

11-1-2023

The Emirates at 2050: Balancing Development and Environmental Stewardship

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Recommended Citation

Burt, John A.; Al-Mansoori, Noura; Bejarano, Ivonne; Brown, Gary; Campbell, Oscar; Els, Johannes; Feulner, Gary R.; Friis-Montoya, Guillermo; Henderson, Aaron; Howarth, Brigitte (Department of Culture and Tourism, Natural History Museum Abu Dhabi; , Abu Dhabi, United Arab Emirates, , Abu Dhabi, United Arab Emirates; John, David M.; Judas, Jacky; Mateos-Molina, Daniel; Mitchell, Matthew; Natoli, Ada; Paparella, Francesco; Yaghmour, Fadi (Hefaiyah Mountain Conservation Centre; and , Environment and Protected Areas Authority, Kalba, Sharjah, United Arab Emirates, , Environment and Protected Areas Authority, Kalba, Sharjah, United Arab Emirates, "The Emirates at 2050: Balancing Development and Environmental Stewardship" (2023). *All Works*. 6175.
<https://zuscholars.zu.ac.ae/works/6175>

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Chapter 24

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24.1 Introduction

The natural history of a region is shaped by the interplay between the forces of nature and the actions of humankind. Currently, the world finds itself in the Anthropocene, an era characterized by unprecedented human impacts on the environment (Steffen et al. 2011; Crutzen 2016). It is against this background that the United Arab

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J. A. Burt (ed.), *A Natural History of the Emirates*,
https://doi.org/10.1007/978-3-031-37397-8_24

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Emirates (UAE) faces the challenge of balancing its rapid economic development with environmental preservation and conservation of its natural assets (Sale et al. 2011; Jayaraman et al. 2015; Mateos-Molina et al. 2021).

Throughout its history, the people of the area now called the UAE have had an outward-looking perspective, engaging in trade from Mesopotamia to the Indus and East Africa, serving as a nexus for the exchange of goods, ideas and cultures across the region and beyond (Boivin and Fuller 2009; Morton 2016; Ryan et al. 2021). In the modern era, the UAE has embraced globalism, becoming a respected voice and valued player in the international order, seeking peace and prosperity through its domestic policies and international engagements (Korany et al. 2010; Maitner and Stewart-Ingersoll 2016; Ulrichsen 2016). In considering the future of the Emirates at 2050, it is presumed that those internationally focused efforts will continue to succeed. On the local stage, however, balancing economic development with environmental conservation will be an important challenge for the UAE as it navigates the complexities of the Anthropocene era.

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24.2 Our Natural Emirates: Valuable but Vulnerable

The UAE is characterized by a diverse range of geographical features and ecosystems, both terrestrial and marine. The country is home to vast expanses of arid desert, austere mountain terrain and a coastline that supports valuable lagoon and marine ecosystems, including mangrove forests, seagrass meadows, algal beds and coral reefs that support a rich and distinctive community of marine life (Hellyer and Aspinall 2005; Lamine et al. 2020; Mateos-Molina et al. 2021). In the terrestrial realm, the UAE's arid sand dunes, rugged mountains, fertile wadis, sabkhas and coastal sands are home to plant and animal species specially adapted to the harsh environmental conditions of the Emirates (Vine and Al-Abed 1996; Hellyer and Aspinall 2005). These habitats and their interrelated ecosystems are the cradle for the region's unique biodiversity, and they combine to offer a variety of ecosystem goods services that contribute to human well-being, as they have done for many millennia.

The unique ecosystems in the UAE are particularly vulnerable to disturbance because they exist in an environment that is already at the limits of physiological tolerance for most organisms. Extreme conditions, such as high temperatures, low rainfall and high evaporation rates, make the native flora and fauna susceptible to even slight alterations to their environment (Scherf et al. 2007; Soorae et al. 2013; El-Keblawy et al. 2015; Sakkir et al. 2015; Paparella et al. 2019; Friis and Burt 2020; Bouwmeester et al. 2021). Human-induced transformations, such as rapid urbanization, the degradation and fragmentation of habitats, groundwater extraction and modification of the coastline and coastal marine environments, pose significant threats to the delicate balance of the UAE's ecosystems (Tourenq and Launay 2008; Gardner and Howarth 2009; Tourenq et al. 2011; Burt 2014; Burt and Bartholomew 2019). Additionally, global climate change has the potential to exacerbate many of these issues (Shahin and Salem 2015; Lincoln et al. 2021; Melville-Rea et al. 2021). As the nation continues to grow and develop, it is essential to carefully consider and address the potential consequences of human activities on the natural environment of the Emirates in order to ensure the long-term health and welfare of its ecosystems and the diverse organisms they contain.

24.3 Challenges to the Natural Emirates

The United Arab Emirates has successfully promoted rapid economic development in recent decades, transforming itself into a prosperous modern nation (Nyarko 2010). However, rapid growth has brought with it a number of challenges, placing increasing pressure on its vulnerable ecosystems and its unique plant and animal life.

Population growth and extensive urbanization, both on land and into the seas, have led to extensive habitat loss and degradation. The expansion of cities and development of infrastructure, such as roads, power lines, pipelines and fences on land and dredged channels and industrial structures in the sea, has resulted in habitat

fragmentation and degradation, often creating barriers that disrupt the movement of species (Tourenq and Launay 2008; Gardner and Howarth 2009; Burt 2014). Overgrazing by camels and goats, and also by wild but management-supported animals within protected areas, has further contributed to widespread habitat degradation, leading to the decline of native plant species, the onset of desertification and the spread of invasive species (Böer 1998; Gallacher and Hill 2006a, b; Shahid 2017; Howari et al. 2022). One has only to look at the all too rare examples of genuinely protected desert to see the difference (e.g. El-Keblawy and Alsharhan 2003).

Water resources are another concern. The UAE is one of the most water-scarce countries in the world, and the extraction of groundwater, mainly for agricultural purposes, has led to the depletion and salinization of aquifers and the decline and sometimes the disappearance of unique freshwater ecosystems in mountain wadis (Freyhof et al. 2015, 2020; Shahin and Salem 2015; Liaqat et al. 2021; Sherif et al. 2021). Desalination, while providing a critical source of freshwater, creates its own set of environmental challenges, including the discharge of hypersaline brines back into the sea and large emissions of greenhouse gases to the air (Le Quesne et al. 2021; Paparella et al. 2022).

Global climate change poses a growing challenge to the UAE's environment. Rising temperatures, and the increasing frequency and severity of extreme weather events threaten to exacerbate existing environmental issues and overwhelm the ability of the country's ecosystems and natural resources to respond. We are already witnessing more frequent and severe regional marine heat waves than in the recorded history (Riegl et al. 2018; Beyraghdar Kashkooli et al. 2022), affecting more vulnerable ecosystems such as coral reefs across the Emirates (Burt et al. 2019) and accelerating the growth of a low-oxygen zone that threatens fisheries on the UAE's Gulf coast (Lachkar et al. 2022). Additionally, climate-driven sea level rise is likely to substantially impact the ecology of widespread low-lying coastal areas that harbor many of the UAE's most unique habitats (e.g. lagoons, sabkhas and mangrove forests) (Brown 2006; Elkabbany 2019; Melville-Rea et al. 2021). The precise impacts of climate change on the UAE's ecosystems and organisms are difficult to predict in detail (Paparella et al. 2019), as are its consequences for the human population, but are likely to include a decrease in water resources, fisheries resources and agricultural potential (due to a decrease in arable land and pollinating organisms), as well as risks for coastal real estate and infrastructure (e.g. power and desalination plants and ports) (Ajaj et al. 2019; Dougherty et al. 2019; Bolleter et al. 2021; Melville-Rea et al. 2021).

The combined effects of all of the foregoing challenges have already led to a decline in the biodiversity of the UAE, with many species categorized as critically endangered, endangered or vulnerable to extinction at the national scale (together representing 28% of assessed species; Allen et al. 2021). The loss of biodiversity has implications not only for the health and resilience of natural ecosystems in the coming decades, but also for the cultural heritage and identity of the nation, and the well-being of people who rely on these ecosystems for their livelihoods and quality of life (Tourenq et al. 2009; Mateos-Molina et al. 2020; Luomi 2022; Pittman et al. 2022).

24.4 Envisioning a Future in Greater Harmony with Nature

In order to address these challenges and chart a more environmentally aware course for the Emirates at 2050, a comprehensive approach is needed that integrates environmental considerations into all aspects of planning and decision-making. The following policy recommendations are proposed to help guide the UAE towards a future in greater harmony with the natural environment (Fig. 24.1):



Fig. 24.1 Environmental policy recommendations for a more sustainable future for the Emirates (Image credit: Oliver Farrel)

- Adopt a national strategy for sustainable development that aligns with international goals and commitments, such as the United Nations' Sustainable Development Goals (SDGs) and the Paris Agreement on climate change. This strategy should prioritize the conservation of ecosystems and nature in the Emirates, while also promoting sustainable economic growth, social equity and sound decision-making and implementation (Umar et al. 2020; Meyer and Warren 2021; Umar and Umeokafor 2022).
- Strengthen environmental policies and regulations to ensure the protection and preservation of the UAE's ecosystems and biodiversity. Potential measures could include the expansion of protected areas, establishing habitat restoration initiatives, bolstering monitoring and assessment of environmental initiatives, and intensifying the enforcement of environmental impact assessments (EIAs) for new infrastructure and development projects, which should be strengthened to incorporate social impacts and cumulative pressures (i.e. rather than single-project based) (O'Brien et al. 2007; Heaton and Burns 2014; Howarth et al. 2019).
- Invest in urban planning and design that minimizes resource use, habitat loss and fragmentation, and promotes arid-adapted green spaces, biodiversity and connectivity between ecosystems. This could include the creation of urban wildlife corridors, use of native plants in landscaping, and promotion of green infrastructure such as green roofs and walls where desert-adapted local vegetation could be integrated into built infrastructure to support a variety of socio-environmental benefits (ADUPC 2014; D'Souza 2014; Haggag et al. 2014; Alam et al. 2017; Mateos-Molina et al. 2020).
- Promote sustainable water management practices to address water scarcity and protect freshwater ecosystems. This could involve further enhancement of water-efficient technologies and practices, promotion of water recycling and reuse, and exploration of alternative, less environmentally impactful sources of freshwater, such as fog harvesting and atmospheric water generation (Murad 2010; Aleisa and Al-Zubari 2017; Cattani et al. 2023; Hassan et al. 2023).
- Encourage use of Nature Based Solutions (NBS) to effectively tackle societal problems while also providing benefits for both human well-being and biodiversity. NBS are actions that include protection, sustainable management, restoration, habitat creation, and nature-based enterprises such as ecotourism and agroecology. The objective is to offer numerous socio-economic and environmental benefits in an efficient and adaptable way, with the benefits serving as a pathway to a sustainable economy (Maes and Jacobs 2017; Cohen-Shacham et al., 2019; Seddon et al. 2021; Pittman et al. 2022).
- Address climate change through the development and implementation of a national climate change adaptation and mitigation plan. This plan should prioritize the protection of vulnerable ecosystems and species, as well as the reduction of greenhouse gas emissions through the promotion of renewable energy and energy efficiency measures (Sgouridis et al. 2016; Krarti and Dubey 2018; Al-Sarihi and Mason 2020).

- Foster environmental education and awareness to promote an appreciation for the natural world, and an understanding of humanity's role in it, to support a culture of conservation and stewardship among the UAE's citizens and residents. This could include the further integration of environmental topics into the national curriculum, the establishment of environmental outreach programs, and the encouragement of citizen science initiatives to engage the public in monitoring and conserving nature in the Emirates (Howari et al. 2019; Natoli et al. 2022).
- Support research and development in environmental sciences, with a focus on understanding and addressing the unique environmental and anthropogenic challenges faced by the UAE's ecosystems and biodiversity. This could include the establishment of rigorous research institutes supported by graduate training programs, and the provision of sustained, competitive funding for environmental research focused on national priorities (Sale et al. 2011; van Lavieren et al. 2011; Al Marzouqi et al. 2019).
- Foster inter-Emirate and regional cooperation on environmental issues, by sharing best practices, participating in joint conservation initiatives, and collaborating on trans-boundary environmental challenges such as climate change, marine pollution and migratory species (Aspinall 1996, 2001; Knight et al. 2011; Sale et al. 2011; Al-Saidi 2021).
- Encourage the private sector to adopt environmentally responsible business practices and invest in green technologies. This could involve the development of incentives, such as corporate tax breaks and grants, for companies that demonstrate a commitment to environmental conservation, as well as the establishment of corporate reporting requirements and standards related to their environmental initiatives (Al Naqbi et al. 2019; Al Yammahi et al. 2019; Samour et al. 2022a, b).
- Monitor and evaluate the progress of environmental policies and initiatives to assess their effectiveness and inform future decision-making. This could include the development of a comprehensive set of environmental indicators and the regular publication of an environmental performance report (Van Lavieren and Klaus 2013; Gulseven 2020; Gulseven and Ahmed 2022).

Many of these policy recommendations are already being implemented in the UAE to some degree, demonstrating the nation's commitment to sustainable development and environmental conservation. For example, the UAE Net Zero 2050 initiative focuses on transitioning to a knowledge-based, sustainable and innovative economy while preserving the environment (MOCCA 2021; Al Fahaam and Saleh 2023). It has also invested heavily in renewable energy projects, such as the Mohammed bin Rashid Al Maktoum Solar Park in Dubai and the Barakah Nuclear Energy Plant in Abu Dhabi, which aim to reduce greenhouse gas emissions and diversify the UAE's energy sources (Obaideen et al. 2021; Davidson 2022; Marketos et al. 2022). Such initiatives align with international commitments such as the United Nations' Sustainable Development Goals (SDGs) and the Paris Agreement on climate change, while also moving towards a more sustainable future for the Emirates. Mitigation of global climate change and a transition to renewables are necessary and laudable

strategies as the UAE matures towards the middle of the century, but many of the pressures and challenges facing terrestrial and marine ecosystems within the Emirates are occurring on rapid time scales, requiring a more urgent commitment towards nationally focused initiatives.

24.5 Conclusion

As the UAE looks ahead to 2050, it is important that the nation strikes a balance between its ambitious development goals and the need to preserve and protect its unique natural heritage by acting as stewards of the environment for subsequent generations. By adopting an approach to development that incorporates environmental conservation, the UAE can hope to ensure that its rapid growth and modernization do not come at the expense of its invaluable natural assets.

The policy recommendations outlined here provide a roadmap for the UAE to navigate the challenges of the Anthropocene era and build a more prosperous future for its people, enhancing both its environment and its place in the world. Successfully implementing these recommendations would bring numerous benefits, including improved quality of life for the UAE's citizens and residents. Moreover, preserving the nation's distinctive nature would help to attract the growing number of environmentally minded tourists, bringing additional economic benefits while fostering an appreciation for the UAE's dedication to environmental stewardship.

By embracing a vision of development that respects the natural environment and safeguards its plant and animal life, the UAE can demonstrate its commitment and set an example for other nations to follow, earning international recognition for its responsible approach to development. Achieving this vision will require the concerted efforts of policymakers, businesses, researchers and the public, all working together to ensure that the UAE's unique natural heritage is preserved for generations to come.

At 2050, the Emirates could be a shining example of responsible development, whereby the country's rich natural heritage is protected and celebrated, and where economic growth, environmental stewardship and social well-being are all equally valued and pursued. The successful implementation of the proposed policy recommendations will lay the foundation for a future in which the UAE's natural environment flourishes alongside its thriving economy, setting a standard for environmentally-conscious development that inspires the world.

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