BAHRAIN LAND RECLAMATION

Introduction

The Kingdom of Bahrain, a small archipelago situated in the Arabian Gulf, is composed of 50 natural islands and an additional 33 artificial islands, with Bahrain Island itself constituting the majority of its landmass, accounting for approximately 83%. The total land area of Bahrain has seen fluctuations over time due to extensive land reclamation projects, with the territory expanding to around 780 square kilometres. Its strategic geographical location places it between Qatar and the northeastern coast of Saudi Arabia, connected to the latter by the King Fahd Causeway.

Demographically, Bahrain boasts a diverse population of over 1.5 million individuals, according to recent estimates, with Bahraini nationals comprising a significant portion. The population density of Bahrain ranks among the highest globally, emphasizing the density of its urban settlements and the pressure on its resources. Ethnically, Bahrain reflects a rich tapestry of identities, with Shia Bahrainis and Sunni Bahrainis constituting the two main religious and ethnic groups, followed by Christians (14.1%), Hinduists (10.2%) and Buddhists (3.1%). The Shia community is further divided into Baharna and Ajam, while Sunni Bahrainis encompass Arabs and Huwala, with historical ties to both Iran and Arab nations. This diversity enriches the cultural fabric of Bahrain but also underscores underlying social dynamics and power structures within the nation.

Economic Landscape

Bahrain's economic landscape reflects a remarkable trajectory of growth and diversification, propelled by strategic initiatives and robust performance across various sectors. While traditionally reliant on the petroleum sector, Bahrain has embraced diversification efforts, with the non-oil sectors emerging as significant contributors to economic growth. The strategic focus on non-oil sectors has yielded tangible results, with the transportation and communications sector witnessing remarkable growth of 11.2%, propelled by increased air traffic and broadband subscriptions. Real estate activities and business services have also thrived, posting a growth of 5.3%, supported by robust real estate trading transactions. Notably, the sector's contribution to GDP surpassed the oil sector for the second consecutive time, reaching 17.9%, underscoring the transformative impact of diversification efforts.

Bahrain's positive economic performance has garnered international recognition, with significant advancements in global competitiveness rankings and logistical performance indices. The Kingdom's ascension in various global reports underscores its commitment to fostering a conducive business environment and nurturing innovation ecosystems. Amidst these achievements, Bahrain continues to navigate challenges such as food security vulnerabilities and the need for sustainable development. As the nation progresses towards its 'Vision 2030' goals, concerted efforts towards economic diversification, environmental sustainability, and social inclusion remain imperative to ensure inclusive growth and prosperity for all Bahraini citizens.

Contextualizing Land Reclamation

Bahrain has embarked on a remarkable journey of land reclamation, altering its geographical landscape and expanding its territorial boundaries. Driven by a combination of state investment and private sector interests, Bahrain's ambitious land reclamation projects have added approximately 90 square kilometres of artificial land since 1963, fundamentally transforming the nation's coastline and coastal ecosystems. Indeed, the original land mass of the Kingdom of Bahrain was increased from 667.88 km2 in 1963 to 759 km2 in 2007/08. The land mass was 711 km2 in 1998 which was a 7% increase, but it increased by 13.6% in the year 2009, to around 759 km2.

These initiatives have been done in the name of accommodating urban growth, fostering economic development, and meeting the evolving needs of Bahrain's population. However, they are not devoid of challenges. Indeed, the transformation of coastal areas into urban hubs raises concerns about environmental degradation, socio-economic impact and human rights violations, underscoring the importance of balancing economic imperatives with environmental sustainability. Moreover, state-driven investment has played a central role in these endeavours, with a focus on constructing private artificial islands to accommodate prime sea-front real estate, available for purchase by private investors. This has led to a situation where 90% of reclaimed land is in the hands of private investors, while only 10% is accessible to the public. Such disparities in land ownership raise questions about equity and social justice in Bahrain's development trajectory.

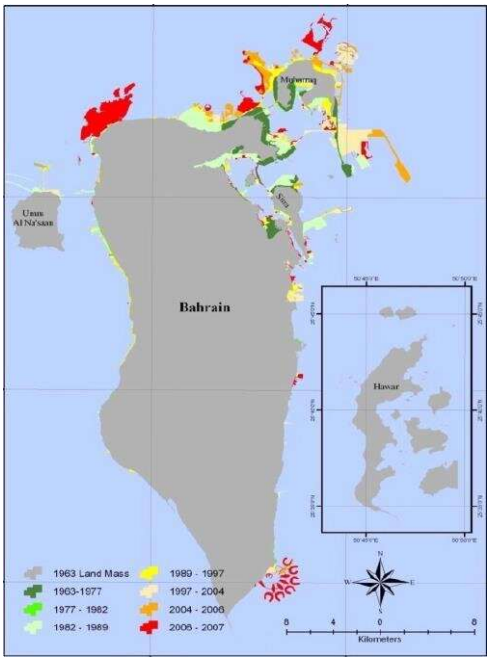
Table 1
The increase in the land mass and the annual rate of increase during (1963–2008).

Period	Added area (km^2)	Increase in the land mass (km^2)	Annual rate of increase (km^2/year)
1963–1977	13.14	667.88	0.94
1977–1982	1.46	681.02	0.29
1982–1989	20.10	682.48	2.87
1989–1997	8.60	702.58	1.07
1997–2004	15.68	711.18	2.24
2004–2006	10.12	726.86	5.06
2006–2007/08	21.99	736.98	21.99
Total	91.09	758.97	

Source: The cumulative impacts of reclamation and dredging on the marine ecology and land-use in the Kingdom of Bahrain.

The period from 1997 to 2007 has witnessed a higher rate (21 km2/year). This increase was attributed to the increasing demand for land. The main land-use of the reclaimed land has been for roads (23.2%), agriculture (21.4%), industrial areas (14%), parks and green areas (17%).

The origins of Bahrain's land reclamation efforts can be traced back to the early 1970s when projects such as the *North Sitra Industrial Area* and the development of *Mina Salman Port* emerged. The North Sitra Industrial Area, initially reclaimed in 1973 for the construction of the Sitra power station and desalination plant, involved dredging in the immediate vicinity to form a deeper underwater intake channel. Similarly, the development of Mina Salman Port was made possible through dredging associated with the deepening and realignment of the navigation channel, utilizing special quality material dredged from the seabed south of the Sitra jetties of Mina Sitra. Expanding further into the southeast, the Gulf Industries Investment Company (GIIC) and Arab Ship Building and Repair Yard (ASRY) reclaimed approximately 2-2 square kilometres of land southeast of Al-Hidd. The reclamation process involved forming retaining bunds with landfill to enclose the area, followed by hydraulic infilling with dredged material using caprock and limestone. The Gulf Petrochemical Industries Company (GPIC) contributed to Bahrain's land reclamation efforts with the creation of artificial islands known as the Al-Dar Islands - southeast of the capital- involving dredging two channels, one for cooling water and the other as an alternative to an existing fisherman's channel, with part of the dredged material used to form the islands.



Reclaimed sea land around the coastal areas of Bahrain during 1963–2007.

In recent years, Bahrain has witnessed a surge in residential, commercial, and tourism projects on reclaimed land, symbolizing the nation's aspirations for urban development. *Diyar al-Muharraq*, *Dilmunia Health Island*, *Amwaj Island,* and *Northern City* are prime examples. Specifically, Diyar al-Muharraq reclaimed land has increased from 13 square kilometres in 1951 to 56 square kilometres in 2008, fundamentally altering more than 80% of Bahrain's coastlines, serving as a residential and tourism development area. While Dilmunia Health Island, occupying an area of 1.25 square kilometres, caters to health and wellness tourism. Then Amwaj Island, covering 2.8 square kilometres, is a mixed-use tourism and residential project, while the Northern City, spread over 7.4 square kilometres, is allocated for government-funded housing projects.

Moreover, Tubli Bay which hosts the last remaining mangroves in Bahrain, has been reduced from to 25 to 12 km2 in 2008 due to intensive reclamation activities. These activities destroyed over 95% mangroves and reduced their spatial distribution to 0.31 km2.

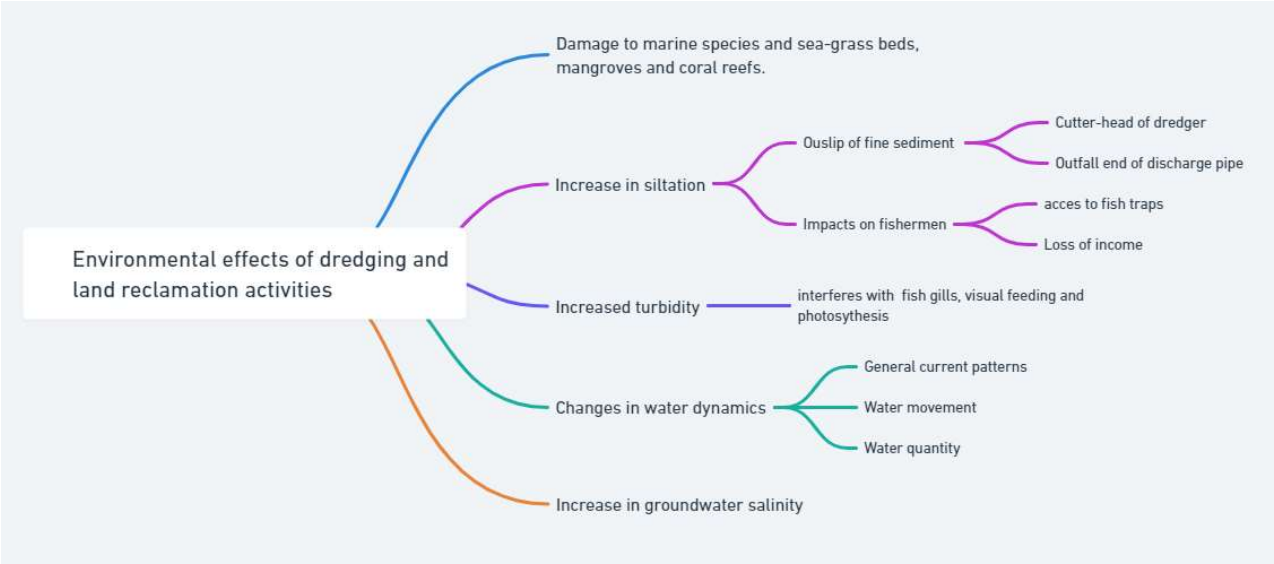
These images show changes across 35 years. The first image was captured by the Thematic Mapper on Landsat 5 on August 17, 1987. The second image, captured by the Operational Land Imager (OLI) on Landsat 8, shows the same area on August 17, 2022.

Environmental impact

Dredging and reclamation operations that are not under control or poorly managed have a recognized negative impact on marine environments all over the world. Bahrain's biosystem has suffered irreversible harm from dredging and land development, with many corals dying as a result. Given their age—some of the biggest corals are over a century old—it seems unlikely that they will ever be able to settle again on silted areas. Depending on how they are built, concrete jetties may change the water's natural flow and cause sedimentation in some places. The fishing industry in coastal and offshore areas is greatly threatened by the possible environmental effects of coastal activities which are now concentrated in a small region. These activities may also have a negative influence on the overall productivity and quality of the marine ecosystem. Sea-grass beds and coral reefs are the two most prolific and diversified parts of the sea that are currently being destroyed by dredging and reclamation in the shallow nearshore regions. Impacts are felt across much greater regions when siltation or changes in currents occur, not just the little areas that are actually dredged or reclaimed. It is probable that dredging and reclamation far from these reefs has increased water turbidity, which has contributed to the mortality of large sections of coral reefs beyond the northern shore. Shrimp and many fish species rely heavily on the vast sea-grass beds that run the length of the coast as nursery. Coastal fishing in the impacted areas will undoubtedly be impacted by the

destruction of these sea grass beds. Sea-grass beds, mixed rocks, and sand bottoms make up the majority of the shallow seabed in the Bahrain region. Sea-grass beds, by percentage cover, constitute the dominant soft and mobile habitat type within a 2–12 m subtidal zone spanning most of the east coast and certain sections of the west coast. This is particularly true in the region between Muharraq and Manama as well as along the Sitra coast, where significant development has taken place. Dredging and land reclamation operations have had a direct impact on large regions of shallow bottom and are anticipated to continue. Sea grasses have a special function in Bahrain's coastal regions. They are home to many adult fish species as well as the juvenile stages of economically significant penaeid shrimp. Additionally, they provide as a vital feeding place for dugong and turtles. Sand and mixed rock bottoms offer a plethora of different habitats. Numerous creatures find refuge in them, including a variety of fish including mamba, bream, and goatfish as well as shellfish like crabs. Reclamation efforts have significantly decreased the mangrove cover in the Tubli Bay region during the past 50 years. Furthermore, a significant portion of the decline came at the price of mangrove ecosystems. Since 1967, almost 95% of mangroves have been gone, translating to a 29709.6-ton carbon stock. This suggests that 109,034.23 potential CO2 emissions that might have been sequestered have instead been released. Bahrain's wetland coastal habitats depend on mangroves as vital parts of their ecological systems. In addition to providing co-benefits for mitigating climate change adaptation, promoting mangrove ecosystem-based adaptation assures the protection and management of mangrove biodiversity. In this sense, mangroves' ability to preserve biodiversity and strengthen the fight against the effects of climate change, particularly sea level rise, may be enhanced by afforestation and the restoration of degraded mangrove regions.

In addition to the above impacts, this action has led to an increase in groundwater salinity since it has mixed seawater with groundwater in the dredged regions. Groundwater was no longer appropriate for household or agricultural usage due to its increasing salinity. The water table is rising as a result of reclamation work that has isolated some of the coastal areas' naturally occurring drainage systems. The low-lying areas may flood as a result of this increase, destroying the vegetation.



Socio-economic impact

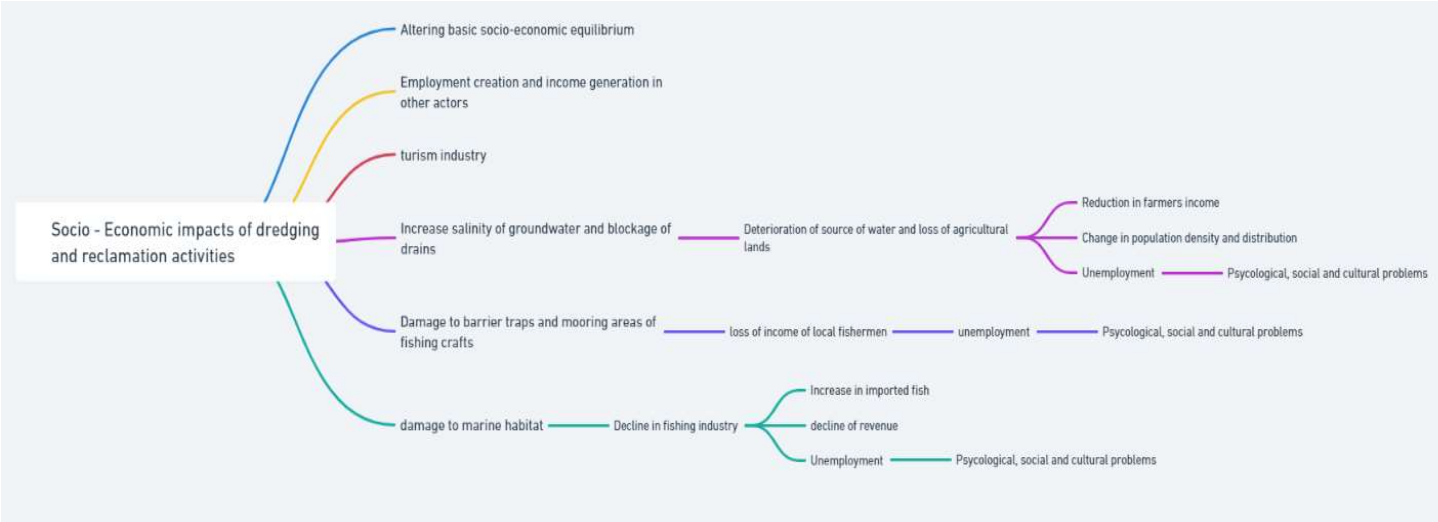
The main benefit from dredging and land reclamation is the increase in land available for housing, industrial, recreational and other purposes - gained at a very low monetary cost. However, there is no doubt that dredging and reclamation may damage the marine habitats such as coral reefs, seagrasses and sand-fiats which are the prime grounds for fish and shrimps. This decline due to habitat destruction has far-reaching implications for both the fishing industry and the wider economy. Local fishermen, who heavily rely on these resources for their livelihoods, have witnessed a notable decrease in their income, namely from 29.2% to 34.0% respectively in 1987 compared to 1986, leading to heightened financial insecurity and socio-economic distress. Moreover, the artisanal fishing sector, which forms a vital component of Bahrain's economy and cultural heritage, has experienced a steady decline in catch and revenue – in 1987 was 6-5% less in comparison to the 1986 catch- threatening the sustainability of traditional fishing practices.

The reliance on imported fish to compensate for the decline in indigenous production has strained Bahrain's balance of payments, exacerbated economic vulnerabilities and widening trade deficits. Indeed, fish imports in 1983 made up 39% of total fish consumption by weight, and it made up 24.6% of the total fish catch in 1987 (Directorate of Fisheries, 1988). As a result, Bahrain is importing more fish than it is exporting, and that this gap is widening, ultimately leading to a worsening of the balance of payments.

Furthermore, the adverse effects of dredging and reclamation on groundwater resources and agriculture have compounded these challenges. Rising water tables, intrusion of seawater, and

increasing salinity of agricultural soils have led to diminished agricultural productivity and a decline in indigenous food production. This not only jeopardizes food security but also necessitates increased reliance on food imports, further exacerbating economic pressures.

The tourism industry, which has been identified as a key driver of economic growth and diversification in Bahrain, has also been impacted by dredging and reclamation activities. While reclaimed areas have the potential to create attractive recreational spaces, the overall degradation of coastal ecosystems has rendered many beaches unsuitable for tourism. This threatens to undermine efforts to promote Bahrain as a tourist destination and diversify the economy beyond traditional sectors.



Domestic Tensions

The socio-economic impacts of dredging and land reclamation have exacerbated domestic tensions, particularly among affected communities and stakeholders. The collapse of fish stocks and the erosion of traditional fishing livelihoods have fuelled discontent and protests among fishermen, who view reclamation activities as a direct threat to their way of life. In early 2010, Bahraini fishermen announced a week-long strike to protest against further coastal reclamation plans, and in the same year they signed a petition, which was submitted to the authorities, calling for more stringent regulation of dredging and reclamation practices and for better protection of national fishing grounds.

Moreover, allegations of corruption and collusion between government officials and private developers have fuelled public outrage and eroded trust in institutions. The ambiguous allocation

and sale of reclaimed land at below-market rates have raised questions about accountability and fairness in land management practices. As protests swept across Bahrain in 2011, the issue of land reclamation emerged as a focal point of anti-government protests, following revelations by opposition leaders that the area of land reclaimed for the Bahrain Financial Harbour had been sold by the government to the Prime Minister for private development at a cost of just BD1 (equivalent to US$2.7). Demonstrators marched outside the Bahrain Financial Harbour, holding up one-dinar notes in symbolic protest about the perceived lack of transparency of such transactions. These grievances have been compounded by broader socio-political dynamics, with land reclamation emerging as a symbol of broader issues related to governance, transparency, and social justice.

The escalating tensions between Bahrain and Qatar over territorial disputes have further complicated the socio-economic landscape, particularly in the context of fisheries resources. Conflicts over maritime boundaries and territorial waters have led to confrontations between Bahraini fishermen and Qatari authorities. In May 2010, tensions between Bahrain and Qatar escalated dramatically when Qatari forces opened fire on seven Bahraini vessels that had inadvertently crossed into Qatari waters, resulting in the injury of a Bahraini sailor. This incident exacerbated existing diplomatic strains between the two nations. In response, ten days later, the Bahraini government took retaliatory action by imposing a ban on the Qatari-owned Al-Jazeera Satellite Channel from operating within Bahrain's territory. This decision was justified on the grounds of alleged violations of professional media norms and regulations governing press and publishing activities. These consecutive events underscored the deepening rift between Bahrain and Qatar, highlighting the precarious nature of their bilateral relations. During 2010 only, Qatar seized a total of 260 Bahraini vessels and arrested over 140 Bahrain-based fishermen. These incidents underscore the interconnectedness of regional geopolitics and local livelihoods, with disputes over natural resources exacerbating diplomatic tensions between neighbouring states.

The socio-economic impact of land reclamation in Bahrain is a complex and multifaceted issue that requires careful consideration of both its benefits and drawbacks. While dredging and reclamation projects offer the advantage of increased land availability for various purposes at a relatively low cost, they also entail significant environmental degradation and socio-economic disruptions. In light of these challenges, it is imperative for policymakers to adopt a sustainable approach to coastal development, balancing economic growth with environmental conservation and social equity. This requires greater transparency, accountability, and community engagement in decision-making processes, as well as efforts to address the socio-economic concerns of affected communities. By

prioritizing environmental sustainability, social justice, and inclusive development, Bahrain can navigate the complexities of land reclamation while safeguarding the well-being of its citizens and ecosystems. Moreover, the incidents between Bahrain and Qatar serve as a stark reminder of the interconnectedness of regional geopolitics and local livelihoods, highlighting the need for diplomatic dialogue and cooperation to address disputes over natural resources and promote peace and stability in the region.

Conclusion and Recommendations

In conclusion, the intricate landscape of Bahrain's land reclamation endeavours intertwines economic aspirations with environmental preservation, social equity, and regional diplomacy. While these projects have expanded Bahrain's urban landscape and diversified its economy, they have also catalysed environmental degradation, socio-economic disparities, and domestic tensions. Moving forward, the imperative lies in striking a delicate balance between development imperatives and sustainability goals, guided by principles of accountability, transparency, and democratic governance. By prioritizing human rights, environmental protection, and sustainable development, Bahrain can pursue a path towards resilient and equitable coastal management, fostering regional cooperation and stability while safeguarding the well-being of its citizens and ecosystems. Moreover, as Bahrain navigates the complexities of land reclamation, the need for diplomatic dialogue and collaboration with neighbouring states underscores the interconnectedness of regional geopolitics and local livelihoods, emphasizing the importance of fostering peace, cooperation, and prosperity in the Arabian Gulf region.

These recommendations offer a comprehensive approach to address the issues surrounding Bahrain Land Reclamation:

1. Enhancing Accountability and Transparency in Land Management

To establish an independent regulatory body tasked with overseeing land reclamation projects, ensuring compliance with environmental regulations, and promoting transparency in land allocation and sales processes.

To Implement mechanisms for public consultation and participation in decision-making processes related to land reclamation, including the development of comprehensive environmental impact assessments and socio-economic impact studies.

To enforce strict penalties for violations of environmental regulations and instances of corruption or collusion between government officials and private developers, with a focus on enhancing accountability and restoring public trust in institutions.

2. Promoting Democratic Governance and Community Engagement:

To foster dialogue and cooperation between government agencies, private developers, and affected communities to address grievances and concerns related to land reclamation projects.

To stablish community-driven initiatives to empower residents, particularly fishermen, in the decision-making process regarding coastal development projects that directly impact their livelihoods and well-being.

To ensure the inclusion of marginalized groups, such as migrant workers and vulnerable populations, in discussions around land use planning and development to promote social justice and equitable distribution of resources.

3. Prioritizing Human Rights and Environmental Sustainability:

To introduce legislation and policies that prioritize the protection of marine ecosystems, including coral reefs, sea-grass beds, and mangrove forests, through the implementation of conservation measures and habitat restoration projects.

To incorporate principles of sustainable development into land use planning and development strategies, with a focus on minimizing the ecological footprint of reclamation projects and promoting the conservation of natural resources for future generations.

To enhance monitoring and enforcement mechanisms to ensure compliance with environmental standards and mitigate the adverse impacts of dredging and reclamation activities on water quality, biodiversity, and coastal ecosystems.

4. Addressing Socio-economic Disparities and Vulnerabilities:

To implement targeted interventions to mitigate the socio-economic impacts of land reclamation on vulnerable communities, including support programs for affected fishermen, alternative livelihood opportunities, and compensation schemes for loss of traditional fishing grounds.

To strengthen food security measures and agricultural resilience to counteract the negative effects of rising water tables, groundwater salinity, and soil degradation caused by land reclamation activities.

To promote sustainable tourism practices that prioritize the preservation of coastal ecosystems and cultural heritage sites, while also fostering economic opportunities for local communities through ecotourism and community-based tourism initiatives.

5. Fostering Regional Cooperation and Diplomatic Dialogue:

To engage in diplomatic dialogue and cooperative agreements with neighbouring states, particularly in resolving maritime disputes and promoting sustainable management of shared fisheries resources in the Arabian Gulf region.

To strengthen regional partnerships and collaborative initiatives aimed at addressing common challenges related to coastal development, environmental conservation, and sustainable resource management, with a focus on promoting peace, stability, and prosperity in the Gulf region.

By implementing these policy recommendations, Bahrain can navigate the complex challenges associated with land reclamation while upholding principles of justice, accountability, and sustainability in coastal development.