating enduring lessons for infrastructure economics, governance, and sustainable development.

Table # 2: Comparative Chart: Marib Dam vs. Modern Megaprojects

Feature / Aspect	Marib Dam (Ancient Yemen)	Three Gorges Dam (China)	GERD (Ethiopia)	NEOM "The Line" (Saudi Arabia)
Time Period	8th–6th century BCE (Sabaean)	1994–2012 CE	2011–present	2021–2030 (planned)
Purpose	Irrigation, agriculture, water management	Hydropower, flood control, navigation	Hydropower, regional electricity	Urban development, smart city, sustainability showcase
Engineering Material	Stone, clay, rubble masonry	Concrete, steel	Concrete, spillways	High-tech materials, AI-integrated infrastructure
Length / Height	~620 m length, 4–14 m height (original)	2,335 m length, 185 m height	1,780 m length, 145 m height	170 km linear city, multi-layered vertical structures
Water Management System	Sluices, canals, irrigation networks	Spillways, turbines, locks	Spillways, turbines	Smart water and energy management
Governance / Maintenance	Collective stewardship, later neglect → collapse	State-led, continuous maintenance	Regional cooperation, ongoing monitoring	Planned centralized smart governance

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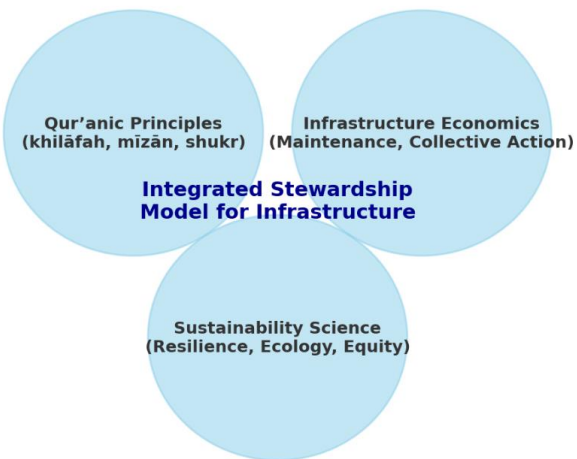
Sustainability	Dependent on maintenance; ecological impact not fully managed	Large-scale, significant ecological trade-offs	Limited ecological studies, potential downstream impact	Designed for net-zero, sustainability-focused
Collapse / Risk Factors	Collapse due to neglect, social/political factors	Structural stress, siltation, seismic risk	Political tensions, climate variability	Technological, economic, and environmental feasibility risks
Socio-Economic Impact	Triggered migration, agricultural disruption	Power generation, urban development, displacement	Regional energy security, potential displacement	Future urban economy, global attention, transformative vision
Moral / Ethical Lessons	Stewardship and neglect linked to societal consequences	Large-scale human intervention vs. environmental responsibility	Coordination among stakeholders critical	Integrated governance, sustainability, and social equity

Figure # 3: Conceptual Framework Linking



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Methodology

This study employs a qualitative and interdisciplinary methodology that integrates Qur'anic hermeneutics, historical-archaeological reconstruction, and comparative case study analysis. The Qur'anic account of the Maʿrib Dam (Sūrah Sabaʾ 34:15–19) is examined through close reading and classical exegesis (al-Ṭabarī, Ibn Kathīr, al-Qurṭubī), alongside modern commentaries, with thematic coding used to extract recurring motifs such as stewardship (*khilāfah*), gratitude (*shukr*), balance (*mīzān*), and accountability. These textual insights are contextualized through archaeological and historical research on the Maʿrib Dam's construction, expansion, and collapse, drawing on excavation reports, UNESCO documentation, and secondary scholarship to highlight the interplay of environmental pressures, governance fragility, and maintenance failures. To extend the analysis into the present, a comparative framework is applied to modern megaprojects, specifically the Three Gorges Dam in China, the Grand Ethiopian Renaissance Dam in Ethiopia, and Saudi Arabia's NEOM project, chosen for their geographic diversity, governance models, and relevance to debates on sustainability and resilience. Each case is analyzed across five dimensions—economic rationale, governance arrangements, ecological impacts, social consequences, and resilience strategies—using academic, policy, NGO, and media sources. Finally, a normative synthesis connects scripture, history, and contemporary practice by mapping Qur'anic principles of stewardship, balance, and accountability onto modern frameworks such as infrastructure economics, the UN Sustainable Development Goals, and the Sendai Framework for Disaster Risk Reduction. Ethical considerations underpin the approach: scriptural texts are treated with scholarly respect, modern cases are assessed with balance, and

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limitations are acknowledged, including subjectivity in interpretation, fragmentary archaeological evidence, and potential biases in modern reporting. Triangulation across textual, historical, and contemporary data strengthens validity and ensures a holistic perspective.

Findings

The study's comparative research demonstrates the direct links between the realities of today's megaprojects and the Qur'anic description of the Maʿrib Dam. Even while technology has improved and projects are now much larger in scope, the fundamental problems still exist. Questions of sustainability, governance, and ethical responsibility continue to shape whether such undertakings lead to lasting prosperity or repeat the vulnerabilities of the past.

Resilience Is Contingent on Stewardship and Maintenance

The Qur'an links the prosperity of the People of Sabaʾ directly to gratitude and responsible stewardship, offering a timeless warning that neglect invites decline. It reminds us of the divine message: "Grateful to your Lord, a forgiving Lord and a fair land, eat of the sustenance from Him." However, they disregarded us, so we brought the dam's water upon them (Qur'an 34:15–16). The poem portrays prosperity as something that needs to be actively maintained and not taken for granted, capturing both the blessing of plenty and the fallout from abandoning thankfulness and equilibrium. According to archaeological evidence, the Maʿrib Dam's continued existence over many centuries was dependent on routine maintenance, silt dredging, and methodical irrigation control (Schippmann, 2001). Its eventual collapse was the cumulative result of declining governance capacity and diminished collective upkeep (Bronson, 1988). Modern parallels reinforce this pattern. The Three Gorges Dam in China, despite its unprecedented engineering scale, faces persistent threats from sedimentation, seismic activity,

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and ecological stress (Wilmsen, 2016). These cases illustrate that resilience is never a one-time achievement but an ongoing process rooted in stewardship and adaptive maintenance.

Prosperity without Gratitude, Balance, and Ecological Awareness Is Unsustainable

The Qur'an emphasizes that material abundance is conditional upon gratitude (*shukr*) and adherence to balance (*mīzān*) (Qur'an 55:7–9; 34:15). When these values were neglected by the Sabaeans, flourishing orchards were replaced with barren fields of bitter fruits and thorns (Qur'an 34:16). Historically, while the Maʿrib Dam magnified prosperity by enabling irrigation and trade, that prosperity became fragile once complacency and neglect prevailed (Beeston, 1981). Contemporary megaprojects often echo this imbalance. Large dams promise economic growth but frequently displace communities, undermine food security, and destabilize ecosystems (Scudder, 2019). Saudi Arabia's NEOM project, despite being marketed as futuristic and sustainable, has been criticized for neglecting ecological and social realities (Krane, 2021). These examples reveal a recurring truth: prosperity detached from gratitude, justice, and ecological respect inevitably breeds instability and decline.

Governance and Collective Responsibility Shape Infrastructure Outcomes

The durability of infrastructure is closely tied to governance and collective responsibility. Qur'anic and historical accounts alike indicate that the Maʿrib Dam endured when the Sabaean polity was cohesive and maintenance responsibilities were upheld, but it declined when political fragmentation and weakened institutions eroded collective capacity (Schippmann, 2001). Modern cases reinforce this principle. The Grand Ethiopian Renaissance Dam (GERD) illustrates how governance disputes and the absence of cooperative management

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among riparian states exacerbate vulnerabilities (Cascão & Nicol, 2016). Similarly, Pakistan's recurring flood crises reveal governance shortcomings in land-use planning, preparedness, and accountability (Mustafa & Wrathall, 2011). The Qur'anic command: "Seek the Hereafter by what Allah has given you, yet remember your portion in the world. and do not pursue corruption in the nation" (Qur'an 28:77)—emphasizes the need of open, inclusive, and equitable governance in determining the results of infrastructure.

Infrastructure Embodies Moral as Well as Technical Dimensions

The Qur'anic description of the Maʿrib Dam serves as a reminder that infrastructure is always a moral endeavor as much as a matter of economics and science. According to Qur'an 34:16–17, its demise is shown as both a structural failure and a reckoning associated with conceit, ingratitude, and a lack of confidence. According to classical scholars such as Ibn Kathīr (2003) and al-Qurṭubī (2006), the disintegration of the dam was a manifestation of divine vengeance, signifying how moral decay may erode even the greatest accomplishments. These realities are reflected in contemporary undertakings. No matter how well-engineered they are, megaprojects that disregard equality, uproot communities, or damage ecosystems frequently face opposition, instability, or even collapse (Flyvbjerg, 2023). This calls into question the limited perspective that success can only be evaluated in terms of money or technical proficiency. Rather, it emphasizes the significance of moral standards—the values of justice, stewardship, and intergenerational accountability—without which infrastructure runs the danger of becoming brittle and transient.

Conclusion & Recommendations

A timeless lesson on the relationship between human ambition, government, and moral responsibility may be learned from the collapse of the Maʿrib Dam, which

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is mentioned in the Qur'an and is corroborated by historical and archeological data. This study shows that infrastructure—whether ancient or modern—cannot survive on technology alone. Its true strength lies in long-term care, fair governance, environmental balance, and moral responsibility. Projects such as the Grand Ethiopian Renaissance Dam, the Three Gorges Dam, and Saudi Arabia's NEOM illustrate this point. No matter how advanced or well-funded, infrastructure remains vulnerable if social, ethical, and environmental dimensions are ignored. When viewed only as symbols of power, modernity, or economic growth, these projects risk repeating the downfall of the Maʿrib Dam, which collapsed under the weight of neglect, arrogance, and poor stewardship.

For reimagining infrastructure in the twenty-first century, the Qur'anic principles of *khilāfah* (stewardship), *shukr* (gratitude), and *mīzān* (balance) provide a powerful guide. Building within ecological limits, governing transparently, sharing benefits fairly, and embedding resilience into long-term planning are not lofty ideals—they are essential requirements. These values enrich today's sustainability debates and align closely with global frameworks such as the UN Sustainable Development Goals and the Sendai Framework for Disaster Risk Reduction. From an academic perspective, this approach highlights how religious traditions can contribute fresh insights to discussions on resilience and infrastructure governance, bridging scripture with sustainability science.

The Maʿrib Dam, therefore, is not just a relic of the past. It reflects both the wisdom of responsibility and the dangers of arrogance. Its story reminds us that large-scale projects are more than technical feats; they are ethical tests. Guided by balance, gratitude, and stewardship, they can secure lasting prosperity. But when driven by pride, injustice, or short-term ambition, even the mightiest structures remain fragile. The lesson of Maʿrib is clear: wealth rooted in justice and

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accountability can endure for centuries, while material success without an ethical foundation quickly fades.

Based on these findings, this study offers six recommendations for future infrastructure planning and research:

1. Integrate spiritual and ethical frameworks into governance.
2. Embed sustainability into every stage of project planning.
3. Ensure fair distribution of benefits.
4. Strengthen community participation.
5. Prioritize long-term maintenance.
6. Foster collaboration between ethics, technology, and policy.

Beyond technical and economic metrics, governance frameworks should explicitly incorporate principles of stewardship (*khilāfah*), gratitude (*shukr*), and balance (*mīzān*) (Qur'an 34:15; 55:7–9), alongside global sustainability standards such as ESIAs, SDGs, and disaster risk reduction guidelines (Nasr, 1996; Flyvbjerg, 2023). Institutionalize participatory governance. Historical and modern cases show that governance breakdowns, more than engineering flaws, determine long-term outcomes (Bronson, 1988; Cascão & Nicol, 2016). Infrastructure planning should engage local communities, civil society, and regional stakeholders to ensure inclusivity and accountability. Commit to long-term maintenance. Neglect of upkeep remains a recurring weakness, from Maʿrib's eventual collapse to sedimentation in the Three Gorges Dam (Schippmann, 2001; Wilmsen, 2016).

Governments and funding agencies must embed sustainable maintenance budgets, transparent monitoring, and adaptive management into project lifecycles. Balance ambition with ecological limits. Megaprojects such as NEOM demonstrate the risks of pursuing symbolic scale at the expense of environmental stewardship (Krane, 2021; Scudder, 2019). Early-stage planning should integrate ecological

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carrying capacity assessments and enforceable safeguards against biodiversity loss, displacement, and irreversible ecological harm. Encourage interdisciplinary and cross-cultural research. This study highlights the value of linking Qur'anic insights with archaeology, history, and sustainability science. Future research should continue bridging sacred texts, cultural traditions, and contemporary policy, enriching understandings of resilience across civilizations (Nasr, 1996; Robin, 2012). Adopt resilience-oriented planning frameworks. In line with the Sendai Framework, infrastructure should be designed for resilience against environmental shocks, governance crises, and social disruptions. The Maʿrib experience shows that resilience is as much social and moral as it is technical (Mustafa & Wrathall, 2011; UNDRR, 2015).

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