

Wadi Hanifah Wetlands

Riyadh, Saudi Arabia

I. Introduction

Wadi Hanifah is the longest and most important valley near Riyadh. With its occasional lush stretches, it is a unique natural and geographical feature in the dry central highlands of Saudi Arabia. It is also a natural drainage course for surface water for a very large area, fed by a number of tributaries. Wadi Hanifah's entire drainage run-off area covers approximately 4,000 square kilometres. While it runs on a course from the north-west to the south-east, passing through the relatively smaller western portion of Riyadh, it also acts as a natural sluiceway for the Saudi capital. And so today, to the south of Riyadh, the valley has turned into a continuous watercourse due to the daily discharge of 400,000–600,000 cubic metres of ground water, rainwater and treated waste water from the capital, which has a population of approximately four million people. This continuous flow of water and treated sewage has created a unique natural phenomenon in the middle of the dry, arid land where a luxuriant ecological corridor, almost 100 kilometres long, has been created, with small waterfalls, lakes and islands, supporting a rich variety of flora and fauna.

Currently, Wadi Hanifah is being exploited by the increased demands of the rapidly expanding Saudi capital. Parts of it are used as a dumping ground for rubbish; stone quarrying and sand removal for concrete manufacture have scarred parts of the valley; and good agricultural land has been overrun by industrial and urban developments, some of which are actually located in the flood plains, presenting a great danger for both people and property. The recently formed wetlands to the south are a particular favourite for recreational use, with many people coming to the valley for picnics, to fish and even to swim, which is dangerous because the water is insufficiently purified.

In light of Wadi Hanifah's great potential for recreational use and as a green haven, the Arriyadh Development Authority (ADA) formally accepted a Development Strategy Plan in 1994, thus marking the beginning of a long-term programme for the preservation and proper utilization of the whole valley. Today, the programme is still at a preliminary stage and it seems that its implementation and complete realization will take a long time.

II. Contextual Information

a. *Historical background*

The valley of Wadi Hanifah, which is the most significant natural drainage course around Riyadh, is connected to many adjacent *wadis*, particularly at the northern part. Important ones include al-Oyaynah, al-Ammariyah, Safar, Wabair, al-Mahdiah, Laban, Namar, Laha and al-Awsat, all of which slope from the west, and the al-Aysan and Batha valleys sloping from the east. The whole extent of the Wadi Hanifah is historically significant, due to the identification of 580 heritage sites, according to a survey made in 1987 (*Wadi Hanifah Development Plan*, ADA, 1992), along its length. Most important among these are the abandoned village of al-Diraiyah, the home town of the Saud family, and the five-hundred-

year-old stone dam near al-Masani. The presence of antique settlements within the valley indicates that this ancient natural scar on the surface of the Najd plateau in central Arabia has supported human existence throughout history, and the presence of water in the valley most probably played a central role in this. In fact, the old stone dam near al-Masani is an indication of earlier settlers' attempts to trap the rare and vital rainwater.

At the turn of the last century, when ar-Riyadh replaced al-Diraiyah as the main settlement in the region, and particularly within the last twenty years when Riyadh has been transformed into a large urban sprawl, the appearance of the valley began to change. During the rapid urbanization of the city, natural features on the side slopes as well as on the valley floor were damaged and destroyed at various points due to the development of stone quarries, sand excavation and rubbish dumps. The sewage network of the city drained into the valley, creating a health hazard.

In view of the continued environmental deterioration of the valley, a protection and development plan was deemed necessary. Preliminary studies were commenced at the beginning of the 1980s. Landmarks, historical sites, roads, traffic and the general condition within a radius of about 120 kilometres of the valley – between Thahrat Sadha, south of the northerly Sudoos, and down to al-Ha'ir lakes in the south – were studied in detail. The Manfouha Sewage Treatment Plant opened in 1982 and, at about the same time, the consultants SCET International, working for Riyadh Master Plan, highlighted the importance of the valley. The consultants proposed that Wadi Hanifah should be designated as green belt to the west of the city of Riyadh, and any land subdivisions in this area, which might encourage urban development, should be prohibited. This, unfortunately, was not realized and the city of Riyadh has sprawled westward, beyond the valley during the past twenty years.

The ensuing studies for the preparation of a development strategy for Wadi Hanifah have included assessments of the watercourse, soil quality, wildlife, land ownership, land use, farming, historical sites, recreational features, traffic, air and water pollution and water life.

The Arriyadh Development Authority (ADA) prepared the Development Strategy Plan for Wadi Hanifah in 1992. The plan was officially approved in 1994, marking the beginning of a long-term programme for the preservation and appropriate utilization of the valley. This year (2001), the ADA is preparing to invite various consultants to submit their proposals for a development programme for the valley, which would be realized in three phases, with the short- and long-term implementation to take place during the final phase.

b. Climatic conditions

Wadi Hanifah is located on the Najd plateau of Saudi Arabia, which has a dry, arid climate, with extremely hot and dry summers and mild, dry winters. The annual rainfall (October to March) is scarce and sporadic. According to rainfall records dating back to 1964, one significant characteristic is that the rain does not cover the whole area or large parts of it but falls on one or more smaller areas. The rain falls with great intensity for short periods, creating flash floods, which are a common phenomenon in desert areas. The records indicate

different rates of rainfall for different parts of the region, ranging between 60 millimetres and 110 millimetres.

The coldest month around Riyadh is January and the hottest is July. The mean daily air temperature ranges from 6.4°C in the winter to 42.9°C in the summer. The overall annual average is given as 24.6°C. Within the valley, cooler temperatures are provided by the shade of steep escarpments, single trees, palm tree canopies and high bushes growing on the banks of the lakes. Given measurements of these areas indicate a reduction in the temperatures of approximately 5 to 7°C.

c. *Site context*

The Development Strategy Plan for Wadi Hanifah prepared by the ADA has divided the valley into five different study sections, due to the differences in their ecosystems and the level of their recent exploitation.

The first section, from the al-Waseel tributary to al-Diraiyah, which comprises the large north-western part and its tributaries, is a dry desert and arid steppe area. However, the sub-valleys descending from the high mountains in the north-east present a rare characteristic for a desert region – a dense covering of wild trees and other plants that provide a suitable environment for a rich variety of wildlife. The dry northern part of the valley is picturesque thanks to its variably shaped desert surfaces, its occasional lush green oases and its ancient settlements like al-Diraiyah, built from mudbricks. The natural characteristics of this first section are mostly undisturbed.

The second section, extending from al-Diraiyah to the sub-valley Wadi al-Aysan, close to old Urai Jah in the south, is surrounded by residential areas and by subdivided land that has yet to be developed. Agriculture is the main activity in this part of the valley, where the water-table is high and the swamps are abundant.

The third section, from Urai Jah to al-Masani in the south, passes through a highly developed part of Riyadh, with an urban infrastructure and many residential districts.

Section four extends from al-Masani in the north to al-Ha'ir in the south. This is the section of the valley where the constant discharge of water begins, treated sewage water and excess underground water being discharged into the valley together. Here the valley is also surrounded by residential plots that have yet to be developed. The main activity is again agriculture.

The fifth section, which broadens and extends from al-Ha'ir to the south, is known as the lake area. This section contains a large number of farms and a wealth of animal and plant life.

The whole extent of the valley was once traversed by old dirt tracks, which are only partially usable today. Currently, various parts of the valley can be reached by secondary dirt roads, which branch out from the paved highway, running parallel to Wadi Hanifah.

d. Site topography

The valley in cross-section consists, in general, of four main formations. The first is the valley bed or bottom, which is the lowest part and includes the watercourse framed by sedimentary side terraces, some of which are either arable or are suitable for grazing thanks to their fertile soil and the availability of water. During high floods, the entire valley bed is covered with water, including the sedimentary terraces. The whole valley is made of limestone and sand. The first 15 metres at the top consist of alternating layers of clay, sand and gravel. This is why water remains on the surface. Rising up from the valley bed, on either side, are limestone slopes. Above these, the rocky edges of the valley delineate the upper limits of its width.

To the north-west lie the high Tuwaiq mountains from which a series of sub-valleys descend towards the east, to join the Wadi Hanifah. The northern part of the valley, from al-Waseel to al-Diraiyah, consists of hard geological formations, and their steepness is characteristic of the side slopes of the main valley as well as the sub-valleys. Here, vast areas of bare land are punctuated by some agricultural and industrial activity.

The valley becomes flatter and more fertile between al-Uraiya and al-Masani, but here the urban development of the city of Riyadh has extended as far as the very edge of the valley.

The land south of al-Masani to al-Ha'ir and beyond consists of weak geological formations and the valley becomes so wide at this point that it is impossible to see the side escarpments from the valley bed.

III. Programme

As has been indicated above, The Wadi Hanifah Development Strategy Plan was prepared by the ADA as a result of the rapid deterioration of the natural environment in the valley, due to the swift growth and urbanization of Riyadh, which is located almost halfway down the valley. Physical changes had occurred in the valley from quarrying, dumping and sand excavation. In addition, inadequately purified waste water from the city, together with excess underground water, meant that about 600,000 cubic metres of water were discharged daily into the valley. This caused the underground water levels to rise, creating swamps and polluting the water and adjacent land, which is used by visitors for picnics, to fish and – unadvisedly and prohibited – even to swim. Further dramatic changes in land use occurred as good agricultural land was swallowed up for residential and industrial purposes.

A long-term programme for the preservation and correct utilization of the valley was launched in 1994 when the Wadi Hanifah Development Strategy was officially approved. Since then, environmental awareness has accelerated apace. The sustainability of resources has become a major goal in all planning and development activities in Riyadh. It was also recognized that the assets of the valley should significantly improve the quality of life of the people in the growing metropolis and its environs. As a result, based on the 1994 strategy and subsequent studies, new objectives and criteria were established for a comprehensive

planning and development project for Wadi Hanifah, to be advanced by a limited competition between invited consultants to be held this year (2001).

The first phase of the development project for the valley is expected to summarize the results of research due to be conducted, to indicate a short- and long-term vision for the valley, and to prepare alternative development proposals according to these ideas. The second phase is likely to be the preparation of a general plan, which should include land use, environmental zoning, water-management plans, guidelines for urban design and principles for environmental planning. The final and most important part of the programme will be the implementation phase of creating and designating roads, open spaces and recreational areas, together with the restoration of the water system and the historical sites. The implementation is expected to require a long timescale.

IV. Description

The Wadi Hanifah catchment area is approximately 4,407 square kilometres. This includes approximately 70 per cent of the city of Riyadh, with 80 per cent of its population. The valley is about 150 kilometres long and an average of 30 kilometres wide. The urban section of the valley from Sad Ilb to al-Masani, where the city of Riyadh is located, is the area in which the proposed new drainage channel is to be undertaken. This area has been irreversibly damaged by uncontrolled urban growth, resulting in considerable deterioration of the natural and historical features of the valley.

The upper section of the valley, from Sad Ilb to the north, still retains its relatively pristine condition and contains a considerable number of sites and villages of historical importance. Therefore, the planning for this area will focus on maximum protection, so that possible future exploitation can be controlled.

The southern section, extending from al-Masani to the lower extremity, includes the new al-Ha'ir dam (regulator) and contains unique, untouched natural settings. This section of the valley, affected over recent years by the constant discharge of water from Riyadh, terminates with a large area of interconnected lakes and islands. This area, in particular, will be earmarked for recreational use.

To retain the fine qualities of Wadi Hanifah, protection of the native wildlife is of the utmost importance. The greatest ecological potential in the valley can be seen in the northern and southern sections, away from the urbanized areas. The main plants that grow in the dry land of the northern section of the valley, aside from the short-lived desert weeds, are *Calotropis procera* (*ausher*), an evergreen shrub with poisonous sap that grows up to 3 metres; acacia (*salam*), a dry-climate variety with thistles that grows to 6 or 7 metres; and tamarix (*ethel*), a blooming native desert tree that can reach a height of 10 metres and survives in all parts of the valley, dry or wet. In the wetlands to the south, the watercourse is framed on either side by a dense belt of wild vegetation. The most common plants in this area are tall water reeds, *Phragmites australis* (*ghab*) or the marsh herb typha (*dees*), a leafy, spreading bush; convolvulus (*oleik*); and tamarix. This part of the valley is also known for its growing population of various species of bird, most of which are migratory, coming from Eastern

Europe and Siberia on their way to their winter grounds in Africa. They land in the valley to rest or even to stay for the winter. In addition to the migratory birds, about thirty different species have been identified, including various types of heron and egret.

Various forms of water molluscs (such as tiny water snails), and fish such as carp, tilapia and molinesia live in the watercourse, while tiny leopard frogs and insects such as dragonflies abound, together with various butterflies and a few species of spiders that live in the thickets of the waterside plants. While domestic animals like sheep, goats and cows are brought down to the water's edge for grazing, stray dogs and other animals from the city, such as rats, also roam the southern part of the valley.

Alongside its drainage function, Wadi Hanifah has great potential to provide recreational space for the four million citizens of Riyadh, a population that increases by 8 per cent each year. Particularly at the northern and southern extremities, environmental protection and recreational possibilities are closely linked. At present, the wetlands in the south are completely littered with rubbish left by picnicking visitors, while in the north, careless barbecue fires sometimes destroy whole palm groves.

For the time being, the whole valley is devoid of any social or recreational services, such as parking areas, designated picnic grounds, restaurants, toilets, supplies of fresh water and so on. These will have to be tackled in the comprehensive development plan for Wadi Hanifah, which is going to be put out to tender this year. This three-tier plan requires alternative development proposals to be submitted to fulfil its first part, after a period of analytical studies have been undertaken in the valley. The general plan is expected to be consolidated in the second part, when land use, water-resource management and environmental zoning will be decided. Part three consists of a ten-year implementation programme, when particular plans will be put into action.

The official client of the Wadi Hanifah Development Plan is the Arriyadh Development Authority. Since the beginning of the 1980s, more than twenty reports have been prepared relating to the development of the valley, put together by architects, engineers, academics, planners and consultants who have worked under the direction of the ADA. While there have been several foreign experts among these professionals, many were local members of the ADA.

V. Technical Assessment

The Wadi Hanifah Wetlands is not a designed or implemented project but a natural phenomenon which has been formed by the presence of a continuous and abundant flow of waste water, discharged from an urban conglomeration containing about four million people. The result is an amazing green corridor in a desert environment that opens into a wide stretch of interconnected lakes, teeming with wildlife. Such a positive result, achieved by waste water in a dry valley-bed in the desert, is hugely encouraging for the future of mankind, which continuously abuses its natural environment.

The valley in its natural condition today provides immensely valuable recreational possibilities for the citizens of Riyadh, with its fascinating landscape formations, the lower temperatures thanks to the shade of trees and tall bushes, and the soothing effects of its running and still waters. Currently, it is exploited by visitors, who damage the environment with rubbish and discarded belongings. Nevertheless, in the future, when the valley has been properly planned and developed, its usable recreational value will increase noticeably, and its exploitation might be controlled.

Since time immemorial, Wadi Hanifah must have drained flood waters from its catchment area, a process that has helped it attain its present form and depth. Considering its great width at certain points, some of these floods in the past must have been large, forceful and devastating. The impermeable soil of the valley bed, with its alternating layers of sand and clay, forces the water to run on the surface rather than quickly disappearing underground. In the new development programme, research on water resources and their management will be an important issue. This study will include surface and groundwater resources, the frequency and extent of floods, evaporation, pollution, and the use of water for different purposes. According to the results of the study, a restoration scheme for the water system is expected to be devised, including channels, lakes and ponds. The priority given to the restoration of the water system in the valley is a sound decision since it is the main element that has revitalized the once-dry valley.

Because a new, high-quality road network will ease access to the valley after the implementation of the development programme, pedestrian and vehicular numbers will undoubtedly increase. However, for the time being, there seems to be no great problem with traffic circulation within the valley since no development project has yet been designed or realized.

VI. Users

At present, Wadi Hanifah is being used by various kinds of people from Riyadh, for various reasons. Most of those who come to fish are adults and children from low-income families. Among these, workers from the Philippines, Thailand and Sri Lanka, who are particularly fond of tilapia, make up a high percentage. Mid- or low-income Saudi families usually come for picnics. Contractors still occasionally illegally dump demolition debris in the valley, but those involved in quarrying and sand excavation have been effectively banned from the area. The public reaction to the future development of the valley as a protected recreational space has definitely been positive, with support from administrators and professionals.

VII. Persons Involved

During the past twenty years, around thirty people have been involved in writing reports about various aspects of Wadi Hanifah, preparing it for future development. It is the ADA personnel, however, who have particularly worked towards this goal. Among them, Abdullatif al-Shaikh, the president of the ADA, and his vice-president Ibrahim al-Sultan are the main directors of the programme. Dr Zahir A Othman, the secretary general of Al-Turath – Prince Sultan bin Salman Award for Urban Heritage, was the vice-president of the ADA

until last year and has also been involved with the Wadi Hanifah project. Abdulrahman M Al-Sari, director of Urban and Cultural Development in the High Commission for the Development of Arriyadh, is another person who is responsible for the progress of the programme.

Among the foreign consultants who have written reports on the valley, the German landscaping company BWP (Bödecker-Wagenfeld and Partners) has been instrumental. From this firm, Richard Bödecker, Klaus Klein, Joachim Müller, Christian Meisert, Richard Grothus and Martin Strassen have been involved with the production of several reports since 1985. Richard Bödecker's son, Jens Bödecker, and his friend, Uli Riederer, have written about the results of a boating expedition in the valley in 1993.

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