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Conservation and Land Reclamation on the Urban Fringe with Special Reference to the Jeddah Area, Saudi Arabia

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ABSTRACT The large cities of Saudi Arabia have been expanding at a prodigious rate, and this has caused problems to the urban fringe areas. Although the town centers are now kept very clean, the areas adjoining the built up spaces suffer from dumping of unwanted fill or general rubbish whilst the mountains and wadis are quarried for building materials and topsoil leaving scars on the landscape.

In this paper, the author discusses the problem and looks at the ways in which the land can be conserved and reclaimed for future generations of Saudi Arabia.

As an example, the urban area of Jeddah is considered, and it is seen that the coastal and inland areas should be considered separately. Then, twelve sites in a semicircle around the city are mapped and identified as being worthy of special consideration for land reclamation and conservation projects. A brief description is given of each. Finally, the difficulties of planning control and implementation are discussed and some ideas put forward as a contribution to the process of finding solutions. This article highlights a growing problem, which if dealt with now will have increasing benefits for the future.

The Existing Situation

When urban areas expand as fast as they have in the Gulf Region, there are similarities to the old gold rush towns of the New World. The need for shelter and infrastructure facilities is so great that there is little time for the consideration of environmental policies. There is scarcity of many commodities, but one which has almost limitless availability in the desert environment is land. The desert stretches in a flat, sometimes monotonous, way as far as the eye can see. Outside the urban areas

it is not needed. May be there is oil or water underneath it, but the actual surface is disregarded. No one has time to care if the intrinsic suitabilities are destroyed. This is tomorrow's problem. The desert becomes subordinate to the needs of the town. Water is pumped from the aquifers, thus lowering the water table and depriving the few agricultural areas of irrigation water. Rock outcrops and hills close to the towns become quarries for concrete and roadstone. Topsoil from the wadis is removed to form private and municipal gardens. Above all the desert becomes a tip. The vast quantities of excavated materials, rubble from old buildings and old cars are dumped in the desert, usually on the nearest area of unfenced land. When this land too is required the rubbish is moved again, a little further out into another vacant area of desert and so on. Palaces, residential areas, sculptures, estate roads with lamp posts all rise out of seas of rubble and discarded junk. Such is the environment of most Arabian towns today. Hopefully this will prove to be a transition period.

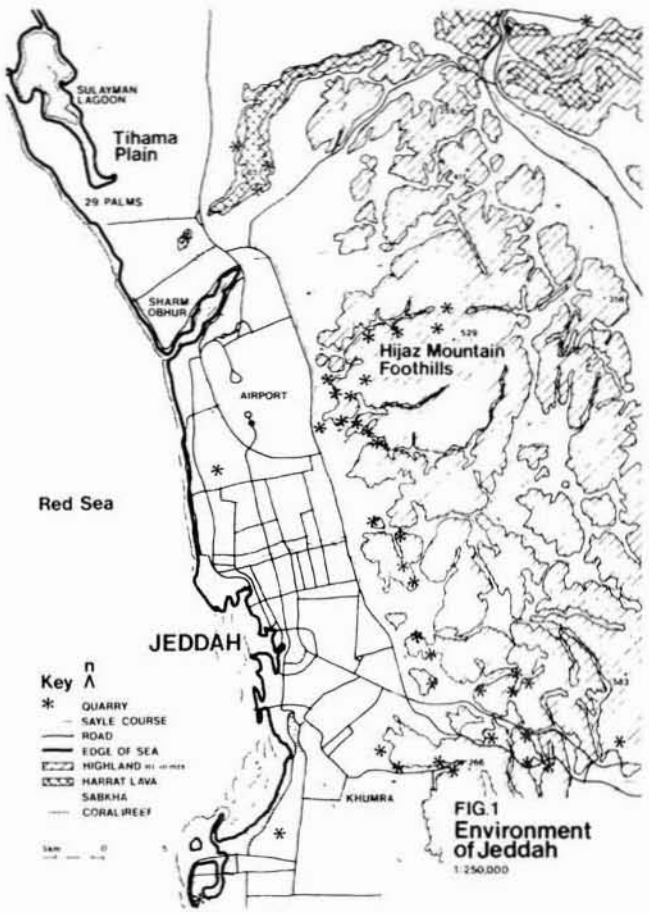

FIG. 1. Environment of Jeddah.

The Saudi Arabian Government has recognized these problems and has been finding ways to safeguard the environment for the present and future generations of Saudi Arabia. Large desalination plants have been built on the coasts for the large towns. This will relieve the pressure on many of the inland aquifers soon. On the national scale, an event, of far-reaching importance, was the establishment of The Meteorological and Environmental Protection Agency (MEPA) to fight against pollution and conserve heritage lands, amongst other important functions. This agency has identified important areas of conservation, nature reserves and potential National Parks where landuse strategies are being evolved for the encouragement of wildlife. On the urban scale, the large cities such as Riyadh and Jeddah have excellent waste management schemes which include daily refuse collections by contract cleaners. The streets are certainly kept clean and the city centers have now lost the poor record of domestic refuse collection for which they were once notorious. The problem now lies in the areas between the town centers and the wide open rural spaces: the urban fringe and the small towns and villages These are poorly maintained and need urgent attention.

As an example of the type of problem that can occur, the famous water hole of Ain Heat on the outskirts of the Riyadh conurbation can be mentioned. This was a tourist attraction for all visitors including foreign workers in Riyadh. Formed by a collapsed cavern roof, the steep descent to the water has a historical value. It was the visit by American oil prospectors to this water hole which encouraged them to drill deeper at Dammam, and, thus, discover oil, since they had noticed the same type of cap rock formation that existed at the oil well at Bahrain[1]. Up until 1982, it was still possible to descend to the cool water and swim. Then, the walls became covered in graffitti, old cars were pushed into the water and the water table fell perhaps due to excessive extraction for nearby farms. This historic site was destroyed probably beyond restoration. Ain Heat suffered because it was within easy reach of Riyadh and could be visited by too many people, several of whom did not care about the historic significance of the place or the natural attraction of the setting. It was destroyed before public awareness could come to the rescue.

On the other hand, what can be accomplished is seen at the new Diplomatic Quarter in Riyadh[2,3], where the greatest care has been taken to conserve the desert around the site as a desert park, and where residential areas abut expressways the excavated fill and other rubbish from the development has been formed into a large perimeter mound which is tall enough to prevent nuisance from external traffic.

The conservation and land reclamation problems of Jeddah differ from Riyadh because of an additional factor: the sea. The Red Sea possesses opportunities and constraints of a separate type compared to the narrow strip of flat Tihama coastal plain and the Hijaz mountain foothills beyond. The coastal plain, which was once under the sea, consists of aeolian and alluvial sands underlayed by coral limestone rocks. The mountain foothills comprise an old peneplain of granites and schists penetrated at intervals by recent lava flows covering sandstones and conglomerates.

Considering first the mountain areas, Fig. 1 shows the large number of quarries in the vicinity of the town. These have been opened up in great haste to feed the con-

struction industry and to provide roadstone or protection for the sea edge. Those with the wadis provide topsoil. When they are exhausted the land is usually left in very degraded state. The granite mountain remnants look like artificial stumps and out of keeping with the original. In places the black rocks of the basalt lava flows have been stripped of their cover by bulldozers moving up the sides of the mountains, exposing the underlying sandstones in ugly scars which may remain indefinitely. In the wadis, the topsoil is removed until ground water level is reached. This may be five meters but varies considerably. Here again, when the extraction is finished the wadi tends to look like a battlefield!

The professional skills to reclaim this land are held by the landscape architect, and the Saudi Government has been very farsighted in providing courses for this discipline at two universities. There is now scope for this training to be put into practice. The wadis could be reclaimed for recreational purposes or simply returned to rough grazing for the Bedouin.

Sometimes, the wadis have suffered because of water extraction for the neighbouring town's water supply. Such as example is Wadi Fatima between Jeddah and Makkah. Originally famous for its agricultural produce which was sometimes exported to Lebanon, the farms began to suffer as the underlying aquifer was tapped to feed both these towns. The water level fell from three meters to thirty meters and seven villages were abandoned before the establishment of desalination plants on the coast helped to relieve the pressure on this water source[4]. Now that the first tertiary treatment sewage farm at Khumra, South Jeddah, is about to produce quantities of very pure water, there is an option of pumping back water to Wadi Fatima to be used for irrigation. This type of opportunity should be carefully considered in a country like Saudi Arabia. Such water should be used 'over and over again'[5].

Uncontrolled landuses at the urban fringe can have a bad effect on the ecology. Chemical spills can poison fish and kill plants. The decision to construct a special treatment plant related to Jeddah's industrial city shows that the problem has been realized. Uncontrolled topsoil removal without an enforcement to reinstate the land degrades the environment. Uncontrolled grazing can also be a problem if the Bedouin bring in large flocks of sheep, goats or herds of camels. The animals often find their way to the rubbish tips where diseases can be caught or spread. Edible shrubs are stripped leaving only the poisonous ones behind. This increases the rate of surface runoff during rainstorms, encourages erosion and denudes the landscape visually. There is sometimes a good example of this where one side of road has been fenced off for a few years and the other left free for unrestricted grazing. This occurs at Jeddah where shrubs grow quite high in the enclosed area of the airport whereas the other side of the bypass road is barren by comparison and dominated by inedible *Calatropis*. Overuse of the land by either nomads or picnickers can lead to the destruction of trees for firewood. This is especially dangerous from the ecological point of view and because many are nitrogen fixing Acacias, plants find it even harder to become established and habitats for many types of organisms are reduced. Outside Abha in the Asir region there are dangers that the carrying capacity of the most favoured picnicking areas could be exceeded and park authorities are countering this by opening up new areas and encouraging the use of alternative fuel for barbeques.

Sometimes, an unexpected opportunity for the upgrading of an urban fringe land-use presents itself. At Riyadh, people are surprised to learn that in a country that can boast of no permanently flowing river an artificial one has been developing in recent years and is now some fifty kilometers long stretching to the nearby agricultural area of Al Kharg. This river is formed of treated sewage effluent apart from the runoff during the occasional rainstorms. Some of the water is used by agriculture or to replenish groundwater supplies, but the principal importance of the river is that it attracts some 270 species of bird giving opportunities for scientific study, education and recreation.

The conservation and reclamation problems of the coastal regions of Jeddah are different from the inland areas discussed above. For instance, here the water table tends to be too high. This is partly because much of the new town is built on 'Sabkha' areas of low lying saline water infiltrated by the sea in winter but drying out in summer. Leakages from cess pools and burst water mains exacerbate the problem. Also, the impermeability of the soil makes it hard for the groundwater to drain away. Experiments by the Faculty of Engineering, King Abdulaziz University, Jeddah, have led to a contract which, at the time of writing, has resulted in the lowering of groundwater in some places.

The town of Jeddah itself has now a universal reputation for good townscape achievements both in conservation (the old city centre) and modern offices, housing areas, industrial estates, mosques, and other new works. With over four hundred sculptures, it must provide one of the most important modern sculpture displays in the world, with examples from many famous sculptors such as Henry Moore. They are found at roundabouts and street corners, but especially on the Corniche, the landscaped road which runs for many kilometers both north and south of Jeddah. The achievements in the field of 'soft' landscape are just as remarkable because a few years ago the town was said to have only one tree. Now the town is remarkably green and the government encourages public participation by annual 'plant a tree' weeks. Much of this work has been encouraged and implemented by an architect mayor, Mohammed Saeed Farsi, now recently retired.

The Corniche provides excellent recreational opportunities throughout its length, but so fast has been the growth of Jeddah, that one hour's drive from the city center is about the time that it takes to reach the nearest undeveloped sandy beach and these are often in a poor state of maintenance. The Red Sea has an unusually small tidal range of about forty cm and although the effects of a strong wind can increase this a little, it means that the sea cannot remove rubbish left on the beaches by picnickers. This tends to mount up and degrade the environment. Also the aridity, sea spray and salinity of the soil have precluded natural tree growth at the sea edge and so there is no shade. It is very important that these remaining soft edges are maintained, conserved, and areas of drought-resistant natural vegetation introduced to provide shade.

One of the remarkable facts of the Hijaz coast line is that although the land is one of the most barren deserts in the world with an average of about five cm of rain per

year, the underwater life of the coral reefs cannot be excelled by any other country in the world.

Recently, pressures caused by the large population increase of Jeddah has placed this coral in danger. In places it is being trampled by the feet of too many snorkelers. Silt and sewage effluent also destroy this habitat. The coral platform between the reef edge and the coastal dunes has been used for the position of the Corniche Road so that expensive land purchase is avoided, and the land between the new road and the beach either reclaimed or left as a coastal lagoon. These man-made lagoons, however, have been conceived with inadequate access to seawater for replenishment. As a result, they suffer from excessive salinity and a consequent reduction in ecological richness. As the Corniche is extended, consideration should be given to constructing the road several meters inland from the beach to leave a generous strip of sandy seashore as an alternative to the hard edge of basalt boulders stripped from sides of the lava flow table lands.

Conservation Suggestions for the Jeddah Area

The Kingdom has now reached a period of consolidation and the basic infrastructure is nearly complete. In the case of Jeddah, the last major infrastructure requirement is a comprehensive sewage system and the construction of this is already underway. The expanding and increasingly well educated population will have additional time available for recreation and the government is encouraging investment in this field so that Saudis will feel happy to take more vacations at home rather than abroad. A massive area of active recreation has been proposed in North Jeddah adjoining the Sulayman Lagoon[6] which if implemented will hopefully prove attractive to many people. Looking ahead to the future, however, it is very important to reserve areas of countryside for future generations in an unspoilt state. The economic pressures on this land are severe, as we have seen. What is needed now is the selection of a number of *country parks and conserved lands* within easy reach of the built up area of Jeddah; well maintained and protected from development by legislation. It may be that the ancient 'Hema' rangeland control concept can be used for this purpose with the necessary modern adaptions[7]. Figure 2 is a first attempt to identify those areas which should receive careful consideration for protected status. Two of them require extensive land reclamation before this goal can be realized, others merely require protection, and several require modest land reclamation. A variety of habitats have been chosen so that they are representative of the Jeddah region. Some have already been noted by The Meteorological and Environmental Protection Administration (MEPA) but most have been selected from personal knowledge of the countryside adjoining Jeddah. All are suitable for a family picnic not further than one hour's drive from the town center and those to the south are especially useful because they are also close to Makkah. The sites, twelve in all, form a semicircle around Jeddah. They are briefly summarized below and shown on Fig. 2.

Apart from any land reclamation, it is anticipated that only low key, minor facilities should be provided in these parks. The emphasis would be on protection and maintenance.

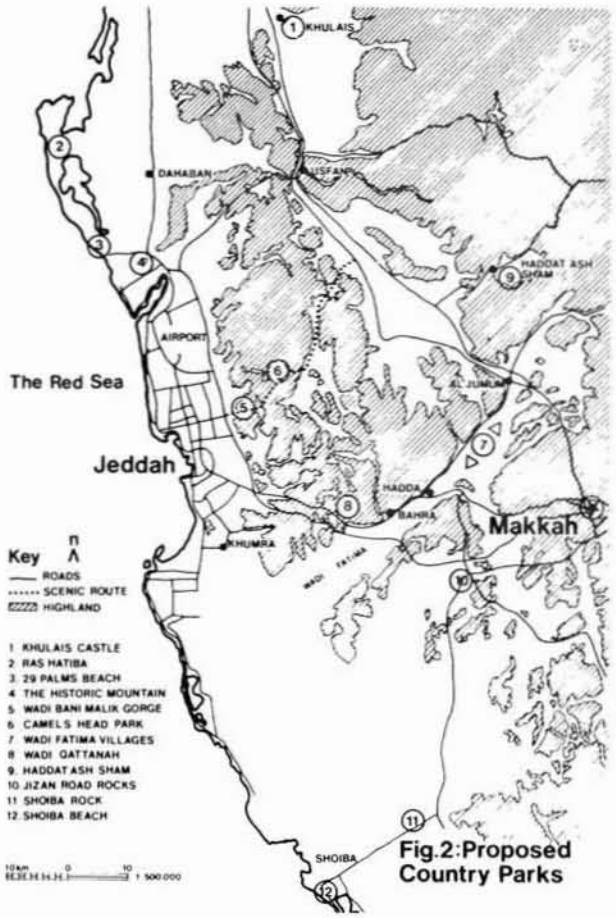

FIG. 2. Proposed Jeddah area country parks.

1. Khulais Castle

From the battlements of this ruined Turkish castle magnificent panoramas over the green Wadi Khulais can be enjoyed. The wadi has probably more vegetation than any other in the region, both natural and man-made. Villages are scattered and small throughout the valley. The rock upon which the castle is built consists of massive Harrat basalt boulders and the castle likewise. Acacia and tamerisk scrubland at the foot of the castle ridge provides good potential for picnicking. Wadi Marwani, a subsidiary wadi, has acquired the interest of MEPA.

2. *Ras Hatiba*

A low sandy peninsula north of Jeddah which has frequently been recommended as a marine conservation park but which is now under threat from commercial pressures. There are good fringing and batch coral reefs, ospreys catch fish and dujong have been observed in the sea grass areas between the peninsula and the main land. In winter, the peninsula becomes an island separated from the saline Sulayman lagoon and therefore is afforded natural protection, but this *ras* needs careful protection from incompatible forms of active recreation.

3. *29 Palms Beach*

There are actually only about three palm trees left in a small desolate cluster a kilometer from the beach where they have survived for years without irrigation. This sandy beach suffers from uncollected garbage and the destruction of dune vegetation by vehicles but is otherwise unspoilt and the nearest natural shore line to Jeddah. Remains of the primary dune gives some privacy to bathers, whilst the coral reef is available to snorkelers.

4. *The Historic Mountain*

This gains its name from the existence of prehistoric drawings on some of the basalt rocks. It is actually the southernmost point of a lava flow stretching from Usfan in the east, but from the new Jeddah-Madinah expressway it presents a sorry sight because the whole central area of the mountain has been quarried away. The prehistoric rocks were happily saved just in time by the Department of Antiquities who fenced the area. A graduation project by a student in the Landscape Department of King Abdulaziz University demonstrated how the mound could be reclaimed[8].

5. *Wadi Bani Malik Gorge*

Perhaps more of a 'narrows' that a gorge this steep sided gateway to a major wadi system in the mountain foothills east of Jeddah is formed of igneous schists and granites. Unfortunately, the site has been severely battered by the quarrying of the rock and the removal of topsoil from the wadi. Yet, a reclamation scheme would be worthwhile for it has excellent potential and adjoins a proposed housing area. It is also very close to Jeddah, and could receive direct access from the nearby flyover. The branch wadis are in good condition at the present time.

6. *Camel's Head Park*

A beautiful area containing eroded granite and commanded by a tall mountain peak. The granite has been sand blasted into interesting shapes, whilst the shade formed by the rocks and natural vegetation are ideal for picnicking. This site has remained unspoilt because of the difficulty of access and can only be reached by narrow dirt tracks. As part of a comprehensive maintenance plan, it could be linked by a narrow paved 'scenic' route to Wadi Bani Malik Gorge at a future date and this road continued to join the Usfan-Al-Jumum road from which visitors could return to Jeddah *via* Wadi Fatima.

7. Wadi Fatima Villages

These villages were the subject of a classic study by the Japanese sociologist Motoko Katakura[9] during the period when they were being settled by Bedouin families. Since that time, the Bedouin have had to re-adapt themselves a second time because the fall in the water table level caused by the requirements of Makkah and Jeddah led to abandoned farms and villages[3]). The villages are still basically low key single storey structures but are in danger of undesirable swamping by 'north Jeddah' type two storey structures destroying the character and privacy. The area needs planning protection as an area of outstanding landscape value and the villages need better services including garbage collection. There are some areas of natural shrubs, especially acacia woodland, suitable for picnics, but the main challenge at Wadi Fatima will be to modernise the villages without destroying their character.

8. Wadi Qattanah

Reached by a concealed entrance off the Old Makkah Road at Bahra, this wadi is unspoilt and used as a picnic spot by local residents and for rough grazing by the Bedouin. An excellent example of the purple banded limestone and mudstones of the Fatima series of sedimentary rocks can be seen, and excellent views experienced from the mountain ridges of Wadi Fatima and the roads to Makkah.

9. Haddat Ash Sham

An enclosed space surrounded by Harrat lava containing a group of villages watered by a wadi bringing down fertile volcanic soil to the farmland. One of the villages is situated on a low mountain peak rising from the valley reminding one of the mountain villages of the Baha region. The Harrat caps sandstone of various shades and colours which outcrop in various places. The valley is threatened by modern development especially residential roads too wide and suburban in character. The area needs conservation as a place of outstanding landscape value with limited public access to the green areas.

10. Jizan Road Rocks

At the junction of the Jizan Road with the Non-Muslim bypass road west of Makkah is an interesting area of exfoliated granite including perched blocks. Providing shade for picnics, the granite is worth exploring to see how it has been chemically eroded, by the extremes of heat and cold, and by the wind. Dykes of lava extrude through the granite forming more resilient ridges and acacia tree roots wedged into the crevices between the rocks also play their part in the processes of erosion.

11. Shoiba Rock (Jabal Abu Shaddad)

This is the last rock outcrop before reaching Shoiba on the road from Makkah, and is isolated from the rest. It has twin peaks of which the eastern contains columnar basalt and the western natural rock arches. It is the haunt of Egyptian vultures in day time whilst at night fall snakes, owls and bats appear. A small amount of reclamation

is required at the foot of the mountain where bulldozers have excavated rocks for the adjoining roadway.

12. Shoiba Beach

Shoiba, also known as Mastabah, is said to have been the port of Makkah before Jeddah was chosen. It has desolate bleak coastline but the underwater life is considered the best in the region and has been identified as in need of protection by MEPA. Near the coastguard station the cliffs of fossil coral rise to a large lagoon containing mangroves. Its entrance is a narrow strait a few meters wide, which if bridged would provide easy access for the visitors to the new fish farm recently opened by Salem Al-Thobaiti.

Planning Controls and Implementation

Planning controls are needed to ensure that the landscape suffers the minimum disturbance from future quarrying. No one doubt the need for this industry; indeed it has played an important part in the development of the country. It is more a question of anticipation of the harm it could do to the landscape and the professional study of ways to keep this to a minimum. There have been many cases in the West where quarrying operations have eventually led to an actual improvement in the original landuse. This is because an agreement has been reached with the quarry owner over the afteruse of land before extraction even starts. Thus, wet quarries, where extraction has continued beneath water table level, can be used for water recreation, while none existed before in the area. Similarly, dry quarries have been levelled and a high quality topsoil spread so that the return from agricultural crops is higher than before. This type of opportunity needs studying in Saudi Arabia. Landscape plans need to be submitted to the Planning Authority before work commences or before an extension of existing quarry land is applied for. Then, it is possible for planning permission to be given subject to agreement to restore land afterwards in the best possible way. In the USA, some states collect a sum of money for each ton of excavated material in order to ensure that the work of reclamation is carried out correctly. In West Germany, in many cases, authorities have safeguarded the redevelopment of quarries. For instance, in the south of the city of Hannover a series of wet quarries have been turned into a homogeneous landscape of lakes with numerous and differentiated facilities for recreation. In the Ruhr Valley district, huge dry land fills which are the remnants of mining have been turned into forests.

Experience shows that an "agreement" with the quarry owner will only be reached if a kind of "Conservation and Land Reclamation Law" forces *him* to come to terms with the authorities. There are three phases to be considered:

1. Initiation of a "Land Conservation and Reclamation Law" stressing a remodelling of a landscape upon the cost of the quarry owner.
2. A control mechanism that ensures a rigid permit procedure.
3. A "Remodelling Landscape Concept" designed and implemented by profes-

sionals at the cost of the quarry owner.

Another important principle is to agree a phasing plan so that reclamation is not left to the last minute but carried out at intervals in such a way that as one part of the quarry is exhausted the afteruse plan is implemented on that land, whilst quarrying operations continue elsewhere.

On land which has already been spoilt by long abandoned quarrying operations, the work of reclamation can be very expensive unless the return for the reclaimed land is adequate. For this reason, there is an obvious reluctance to do the work unless the land can be used for some type of development such as housing. An example is the Jeddah cement works site, where the coral limestone was used for cement and then the ground levelled for a school and residential areas. In Europe, many sites have been reclaimed for the use of National or International Garden Festivals in which governments, public and private organizations can design and implement an exhibition garden within the framework of a master plan designed by a landscape consultant. Since Jeddah has so much to be proud of in this sphere, the idea of an International Islamic Garden Festival on an area of reclaimed land in the Jeddah area is something to be carefully considered in the future.

Concerning the dumping of waste material and the spread of litter, it is only education that can increase the public awareness sufficiently to preserve the landscape of the city fringes. This has already started at elementary school level and good progress made, but somehow the message also has to be conveyed to the adult population that waste materials which a few years ago were mainly biodegradable have now changed considerably. The plastic content has increased; so has the proportion of building rubble. Rubbish, therefore, remains unless it is systematically cleared and the area fenced off.

At Jeddah, the current five years waste management contract envisages the gradual removal of mounds of rubbish, and it is hoped that this will be successful. The land scarred by quarrying could be reclaimed by Saudi Landscape Professionals. At King Abdulaziz University alone, some thirty landscape students have qualified over the past five years. They have all taken specialized courses in landscape planning and land reclamation. Working with allied professionals they would be well qualified to improve the landscape of the urban fringes.

Conclusion

This paper attempts to show that although great progress has been made in conservation and land reclamation at the National Scale such as the Asir National Park and within the large towns, it is the urban fringe of the major cities that now needs care attention. Most people in Saudi Arabia live too far away from the existing and proposed National Parks to enjoy their benefits. They need a similar type of facility closer to home. Both Saudi and non-Saudi families enjoy a weekend picnic in the country in a place with attractive surroundings and privacy, and it is hoped that this paper will contribute to the discussion of recreation within the Kingdom and highlight some of the problems and opportunities that occur.

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الحفـــاظ على بيئـــة تخوم المدن واستصلاحها ، مع التركيز على منطقة جـــدة بالمملكة العربية السعودية

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تنمو المدن الرئيسة بالمملكة بمعدل سريع جداً ، مما سبب المشاكل للمناطق المتاخمة لها . ففي حين أن أواسط المدن تعتبر في حالة نظيفة ، إلا أن المناطق المفتوحة المتاخمة لحدود المدن تتعرض لإلقاء النفايات ونواتج الحفر . كما أن الجبال تتعرض لأنشطة المحاجر للحصول على المواد الأساسية للبناء ، وكذلك الأودية تتعرض للحفر للحصول على طبقة التربة السطحية مما يترك آثاراً غير ملائمة على البيئة الطبيعية .

في هذا البحث ، يناقش المؤلف المشكلة ، ويبحث في الوسائل التي يمكن بها الحفاظ على البيئة واستصلاحها لخير الأجيال القادمة بالمملكة .

أُخذت منطقة جدة كمثال ، حيث تمت بها دراسة كل من المنطقة الساحلية والمنطقة المتاخمة للجبال . في هاتين المنطقتين تم تحديد اثنى عشر موقعا يشكلان نصف دائرة حول المدينة ، ويستحق كل موقع منها الاهتمام به واعتباره مشروعاً للحفاظ على البيئة واستصلاحها . بعد إعطاء وصف ملخص لكل موقع ، تم استعراض الصعوبات التي تواجه مشروعات التخطيط المطلوبة ، وكيفية السيطرة على استعمالات الأراضي ، وتنفيذ المشروعات المقترحة ، حيث أعطيت بعض الأفكار كمساهمة في عملية البحث عن حلول لها . يلقى هذا البحث الضوء على مشكلة آخذة في الازدياد إذا تمت مواجهتها من الآن فسيكون لها فوائد متزايدة في المستقبل .