Explosive Growth, Protected Areas and Conservation Abu Dhabi, United Arab Emirates (UAE)

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Abstract

Evidence is given on very rapid growth in the cities and suburbs of Abu Dhabi and Dubai as well as in hinterland areas of UAE. Some environmental and socioeconomic effects are discussed, notably high demand for space, water and energy in the desert environment as well as impacts on ecosystems of land and sea. Responses are illustrated on the basis of Abu Dhabi Emirates 2008 State of Environment report. Some emphasis is put on planning of protected areas and their uncertain evolution in future.

In about 50 years, Abu Dhabi, Dubai, and, to a less extent, Sharjah, Ajman, Um Al Quaim, Ras Al Khaimah, and Fujariah, the seven Emirates of UAE, have mushroomed from isolated desert tribal subsistence economies to increasingly developed nations states (Figure 1 and 2). All seven states have a rapid growth trajectory but in Abu Dhabi and Dubai, growth can truly be described as explosive (Table 1). Oil development in the 1960s and 1970s transformed the Shaikhdoms of the southern Persian Gulf into a seven state federal government system, headquartered in the city and Emirate of Abu Dhabi.

The new nation was created in 1972 after the departure of the British who had held oversight of the southern Gulf coast tribes since the early 19th century. The new nation inherited a burgeoning oil industry and rapidly rising revenue. In ensuing years this was largely spent on urban development, housing, highways and other infrastructure, irrigation, afforestation and land reclamation, agriculture, education and other pillars of a modern nation (Figure3).

Among the prime development motives was the desire of the Shaikhs, the rulers of the seven Emirates, to improve the lives of the people. Projects like planting of forests, greening of the desert, and the expansion of irrigated agriculture in the southern oases of Al Ain and Liwa were intended to change the ancient date farmers and nomadic Bedouin herders into prosperous producers of crops and livestock of value to them as well as the global export market (Figure 4). Such projects involved the spread and drilling of deep wells to increase substantially the flow of predominantly fossil groundwater that had been the support of the oases for centuries.

Without substantial increases in water supply, greater agriculture production would have been virtually impossible in an exceedingly arid desert where no rain may fall for many years (Government of Abu Dhabi: Environment Agency 2005c). Some of the implications of this development were likely unforeseen, for example the increase in water supply made it possible to concentrate animal production in smaller areas, causing overgrazing and leading to the import of supplementary feed.

Oil profits were used, especially by the Al Nahyan family, rulers of Abu Dhabi, the source of 80% of the UAE oil reserves, to benefit the entire UAE. The greatest investments and most intensive and accelerated developments have been in the city of Abu Dhabi and its neighbor, Dubai, home of about 10% of UAE oil reserves. Historically Dubai is a merchant settlement, trading in fish, pearls, shells and other goods with India and Africa for centuries.

Air photos and satellite images of the 1950s and 1970s have been compared to more recent ones by local military staff, to show the growth and spread of the cities of Abu Dhabi and Dubai (Al Hameli and Alshehhi, 2004). A 1951 air photo shows some buildings and houses scattered over approximately one square kilometer on the north shore of Abu Dhabi island. At that time the island was separated from the mainland by a shallow ford now replaced by a multilane highway and arc bridge.

Oil exploration began in the 1950s and 1960s, with docks, warehouses, housing and other facilities consuming much land. By 1973 the built up area shown on the satellite images was about 15 square kilometers. Oil production soared and by 1984 the built up area was estimated at 83 square kilometers. In the 1980s and 1990s expansion averaged about 10% annually. The built up area reached 160 square kilometers by 1995 and 260 square kilometers by 2003 (Al Hameli and Alshehhi, 2004). Abu Dhabi city's population today is about 700 thousand and may double in the next 10 years, heralding much greater expansion if present policies and procedures continue (Figures 5 and 6).

The growth of Dubai is considered by local observers to have been even more rapid than that of Abu Dhabi. In the late 1950s Dubai was a small settlement of mud-brick buildings, palm frond huts and warehouses at the junction of Dubai Creek and the waters of the Gulf (Al Hameli and Alshehhi, 2004). By 1973 the built up area was about 13 square kilometers jumping to 82 square kilometers in 1984, 128 in 1995 and 240 in 2003. These estimates do not include other manifestations of growth including Jebel Ali free industrial zone on the highway west to Abu Dhabi, the suburban developments north and east toward the Emirates road, and the long strip of increasingly high skyscrapers along the Shaikh Zayed road through the centre of the city.

The information on Abu Dhabi and Dubai tells only part of the story. The city of Sharjah, north of Dubai, has grown at a comparable but smaller scale. Other settlements such as Ras Al Khaimah are expanding along the coast and radiating inland across the Hajar Mountains to Fujairah, the growing port and tourism hot spot on the eastern or Oman coast as well as north into the rugged Musandam peninsula (Figure 7). Between all these expanding urban areas numerous roads were constructed where only camel paths were found in the 1960s and 1970s. Add to this the growing

airports, oil fields, pipelines, offshore drilling and infilling, rural housing, and numerous coastal tourism projects and the result is a fragmented and pulsating landscape on land and sea.

The governments of Abu Dhabi; Dubai and the UAE sense the intensity, extent and pace of development and its impacts on environments and landscapes. But they remain committed to increasing oil production and overall growth, being strongly pushed in that direction by other countries and their rising demand for oil. Local interest is growing, nevertheless, in programs to cushion or prevent environmental damage and restore past losses. The responses of the Emirate of Abu Dhabi are close to the forefront and can be used as an example.

The Abu Dhabi coast is rich in islands, inlets, mudflats, sea grass beds, mangroves and reefs. Near Abu Dhabi City much dredging, infilling and coastal straightening has been carried out. Storage depots and working camps have been placed on the islands which also serve as sources of rock and sand. Numerous navigation channels have been cut and many of these are used regularly by ships of all sizes. In addition to oil operations, fishing is a historic and growing activity in these islands, with abandoned nets and traps causing accidental catches of fish and marine mammals. Inland, oil exploration, roads and settlements, have led to similar disturbing effects. Oil profits have been invested in increased irrigation farming, for example in the ancient Liwa oasis as well as in an afforestation projects in numerous places (Figure 8).

These operations have had major effects on air quality, water quality and quantity, soil salinization, mangrove, and wildlife habitat. Some of these impacts were underway before oil came on the scene and were sufficiently long continued and intense to cause big losses; for example hunting depleted leopard, gazelle, oryx, and thar, especially when the arrival of the auto in the 1920s and 1930s made it possible to run down and kill hundreds of gazelle in a single hunt. Previously these elusive animals were hard to catch on foot or by horse or camel (Figure 9).

The Abu Dhabi government recently established an Environment Agency to replace an earlier Research and Wildlife Branch which had little operational authority (Government of Abu Dhabi, 2002). One of the new Agency's first actions was to develop an Abu Dhabi State of the Environment Report (SOE). The 2007 report can be used to map out the issues and some of the conservation measures required, including protected areas (Government of Abu Dhabi: Environment Agency, 2007).

The Abu Dhabi SOE gives information on, among other things, air quality, climate change, ozone depletion, marine and terrestrial habitats, birds, cultural heritage, land use, waste and water. Some of these issues are greater interest to us than others.

Climate change is recognized as a significant threat, potentially bringing more intense winds and weather, summer heat episodes, higher coastal water temperatures and sea levels. Abu Dhabi and the UAE are among the global leaders in per capita production of CO2, mainly stemming from oil development, transport and power production, notably to desalinize sea water. The SOE acknowledges that the UAE has signed the Kyoto protocol to cut gas emissions but also notes that as a non – Annex I country, the UAE is not obliged to reduce emissions. Some measures are being taken to do so, for example a transition to use of natural gas in power and desalinization plants. Flaring gas from oil production has been cut from 7.5 to 2.5 million cubic feet per day (Government of Abu Dhabi: Environment Agency, 2007).

The SOE recognizes the substantial challenges posed by waste and high water use, with Abu Dhabi and the UAE among the global leaders in per capita water consumption. Water is currently derived from underground sources, desalinization and non – potable waste water. Accelerated technical, economic and population growth has resulted in continuing drawdown of groundwater.

Supply is largely inherited from past accumulation in pluvial and historic times. It is fossil water that can only be replaced naturally at an estimated 3 – 4% annually. Much growth and development has been based on desalinization of sea water and recycling of sewage. Both these sources use considerable energy, with desalinization plants estimated to consume about 20% of energy production in Abu Dhabi by year 2030. The SOE states that this arises from an overwhelming emphasis on increasing supply rather than controlling demand for water (Government of Abu Dhabi: Environment Agency, 2007).

Existing modes of meeting water demand pose threats to wildlife species and habitats. The desalinization plants produce heated saline waste water, salt and chemical residues. Disposal of this waste pollutes both lands and waters, notably near the processing plants. Resulting pressures on fish, birds and other wild life are heightened by the high natural temperatures of the sea which can exceed 34 oC in a hot dry summer. Other historic and more recent pressures on wildlife include over hunting, loss of habitats to various land uses, fragmentation of habitats by roads and other infrastructure as well as various air and water pollution.

Some of the stresses began centuries ago (Hellyer and Aspinall, 2005). Leopard, wolf and other predators have long been targets of herders. The Arabian leopard has been considered extinct in the Emirates for years. The Arabian ostrich may have been around until the 1940s but it is now extinct due to sport hunting. The Arabian oryx, sand and mountain gazelle and thar have been hunted since ancient times by local people primarily for subsistence. But these animals are quick and elusive, remaining numerous until the advent of modern high powered weapons and more automobiles in 1930s and 1940s. Wilfred Thesiger saw oryx fairly frequently on his second journey across the Sands of the Empty Quarter in 1947 (Thesiger, 1994). Pressure on birds such as the Houbara or bustard also increased. Local people have hunted these birds with falcons for centuries, especially during their spring migration to breeding grounds in Syria and central Asia. The decimation of such species has led to restoration programs, notably for the oryx and Houbara.

The Houbara has been a principal target of traditional hunting with hawk and falcon. For centuries the peregrine and Saker falcon have been tamed and used to hunt hare, birds and gazelle. The bustard was a preferred target, especially during spring migration, with its number reduced to a low level by the 1990s. The Abu Dhabi Avian Centre has worked with counterparts in breeding areas to restore the bird, with considerable success. The Saker, is itself threatened, largely because it is a preferred falcon for sports hunting by the elites (Figure 10). Around 1300 captive Saker falcons are said to be kept in the UAE as a whole, 90% wild-caught. The Houbara is globally vulnerable and the Saker endangered, because of the taking of female nestlings for falconry (Government of Abu Dhabi: Environment Agency 2007).

Local people have fished Gulf waters for thousands of years, catching pelagic and demersal fish and hunting marine mammals such as the dugong and sea turtles (Potts, 2003). The dugong is an animal of concern but recent surveys in the waters around the Marawah Marine Protected Area, north and west of Abu Dhabi city, yielded surprisingly high numbers (Government of Abu Dhabi: Environment Agency, 2007). The sea turtles are another matter. The green turtle is a big concern and the Hawksbill turtle is endangered. Hunting of adults and collection of eggs from the depositories on beaches are major causes, although accidental catches in fish nets, collisions with boats and loss of habitat all contribute to the toll.

Various measures have been taken to counteract the pressures on wildlife and habitat, including an official national prohibition on hunting in the UAE. Another major measure is the creation of protected areas. Two presently exist offshore: The 4400 square kilometer Marawah Marine Protected Area and the small Al Yasat Marine Protected Area near the Qatar border (Figure 11). Two additional marine protected area are planned in the coastal waters east of Abu Dhabi

(Government of Abu Dhabi: Environment Agency, 2005a).

The protected areas of Abu Dhabi and other Emirates are mandated by a clause in the 1999 federal law (24) on Protection and Development of the Environment (Government of Abu Dhabi: Environment Agency, 2005b). The Environment Agency of Abu Dhabi is responsible for planning and management of protected areas whose aims are conservation, research and monitoring, education and interpretation. The protected areas are intended for the economic, social and environmental benefit of the people of Abu Dhabi.

Currently only one general type of protected area has been established in Abu Dhabi. It is a multifaceted tool which focuses on zoning, permits, licensing and regulations to balance land use with conservation. The protected area system does not yet provide for the creation of different types of parks and wildlife reserves which vary in accordance with the type of management needed to conserve the resources for which the reserve was created.

The Abu Dhabi protected areas are overseen from headquarters in the city. Rangers and field stations are or will be in place on present and planned protected areas. Monitoring of activities and effects by rangers and scientists are underway and expected to continue in future. Since the marine protected areas can include fishing, oil development, shipping, residential and other activities, the need for an integrated inter-organizational approach to planning and management is high. Numerous government agencies and private stakeholders will be affected and should be involved in decision making.

Only one small mainland protected area has been created. The Wathby is actually a result of an accident. A small desert lake was created by a flood which included domestic waste water. The decision was made to maintain the lake by supplying it with recycled non – potable water. The Wathby protected area is an important breeding and staging site for migratory birds.

A policy has been put forward to commit 12% of Abu Dhabi Emirate to protected areas. To help meet this objective a large approximately 11000 square kilometer protected area is proposed for Umm Al Zamoul, a desert region in southern Abu Dhabi. This is intended to protected hare, rodents, lizards and other desert wildlife as well as the gazelle and oryx which are to be reintroduced into the Umm Al Zamoul.

Attempts to restore oryx have been made in neighboring Saudi Arabia but without sustained success. The future of the Saudi oryx restoration program is in serious question since the government cut its protected area size by 90% in order to facilitate oil exploration and development. The result was a UNESCO revocation of its World Heritage Site status. Hopefully the UAE Umm Al Zamoul project will involve greater commitment and be successful in restoring the oryx. To do so the Environment Agency will have to secure cooperation from oil companies, herders, irrigation farmers and other stakeholders.

A second example is the 4400 square kilometer Marawah Marine Protected Area (MMPA) (Government of Abu Dhabi: Environment Agency, n.d). This includes many islands and coastline about 120 kilometers long. The Marawah contains regionally and nationally significant habitats such as the sea grass beds, coral reefs, and mangroves. This protected area is globally significant as a shelter and feeding ground for dugongs. The Marawah also offers foraging habitat for green and Hawksbill turtles, nesting sites for many bird species and critical nursery and spawning grounds for numerous fish threatened by historic and current heavy fishing.

A Management Plan has been developed to conserve the valuable natural resources of the Marawah Marine Protected Area (MMPA). The Plan policy is to link the various measures needed

for protection together by coordinating government and private stakeholders in “an integrated management exercise”. This is seen as an evolving process requiring cooperation by many disparate organizations and affected individuals.

The planners divide the MMPA into three main systems:

- The mainland coast
- The sub-littoral
- The islands

The mainland coast of MMPA is made up of an unfolding array of sandy beaches, rocky headlands and shallow waters interspersed with human settlements. The sub-littoral consists of predominantly shallow sea around the Marawah islands. The sea contains extensive sea grass beds offering shelter and forage for sea turtles, dugongs and at least three dolphin species. The islands exceed 20 in number, some still relatively undisturbed, providing nesting sites for ospreys, sooty falcons, the Socotra cormorant, and hawksbill turtles. Many of these islands also are the site of bronze age settlements dating about 2000 BC so a combined natural and cultural protection program is desirable.

The Management Plan identifies threats which need to be addressed by managers and stakeholders. A leading one is the very high temperatures and salinity of the waters, putting many of the living organisms close to their thresholds for survival.

Other threats include rapid development, unregulated industrial projects, construction too near the water and much discarded solid waste. Such waste brings risk to coral communities and sea grass beds. Camps on beaches and islands often disturb nesting birds and turtles. Recreational fishermen use illegal practices such as spear fishing and shell collecting.

Some of the foregoing activities can interfere with traditional fisher folk. They, in turn, pose threats through accidental or ghost catches by discarded gear. Carelessness can damage coral, for example by boat anchors and drag nets.

Oil spills are consider a threat, although the probability of their occurrence is thought to be slight according to the Management Plan. On the other hand, one spill could cause extensive and long lasting damage in the protected area, for example to mangroves, sea grasses, dugongs, turtles and sea bird populations.

To counter these threats the MMPA is divided into core, buffer and transition zones. This corresponds to the UNESCO Biosphere Reserve system, the international designation recently awarded to the MMPA. Appendix I outlines the zoning categories, compatible uses and restrictions developed in a Management Plan. Figure 12 maps the zones in the MMPA. The core zone occupies several small separate parts of the protected area, including islands, sea grass beds, reefs and other habitats. No core zones are located along the mainland coast of MMPA.

To the outside observer the success of the protected area program in Abu Dhabi, and perhaps in the Emirates, seems uncertain. Pressures for development are enormous with the efforts in Abu Dhabi representing an important initial step toward more effective nature conservation and sustainable development. In Dubai the focus on development is exceedingly high and includes island construction and real-estate ptojects development in offshore waters. Less is known about protected area and conservation programs in other Emirates such as Sharjah, Ajman, Um Al Quaim, Ras Al Khaimah and Fujairah. Tours of the coast as well as inland deserts and mountains in different parts of UAE show a commitment to wide ranging construction and development with

little sign of protected areas or other significant conservation programs.

Real estate developers have discovered the relatively wild and beautiful Fujairah coast. Condominiums are springing up in the south and north toward the remote Musandam peninsula, an irregular fiorded mountain mass, originated from the spectacular overthrust of ancient oceanic rocks onto the continental platform millions of years ago. Thar and other rare animals are thought to persist in these rugged ranges. Roads are few and far between, but expanding, with more boat tours carrying visitors into the area. The Musandam has long been inhabited by a small population of herders, small farmers and fishermen, some of whom live in unique subterranean stone houses amid historic irrigation channels and numerous archeological sites.

The wild and majestic scenery and the natural and human history and settlement of the Musandam deserve careful study for conservation, especially in the face of rising tourism. Such an effort would have to be undertaken collaboratively with Oman, which owns most of these mountains. The future of conservation in the UAE rests on the support of the rulers. They are in a position to review the thrust of past development and take a more sustainable path in the future. Yet much responsibility also lies in other hands, including all those in overseas markets who push for ever greater oil production.

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Appendix I

Illustrations

Appendix I
Zone Objectives, Uses and Rest

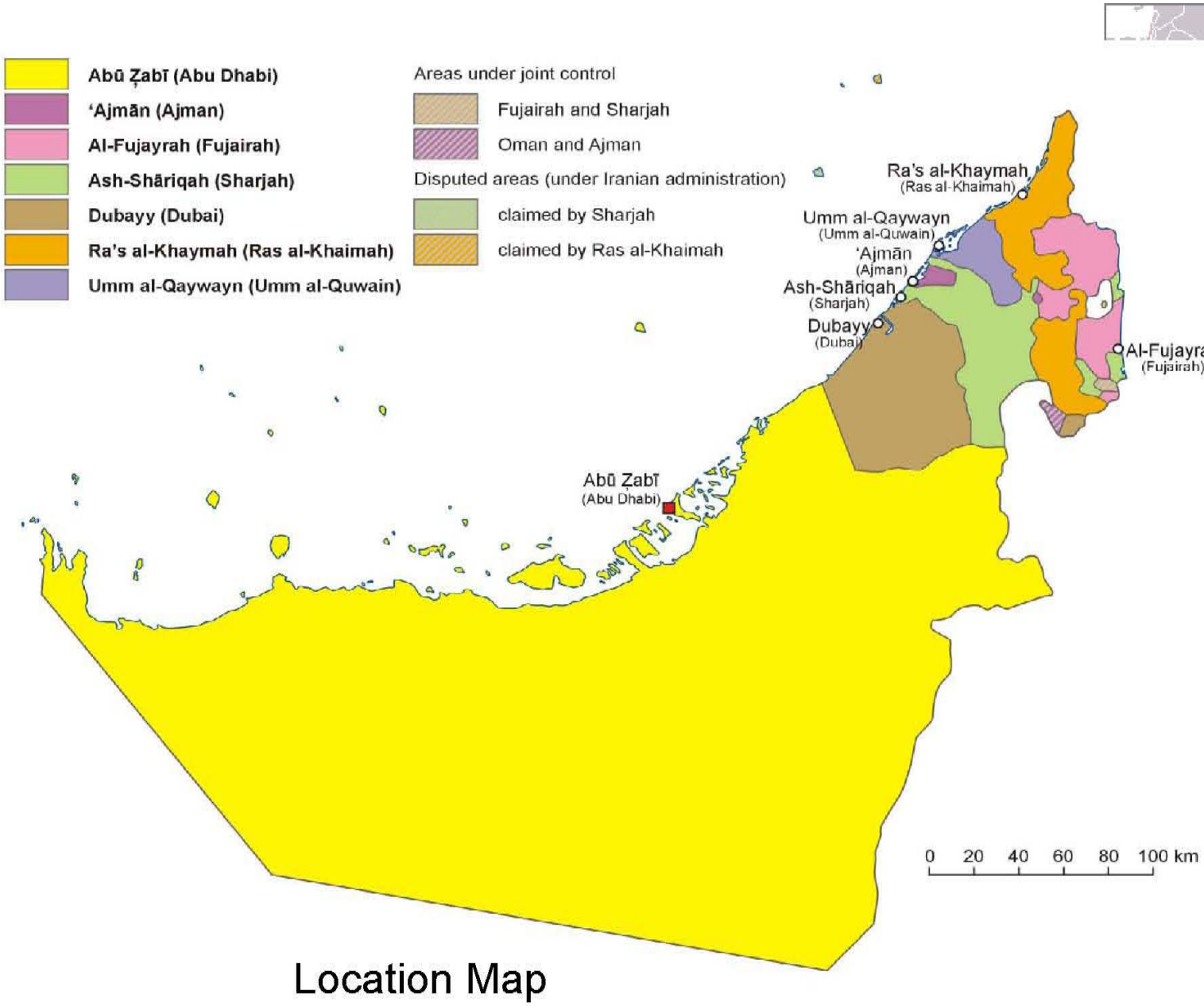
Zone Objectives, Uses and Restrictions

Zone	*Compatible Use*	*Restrictions*
Core Zones (Strictly Protected no-take Zones - see map)	▪ Routine patrol and periodic inspection by MMPA staff ▪ Non- manipulative, non extractive research	▪ Access for any purpose ot permitted research activiti ▪ Researchers must obtain v consent and comply with t *of-conduct for research in MMPA*. All research projec be accompanied by MMPA ▪ Operation of motorized ve speed more than 10 km/h ▪ Anchoring ▪ Building of piers, groins, breakwaters or any other

		▪ Digging of channel ▪ Fishing for comme recreational purpo ▪ Littering ▪ All other activities MMPA
Buffer Zone (Restricted Use Zone - see map)	▪ Traditional activities by residents and fishermen with historical tenure rights ▪ Routine patrol by MMPA staff ▪ Fishermen with tenure rights to fish in this zone may use *Al Ghazl,* and *Al hadhra* that have traditionally been in place and line fishing only	▪ Access without pe ▪ Disturbance of nes birds ▪ Unearthing of nest eggs ▪ Damage, alteratio all marine product ▪ Operation of moto speed more than 4 ▪ Off-road driving or

		coastal zone ▪ Building residences o structures within the or without permit ▪ Uprooting or cutting ▪ Use of fishing nets or ▪ Other activities gene in MMPA
Transition Zone (Controlled Access Zone - see map)	▪ Fishing by fishermen who are residents of Mirfa and adjacent coastal areas and those who have fishing tenure rights inside the MPA using fishing lines and legal fishing nets. ▪ Recreational activities including	▪ Fishing of any kind e Ageny's permits ▪ Littering ▪ Speeding in excess o ▪ Disturbance of living ▪ Damage, alteration o habitats

	scuba diving, and snorkeling in specified areas ▪ Boating at specified speed limits ▪ Research activities including manipulative research ▪ Awareness and Education activities ▪ Anchoring at specific locations including at sites of mooring buoys ▪ Loading of the produced oil from Mubbarraze oil field, outside the declared boundaries of the MMPA	▪ Carry out develop without EIA permi ▪ Carry out oil explo production activiti permit



Location Map

Figure 1

Source: http://upload.wikimedia.org/wikipedia/commons/7/73/UAE_en-map.png

Dubai 1990 - 2003

Figure 2

Source: http://digg.com/odd_stuff/Dubai_1990_2003_pic

City Population

Table 1

Ministry Of Economy, United Arab Emirates

Figure 3

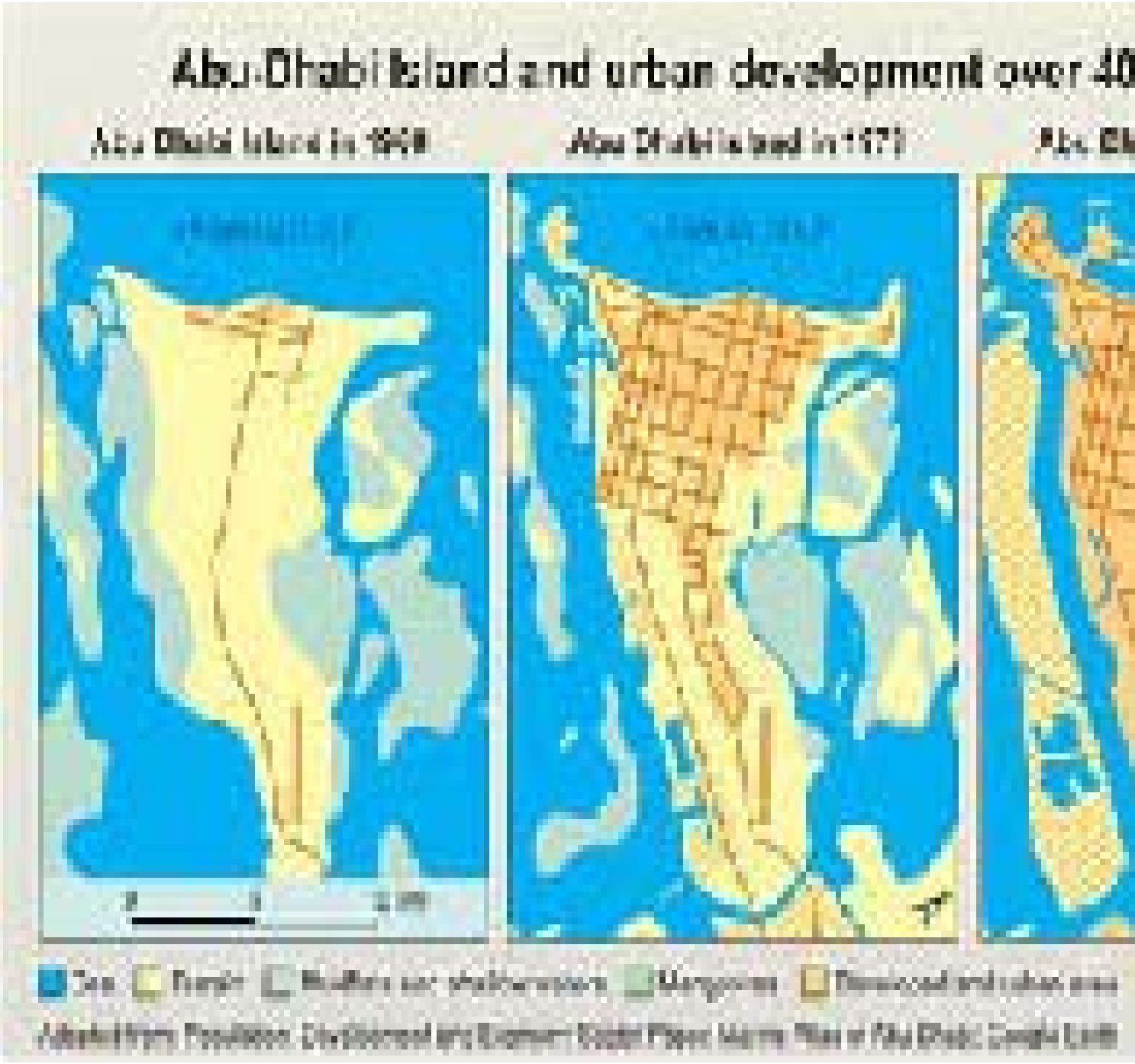
Sheik ZayedRoad, Dubai

c2005

Source:

http://k53.pbase.com/u40/bmcmorrow/upload/26158644.aerials393.JPG


Forests and farmlands in Abu Dhabi Emirate
QATAR
ABU DHABI
DUBAI
SAUDI ARABIA
Abu Dhabi Emirate



Abu Dhabi

Downtown

Shoreline

Figure 6

http://www.uae.gov.ae/images/abu1.jpg

KhorNajdand

HajerMountains near

RasAl Khaima

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http://www.photoway.com/images/emirats-arabes-unis/EAU04_411-oasis-liwa.jpg

Figure 9: Sand gazelle, thar, Arabian wolf and oryx

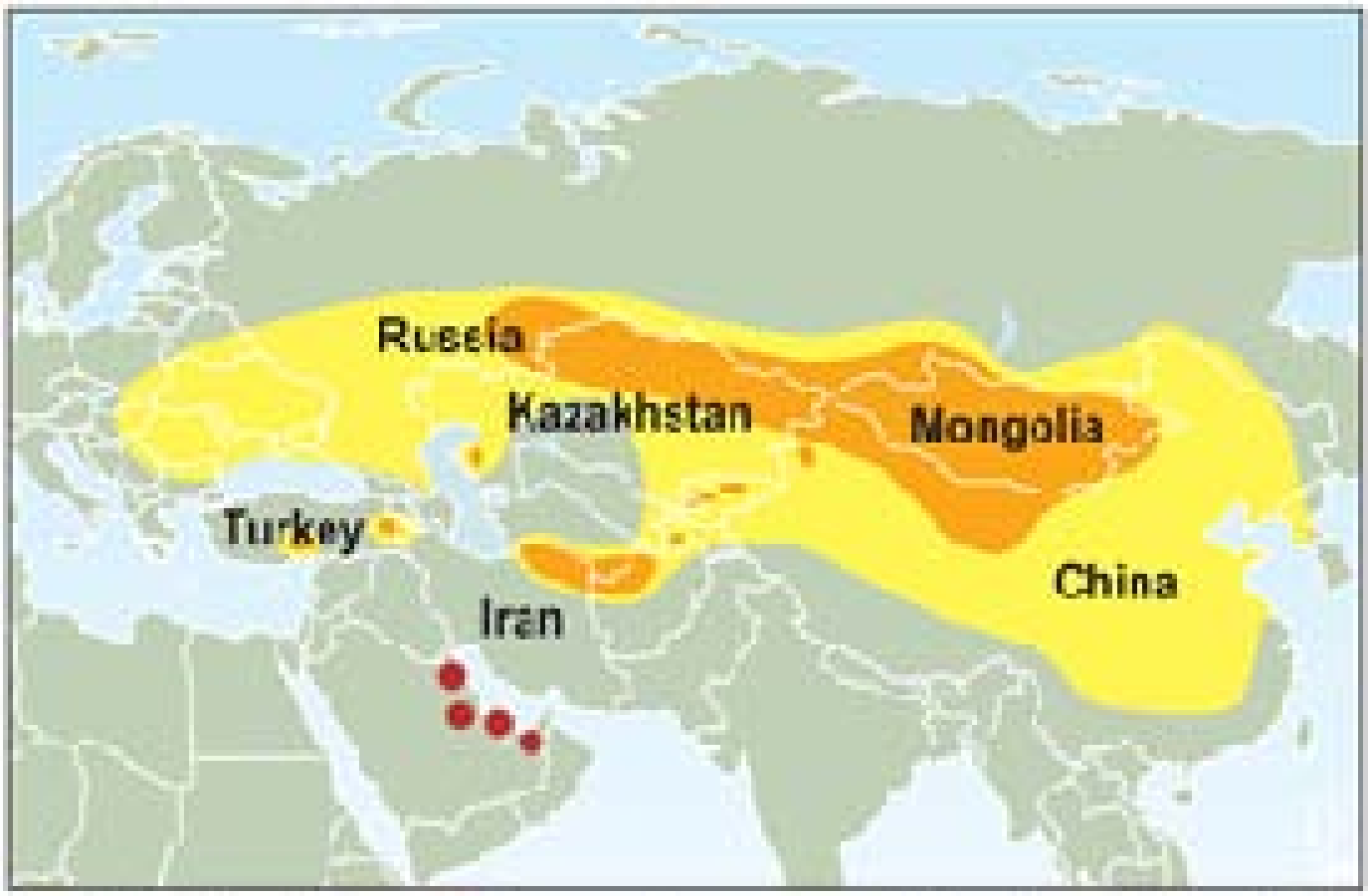
http://www.uaeinteract.com/docs/Regional_strategy_to_conserve_Arabian_Oryx/26555.htm

F i g u r e

Source: Abu Dhabi State of the Environment

Distribution of the Saker falcon

Falco cherrug



Source: Abu Dhabi Falcon Research Institute

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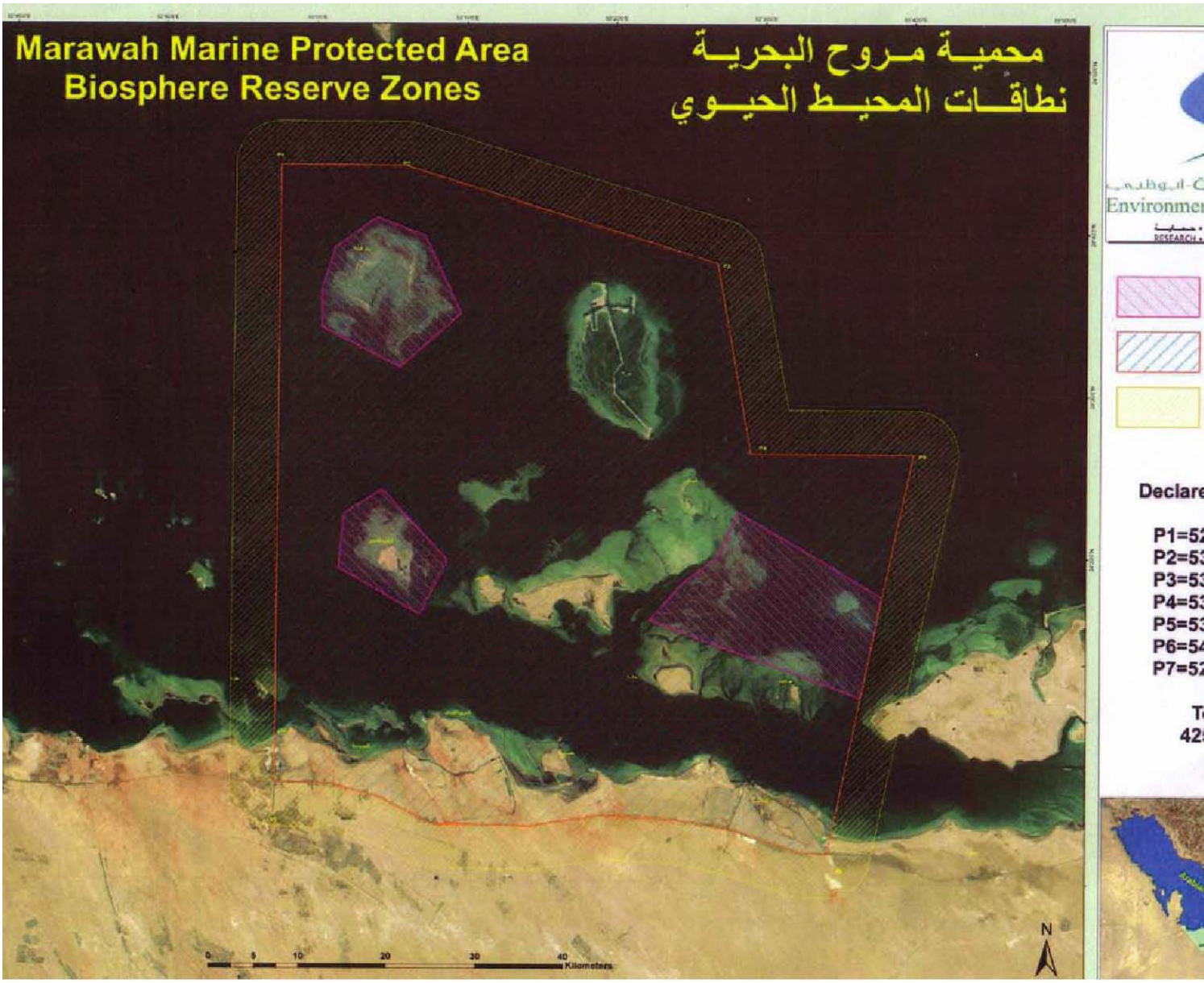
Source: Abu Dhabi State of the Environment

Marine and coastal habitats in Abu Dhabi Emirate

Source: Environment Agency - Abu Dhabi

Source: Abu Dhabi State of the Environment 2008



Zoning of Marawah
Figure 12