

A Survey of Saudi Arabian Urban Problems*

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Abstract. Saudi Arabia has been transformed from a *bedouin* to an urban society in a period of less than half a century. One result of this rapid urbanization is the emergence of a number of serious problems which are associated with this hectic pace of urban development. The objective of this paper is to examine the underlying causes and implications of five of the more serious urban problems: uncontrolled (and probably uncontrollable) urban expansion, the adoption of what can be described as an alien form of urban planning, the problem of providing water to a growing number of urban residents, traffic congestion and an emerging shortage of appropriate housing for the population. These issues will be examined in light of definitions which will be developed with respect to the sustainability of human settlements, the objectives of urban planning and urban policy.

Certain solutions to the problems identified here will be discussed in a companion paper, "Seeking Solutions to Saudi Arabian Urban Problems."

Introduction

Saudi Arabia is one of the most rapidly urbanizing countries in the world. Any time that urbanization occurs at such a rate, problems arise that require solution. The purpose of this paper is to provide an evaluation of this urbanization as it has occurred in the Kingdom of Saudi Arabia, looking particularly at five very obvious areas of difficulty: uncontrolled urban expansion, an approach to urban planning that in many ways was alien to the society, the problem of providing water to cities in the middle of the desert, traffic congestion and housing. In a companion paper, possible solutions to some of these problems are presented.

These observations of urbanization in Saudi Arabia are very personal, based on what the author has seen of this country's urban structure (which

admittedly is not all that much) and on what he has read (which is quite extensive). Although the urban development of cities in the Kingdom is quite distinctive in style, that is, Makkah and Medina and even to a lesser extent Jeddah are different from urbanization in Riyadh, urbanization in the capital Riyadh is held up here as the standard for two reasons: First, the author has been based in Riyadh and has had limited personal experience in other cities of the Kingdom. Second, it appears that Riyadh's style of urbanization may well represent the emerging trend in Saudi Arabia, and as a result may spread to the other areas. Therefore, hopefully, the focus on Riyadh experiences will not bias these observations too much.

In addition to this potential geographical bias, there are three sets of planning issues which, again because of personal experience, color these observations. The first of these is the concept of sustainable development, or more accurately, the concept of the sustainability of human settlements. The second is the entire basis and objective of an urban planning system. The third is the author's great interest in the potential gain to be derived from urban

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policy. These must be defined at the outset of this discussion.

The best known definition of sustainability is that given by the World Commission on Environment and Development back in 1987, who stated (World Commission on Environment and Development, 1987: p. 8) that sustainable development is 'meeting the needs of the present without compromising the ability of future generations to meet their own needs'. This is a very appealing definition which is, unfortunately, much more complex than it appears at first sight and not quite as helpful as it first appears, as there is little link with urban settlements, and certainly it is impossible to find anything to really measure in this definition. Still, it provides a sound starting point for sustainability analysis.

A more helpful definition of sustainability is found in Hardoy, Mitlin and Satterthwaite (1992). Although this definition was compiled from other sources, it contained elements that are capable of actually being measured so that one could gauge progress. According to these authors, sustainability '1. involves the minimization in the use of non-renewable resources; 2. the achievement of the sustainable use of renewable resources; 3. staying within the absorptive capacity of local and global waste absorption limits; and 4. meeting basic human needs'. There are still at least two major omissions from such a definition. First, there is nothing unique about the role of human settlements in it. Second, it is strictly a static definition in that it does not allow for rising expectations as progress and development occurs.

These constraining factors can be overcome if human settlements are defined as (Choguill, 1999: p. 136) 'sustainable if they facilitate for residents of towns and cities material progress and improvements in personal welfare, over and above basic human needs, while at the same time minimizing the use of non-renewable resources, the sustainable use of renewable resources, and staying within the absorptive capacity of local and global waste absorption limits so that future urban generations can meet their own needs'. It is this definition that will be applied in these observations on Saudi Arabian cities.

The second set of criteria that must be established at the outset is the role and objectives of urban planning. Hall (1985: p. 6) provides a good starting point in stating that 'planning as a general activity is the making of an orderly sequence of action that will lead to the achievement of a stated goal or goals'.

Perhaps surprisingly, there is not all that much urban content in that definition.

To 'urbanize' this concept of planning, the most straightforward approach is to adopt a set of urban planning objectives that have been set out by the World Bank (2002), who state that there are four primary objectives to urban planning:

1. To promote efficient provision of urban infrastructure and allocation of land use, thereby contributing to economic growth.
2. To manage spatial extension while minimizing infrastructure costs.
3. To maintain or improve the quality of the urban environment (including the quality of the housing stock).
4. To preserve the natural environment immediately outside the urban area.

It is difficult to provide better objectives than this list, and thus for the current analysis, they will be adopted.

Finally, with respect to urban policy, a concept that will become particularly important in the companion to this paper where solutions will be considered, the term is defined (Choguill, 2003: p. 261) as 'the set of rules and procedures that urban government personnel follow in managing their territory, raising and spending public money and providing services to residents of the jurisdiction'. The importance of this definition is that it provides the path to achieve the sustainability of human settlements as they have been defined here.

With this rather extensive evaluative framework, attention is now focused on Saudi Arabian cities and some of the problems that have emerged in the last 50 years

The Phenomenal Urban Growth in Saudi Arabia

A good place to start any review of a country's urban situation is to look at the national five-year plans and see what the government itself says about its own urban places. As a result, consider the *Seventh Development Plan's* (Saudi Arabian Ministry of Planning, 2000), Chapter 14, which is concerned with provincial and urban center development. The first problem highlighted in that chapter is the need for further efforts in regional planning, and in particular for spatial diversification. Four very relevant objectives are given:

- To reduce internal-migration which has adverse impacts on major urban centers.

- To protect the environment, preserve bio-diversity and implement national and international environmental standards.
- To develop, organize and coordinate economic activities at the regional level to ensure optimal utilization of economic resources based on the comparative advantages of each region.
- To enhance the role of the development centers and enable them to contribute to the development of the various regions of the Kingdom.

The true revelation behind the thinking on these objectives is found in the two most important policies prescribed: to enhance 'the efficiency of infrastructure and services in rural areas' as a means of slowing down migration, *and* to encourage Saudis 'to take up employment in rural areas through the provision of rewarding job opportunities, material incentives and appropriate living conditions in these areas'.

Interestingly, there is virtually no discussion at all in the chapter of the *Seventh Development Plan* on the five *amanat* cities other than a short discussion about the need for a long-run housing strategy, an issue that will be considered later in this paper. Yet, these *amanat* cities are the location of much of the urban dynamism of the Kingdom. For the record, give your attention briefly to the growth rates of seven large Saudi cities over the period 1974 to 1992 (Table 1):

Table 1. Population change of seven Saudi cities (1974–1992)

City	Annual Growth Rate (%)	Absolute Change in Population
Riyadh	+7.8	+2,110,256
Jeddah	+7.1	+1,485,147
Makkah	+5.2	+589,896
Medina	+6.1	+410,109
Dammam	+7.2	+453,477
Taif	+2.3	+211,264
Tabuk	+7.4	+217,730

Source: Population Census, cited in Alkhedheiri (2002: p. 82)

As Table 1 reveals, the growth of seven large Saudi cities has been nothing short of phenomenal. Rates of urban growth above the natural rate of population increase, which has been about 2.6% per year, indicates a high level of in-migration in all cities except Taif. The final column, where the absolute change is given, highlights the challenge that this increase in population has given to urban managers, as this represents the demand for housing, social and physical infrastructure, and all of the other ingredients that make up the modern city.

Table 2 focuses on three of these cities over a

longer period of time highlighting the extent of the problem. These figures include United Nations projections for future years. From the table it is apparent that the growth has been steady and is still not completely finished, although in the future much of it is likely to be at a lower rate, suggesting the importance of natural increase in the urban population.

Table 2. Past and projected populations (in thousands) of the three largest cities in Saudi Arabia

Year	Riyadh	Jeddah	Makkah
1975	705	584	NA
1980	993	745	NA
1985	1,401	952	550
1990	1,975	1,216	663
1995	2,576	1,468	777
2000	3,324	1,810	919
2005*	3,990	2,139	1,079
2010*	4,587	2,460	1,244
2015*	5,111	2,753	1,399

* Projected

Source: United Nations Center for Human Settlements (1996, 2001).

Finally, just to further emphasize the point, consider the 'urbanization rates' for Saudi Arabia from 2000 along with the projected rates into the future, as given in Table 3. These rates indicate that Saudi Arabia has become almost completely urbanized in a very short period of time.

Table 3. Actual and projected urbanization rates in Saudi Arabia (1975–2020)

1975	2000	2010*	2020*
58.7%	86.2%	90.0%	91.6%

*Projected

Source: United Nations Center for Human Settlements (1996, 2001).

The interesting question, of course, is why this phenomenal urban growth has occurred. There are obviously at least three reasons for this migration.

First, beginning in 1912, King Abdulaziz initiated the *hijar* program aimed at the permanent settling of the Saudi *bedouin* population. Although it may have started primarily as a means of controlling religious militancy, it soon extended into agricultural development and picked up speed as a result. Hence by 1982, there were 4,020 *hijar* settlements in Saudi Arabia (Alkhedheiri, 2002: p. 73).

The second stimulus of migration was the Saudi oil boom which lasted roughly from 1974 to 1986, which literally transformed the Saudi economy, turning this rather poor desert Kingdom into one of

the richest nations in the world. According to Hayes (1980), during this period Riyadh was expanding so quickly as residents of rural areas moved to the city to participate in the new riches that the city was described as 'moving northward' at a rate of 2 miles per year. From 1974 to 1980, car registrations in Saudi Arabia increased by a factor of 10, and the demand for electricity rose at 50% per year.

The third reason for the shift was concerned a change in the Saudi lifestyle that accompanied all of the other impulses for growth. Although there are very few studies of Saudi migration over this period, there is one from 1995 (El-Sakran, 1995) which tries to identify why people actually moved to Riyadh. The findings of this study reflect the results obtained in many other studies from diverse countries around the world, although the figures themselves are rather surprising. In the Saudi case, 17% moved because of lack of job opportunities in the smaller towns from which they came, 5% because of a lack of educational opportunities, 4% because of unfavorable economic conditions, and a massive 75% for 'no specific reason'.

This 'no specific reason' sums up many of the limitations that exist in small towns. Small towns are generally based on something to do with agriculture. Agriculture is hard physical work, and given the potential alternative of pursuing a job that potentially relies more on brain than on brawn, when coupled with the lure of free housing plots from municipalities and no-interest mortgages from the Real Estate Development Fund which were available at the same time, it is hardly surprising that the rate of growth in Riyadh, as well as other Saudi cities, was so great.

Can Saudi Arabian Urban Migration Be Slowed Down?

This somewhat superficial review of past Saudi urbanization trends augers poorly for the objectives of stemming further rural-to-urban migration as stated in the *Seventh Development Plan*. Most of the potential migration has already largely taken place, and when coupled with the extremely high birth rates here in Saudi Arabia, further rises in the urbanization rate seem inevitable. Any hope of, as they say, 'keeping them down on the farm', by building some infrastructure and encouraging the private sector to provide employment opportunities, seems ill-fated.

A similar observation might be made concerning a supporting document, the *National Spatial Strategy*

(Saudi Arabian Deputy Ministry of Town Planning, 2001). This well written and theoretically perceptive document may have as many implementation difficulties within this domain as the National Plan.

Restraining migration, or even reducing the flow, is a difficult objective to achieve. Studies of small town development programs as a means of stemming migration in countries such as Malaysia, Tanzania and even in the USA are little more than a waste of money (Choguill, 1989). Only the Chinese and South Africans have succeeded in keeping people in the rural areas and out of the cities, and once the almost draconian laws preventing migration in these two countries were relaxed, in both, rural residents flocked to the cities, even if they knew their lifestyle would be no better, and probably worse, than in the villages.

Work on growth poles (Choguill, 1974; 1977), a popular policy not just in Saudi Arabia but in other countries as well, has revealed that towns with populations of less than 25,000, which of course make up the major source of migration to Saudi Arabia's big cities, have virtually zero chance of capitalizing on employment-creation growth impulses unless they are based on an abundant supply of natural resources or are subsidized over the long-term by a generous government.

Yet, these are really issues for the future, whereas the emphasis in this analysis is with the past. Return to the 1950s and 1960s, but particularly in the 1970s and 1980s, as this was the time that rural Saudi Arabia moved to the city. This leads to a second set of problems: the style of planning adopted by Saudi Arabia in the late 1960s, but one which in a similar form continues today.

Planning in Riyadh

In 1968, the decision was made to invite Constantinos Doxiadis to come to Riyadh and to prepare an urban plan for this city that was about to take off into astronomical growth. Some consider it strange that a modernizer such as Doxiadis would be invited to what must have been rather a traditional, almost sleepy, Arabian small town, to prepare an Ekistics-style master plan (Doxiadis Associates, 1974). Yet, given the poor state of services in Riyadh at that time, and the desire on the part of many decision-makers who were also modernizers to push hard to get Riyadh into the 20th century, the Doxiadis invitation was a rational one within the contemporary

timeframe. In one sense it was unfortunate that the invitation was made in 1968, rather than 1978, as by the latter date, the pattern of growth of the 'new Riyadh' was beginning to take shape. However, 1978 may have been too late to catch up with the planning backlog, and it was certainly too late for poor Mr. Doxiadis, who died in 1975.

Riyadh's first master plan was approved by the Council of Ministers in 1973 (the most extensive analysis of the Doxiadis plan is found in Al-Hathloul (1996), especially Chapters 5 and 6. The plan projected, and hence guaranteed, growth in a northward direction from the existing old city, with expansion constrained on the west by the Wadi Hanifah. The Doxiadis Plan was based on the concept of the superblock, a grid arrangement of 2 x 2 km² squares, extending around a linear north-south spine. It has been suggested that the 2 km² squares were an effort by the planners to replicate the Arabian village, and that each block would be supplied with a set of shopping, religious and other necessary facilities. The blocks themselves were to be divided by major east-west and north-south arterials that would provide the linkages between the blocks.

The land-use system proposed called for industrial areas to the southwest of the city, with the upper-income, commercial and administrative activities congregated in the northeast (Al-Mubarak, 2004: p. 580), thus effectively dividing the city into two sections based on income and class.

The grid and the high-speed arterials were obviously the major building block of the Doxiadis system, creating patterns that could be endlessly repeated as the city absorbed more and more population. The Riyadh grid was not a Doxiadis invention. It had been used originally in Aramco workers' settlements in the Eastern Province (Al-Hathloul, 1996: pp. 149-57; Al-Mubarak, 1999) and later in 1953 for housing developments in Al-Malaz that were designed to provide pleasant suburban accommodation for civil servants transferred to Riyadh from Jeddah and Makkah (Al-Hathloul, 1996: pp. 163-7; Al-Mubarak, 2004: pp. 586-7). Still, it was central to the Doxiadis plan not just in Riyadh but in all of the cities for which he provided plans.

A lasting legacy of Doxiadis was the Saudi 'villa'. Although this too can be traced back to the Al-Malaz development, the Doxiadis blocks, square plots, and suggested planning ordinances were ideally suited to further extension of this style of living, something that Saudis took to enthusiastically once the oil boom

of the next decade got fully underway (Al-Hathloul, 1996: pp. 167-77).

Another interesting aspect of the Doxiadis planning process was the inclusion of greenbelts to protect and limit the growth of his cities. The green belt in Riyadh never stood a chance, as the northward expansion of the city overran it within a very short time. Riyadh's fashionable Olaya Street running north from the original city transverses what used to be the 'green belt'. How ironic.

The Doxiadis plan was obviously thought of as a sign of modernity being introduced into the urban scene in Saudi Arabia. In many ways, Doxiadis epitomized the western, 'modernist' urban planning model. Without doubt he subscribed to the four objectives of urban planning listed at the beginning of this presentation. There is, however, a problem with the Doxiadis approach or that SCET plan (SCET, 1980) that expanded Doxiadis and provided a basis for implementation. The entire approach was totally foreign to the Saudi culture and mentality, and once it was established in an irrevocable way, many Saudis began to question this non-traditional approach.

If Saudi Arabians were given totally free reign to plan Riyadh, what would it look like? Although it is dangerous to speculate about what might have been, there are a few guides to lead us in such a quest (see, for example, Eben Saleh, 2001, 2004; Soliman, 2002; and Bianca, 2000). Remember, however, that one characteristic of the average Saudi Arabian is a fondness for technology, whether it be in the form of mobile phones equipped with cameras, flat screen television sets designed to download transmission signals from overhead satellites signals or the latest 8 cylinder 400 horsepower motorcar. In other words, there has been from the beginning an inherent contradiction between the strict interpreters of Islam, and sincere desire of many in this country to modernize, whatever that might mean.

Still, one can hypothesize that most Saudis at the time of Doxiadis would have expected the planners to produce a document that is provided for housing units that afforded the privacy and security that Islam demands, a non-geometric design of street layouts that included a hierarchy of streets, alleyways and dead end streets and a land-use pattern focusing on the mosque and other community facilities.

Inherently, these two concepts of urban planning are in conflict. Doxiadis did his thing, conforming to local cultural norms to the extent that he understood them, and the Saudi urban residents then proceeded to

adjust it to meet their own needs, and it is this incompatibility that has led to many of the problems that are plainly apparent to any observer of the Saudi Arabian urban scene.

The Problem of an Expanding City

As an example, consider the spatial expansion of Riyadh about which so much concern has been expressed by planners. In 1950, the city was constrained by its traditional defensive walls, and amounted to only about 1 km². Then came the growth phase, and the city currently occupies nearly 2,000 km², which is said to be larger than the spatial extent of Los Angeles in the USA.

Now if this figure is correct, and given the dynamic nature of spatial extent, it is unlikely to be all that precise, then the gross density of Riyadh must be about 1,662 persons to the km². How does this compare with other cities in the world? Quite favorably actually. Manila, for example, has 46,000 persons per km² while Recife, Brazil has 6,230 (United Nations Development Program, 1994). Although these may not be either typical or comparable with Riyadh, they do at least give some idea of general magnitudes.

Planners say that low densities result in a number of undesirable outcomes:

- Infrastructure is more expensive on a per household basis as more pipe or road or wire is needed to hook up the entire city.
- Congestion on the road system is more likely because if residences and workplaces or shopping facilities or social attractions are widely separated, which they are likely to be in low-density situation, more trips will be generated to more places.
- More social infrastructure, such as health and education facilities, are needed because of the limited distances that the sick and the infirm, or young children, can be expected to travel to such establishments.

In order to cope with such problems, urban authorities in Saudi Arabia have gone to great efforts to develop and implement urban growth boundaries on the 100 largest cities and towns in the Kingdom. As Al-Hathloul and Mughal (2004: p. 621) have reported that the objectives of this exercise were '(a) to control urban sprawl by encouraging infill development within the planned area; (b) reduce cost of the provision of infrastructure through better coordination between its provision and urban

development plan, and (c) maintain natural environment particularly around the cities through preservation measures'.

Phase I boundaries were imposed to limit growth during the period 1985 to 1995. A larger area was delineated to accommodate growth expected between 1995 and 2005. Finally, the area beyond the 2005 limit was designated as an urban protection zone, reserved for future urban expansion if required.

Has the policy been effective in limiting the growth of the Kingdom's urban areas? Al-Hathloul and Mughal (2004: pp. 620-2) state that the objectives of the exercise have been met, although to varying degrees, while reinforcing their views with virtually no empirical evidence. They do suggest that the enforcement of the boundaries in the three metropolitan cities of Riyadh, Jeddah and Makkah could have been more effective. The most interesting issue that could be readily researched is whether there has been any increase in the utilization of existing infrastructure and whether, as a result, this has led to greater efficiency in terms of lower capital and operating cost per household.

Another sensitive issue in the urban boundary policy is that although restrictions were placed on the supply of government-provided infrastructure prior to certain dates, that did not preclude private developers from providing the infrastructure themselves to their new developments beyond the appropriate boundary.

Al-Hathloul and Mughal appear to conclude that in most places, the policy worked, yet this is hardly unexpected. Of the 100 largest cities in Saudi Arabia, it would be greatly surprising if real urban growth pressure existed in more than 30 of these cities, almost guaranteeing that land in the remainder would not be subject to enormous growth pressure, whether the policy was effective or not. It appears that no comprehensive analysis of this policy has been made, or if it has been carried out, it is not available to the general public.

A major problem with any policy of this sort is that although urban boundaries and restrictions on development sound like a fine idea, too often they come to be seen as minimum boundaries rather than maximum. Hence, when 1995 rolled around, and development was permitted in the Phase II land, still as much as 30% of Phase I land was vacant (Al-Mubarak, 2004: p. 585), but still emphasis shifted to another area rather than concentrating on utilizing areas nearer to the city center.

There is, however, one additional issue associated with the urban growth boundary policy as it was formulated that deserves attention. This refers to the respect for the urban protection zone beyond the 2005 boundary. Recall that one of the primary objectives of urban planning as outlined at the beginning of this paper was to preserve the natural environment immediately outside the urban area, or translated into the context of Riyadh, in the urban protection zone. Unfortunately, many of the raw materials needed to create the modern city come from this so-called urban protection zone. The appetite of villas for natural resources, particularly the high-quality limestone that occurs in the geological formations immediately outside the city of Riyadh, is colossal. As a result, much quarrying has taken place with no restoration upon the completion of mining operations. As a result, much of the countryside around the city has been destroyed, which was hardly the intention when the urban protection zone was established. To anyone who has ventured into these peripheral areas, it is apparent that there has been a very unevenly matched conflict of two forces: environmental preservation and rapid urbanization. In fact, if the urban preservation zone beyond the 2005 boundary is not protected sufficiently, then everything in this zone is going to end up in the walls of someone's villa in Riyadh, and future generations of Saudis will be the losers.

But then, perhaps, here again is evidence of the conflict of Saudi culture and Doxiadis-type plans. If indeed privacy is the prime motivation for moving further and further out of the city, one can hardly then complain about the problems with urban sustainability, using the definition outlined at the beginning of this paper. It is tempting to hypothesize that one motivation for moving out, and thereby expanding greatly the spatial extent of Riyadh, is the quest to find cheaper land. Yet, from what little information is available on this topic (Telmehani, 1995: pp. 192-6), if anything this distant land can be even more expensive than land closer to the city. If so, it seems that the pursuit of privacy overrides other considerations, the Saudi Arabian way of coping with Doxiadis-type plans.

Before leaving the density issue, it is important to note that sustainability and density are intimately linked. At some stage, this issue will have to be addressed if urbanization in the Central Arabian Peninsula is to survive.

The Problem of Water

There is, however, another issue that is perhaps more worrisome even than that of density. That is the availability, or perhaps one should say the lack of availability, of water. Saudi Arabia is famous for this problem and it is indeed a very serious one.

At one stage, given the very limited usage, Saudi Arabia was blessed with abundant underground water resources. Agricultural production has, however, significantly reduced this resource in a relatively short period of time. Consider, for example, the situation in the central province of Qassim, famous for aerial photographs of green circles of wheat and alfalfa that have been irrigated by a sprinkler system. The water for this wheat comes from 'fossil water' from two Ordovician (meaning that the water being used on today's wheat and alfalfa is 500 million years old) aquifers that underlie Qassim, the Saq and the Tabuk. Moving further south, into Riyadh province, farmers exploit the Minjur aquifer from the Triassic (220 million years old). The three aquifers that lie under Central Saudi Arabia have three points in common. First, virtually all of the water being pumped from these aquifers, fully 91%, is used for agriculture. This leads to unexpected results, as in 1992 Saudi Arabia was the sixth largest wheat exporter in the world, selling a product that at that stage cost 4 to 6 times the world price to produce (Shetty, 2001) given that it was based on irrigation water, and was only sustainable if farmers were given the water for free.

The second point is that the recharge rate of the aquifers is far less than the usage. The FAO (2004) estimates that water withdrawal in Saudi Arabia is 955% of renewable water resources. Basically, that means that every year the Kingdom uses from underground sources 10 years of water recharge, obviously a non-sustainable situation.

The third point is that if Saudi Arabian water use remains unchanged, then given the underground water reserves, this author's calculations based on some rather heroic assumptions suggest that the aquifers could be expected to begin to dry up anytime between 2023 and 2034. Obviously, problems will arise in some areas sooner than others, but the conclusion has to be that like petroleum, water is a finite resource.

As a result of high rates of urbanization, the relative shortage of underground water and the high cost of developing what underground water that there

is, Saudi Arabia has necessarily turned to other sources of pure water in recent years. The Saudi Seventh Development Plan (Saudi Arabian Ministry of Planning, 2000) estimated that by last year (2004), the urban water requirement would be 5.5 million m³ per day, an amount that represents about 10% of the total consumption when agriculture and industry are taken into account. Domestic water is increasingly obtained through the desalination of sea water.

To meet this need, in 1973, Saudi Arabia created the Saline Water Conversion Corporation, which is now one of the largest industries in the country. Saudi Arabia is the largest producer of desalinated water, producing 30% of the world's total, with operations on both the Red Sea and the Arabian Gulf. Because of the multistage flash technology employed, the desalination process produces about 18% of the nation's electricity.

Although the Saline Water Conversion Corporation has proven the existence of significant economies of scale in water purification, with the cost of plants with a capacity of 100,000 m³ per day costing less than SR 2 per m³ and plants with a capacity of 1 million m³ per day expected to lead to costs of SR 1 per m³, the purified water still has to be transported to inland locations for consumption. This final transport stage is expensive, greatly adding to the cost and making the water more expensive than ground water sources. Eventually, as groundwater becomes more expensive, the downward trend of costs of desalinated water, as a result of bigger plants and better technology, will move closer to the upward trend of groundwater costs due to the need for deeper wells and more difficult extraction. Although it is difficult to put a cost figure on desalinated water compared to groundwater (this depends on the technology and scale of desalination plants, the difficulty of obtaining groundwater but also the cost of purifying it if required), it has been estimated (Murakami, 1995) that the unit water costs of desalination are 5 to 10 times as high as those of conventional water resources development.

Still, Riyadh, for example, according to the Arriyadh Development Authority (2005), gets roughly two-thirds of its water from the desalination plants in Jubail by a 450-km pipeline, and about one-third from a variety of sources here in central Arabia that, as noted above are finite, in that unless a major national policy change occurs soon, the groundwater will run out due to high agricultural use. Riyadh's freshwater sources include dams in Hair, Laban,

Namar, Olab and Wadi Hanifa, the 18 wells of the Bowaib Water project, the 62 wells of the Wasei' Water project, the wells and a desalination processor in Salboukh and the 65 wells from the Al-Hunayy Water Project (Saudi Arabian Information Resource, 2005). Some of these, such as Wasei' and Al-Hunayy are over 100 km from Riyadh, suggesting high transport cost.

Riyadh's per capita water consumption is high by international standards, as it currently stands at about 303 liters per person per day, compared to European consumption rates of less than 200 liters per person per day (World Bank, 2005). This may, of course, reflect the climatic differences, but unfortunately probably also reflects the high demands of many palm trees throughout the city that are very thirsty. Still, water consumptions rates are improving, down from 517 liters per person per day just 15 years ago.

When the cost of water is taken into account, the sustainability of the entire water operation is called into question. The cost of water in Saudi Arabia, because of generous subsidies, does not exceed 15 halals (SR 0.15) per m³ until water usage surpasses 500 liters per day (500 liters is ½ m³) (World Bank, 2005). As a result, there is little incentive to reduce wasteful water use. The discrepancy between the cost of producing desalinated water (no less than SR 1 per m³ plus transport) and the sales price is plainly apparent. The apparent subsidy to water consumers in Riyadh is the equivalent to 300% of the desalination cost plus the cost of transport by pipeline from Jubail to Riyadh. How long can any government continue this kind of activity? Yet, any attempt to reduce the subsidy might well result in the same thing that happened after an attempt to remove subsidies from electricity in April 2000: the rate rises were reversed in October of that year after strong public opposition.

Presumably one result of this pricing system is that in fact most Riyadh homes do not receive water from the municipal system on a regular basis. A Zogby poll (Zogby International, 2001) revealed that only 9% of Riyadh homes receive a continuous flow of municipal water daily. Another 12% receive a continuous flow about every other day, 20% say three days a week, and 7% say once a week. The remainder were either not sure (84% use pressure pumps to make the water flow to overhead storage tanks) or had a different timetable from that presented in the questionnaire.

There would appear to be physical planning implications in the water supply given that one-third

of Riyadh's water supply comes from very finite freshwater supplies, while two-thirds are supplied at a highly subsidized, and hence non-sustainable, rate. Population limitations would seem to be essential unless technological breakthroughs in desalination methodology occur at an unprecedented rate. Alternatively, the national spatial plan should perhaps emphasize even more the importance of the east and west coast development corridors at the expense of the north-south corridor based on Riyadh.

The Problem of Congestion

Another result of the Doxiadis plan for Riyadh is the emphasis on personal transportation by motorcar, and the provision of long, straight roads to make this feasible. As a result of the extent of the city, everyone drives, and it is estimated that 92% of all personal trips take place by car, with the number of car trips made increasing year by year. A few years ago, Arriydh Development Authority (1987; 1996) reported that between 1987 and 1995, vehicular trips rose at a rate of 9% per year. The more recent Seventh Development Plan (Saudi Arabian Ministry of Planning, 2000: p. 7) has predicted that over the five-year planning period from 2000 to 2005, the demand for intra-city transport in major cities and population settlements will rise at an annual rate of 3.3%. The inevitable result of this set of circumstances is congestion.

Again, this is a particularly relevant issue in Riyadh. As Al-Mosaind (1998) has noted, the two major radial freeways, King Fahad Freeway and Makkah Freeway reached their designed capacities of 160,000 per day two years after their completion in 1991. As a result, many segments on these two roads are at a standstill not just during rush hours, but at frequent other times of the day. And, given the likelihood of Saudi drivers to run into each other, scattering parts of their very expensive vehicles and themselves all over the road, thus seriously disrupting the traffic flow, it is not just road capacity that contributes to congestion.

The obvious answer to this problem is investment in public transportation. A few years ago, the public bus company, SAPTCO, did indeed attempt to establish certain set bus routes within the city. The project failed because of low usage. The result was that the routes were left to private minibuses that operate on popular routes, stopping at any time they see a passenger, disrupting traffic flow in the process.

These minibuses are not all that different from the 'informal' transport facilities that occur in other parts of the world. Owned entirely by the private sector, they operate under such titles as *dolmuşes* in Turkey, *jeepneys* in the Philippines, *putt-putts* in Thailand and *mammy wagons* in much of Africa, although it is unlikely that Saudi Arabians would like to be placed in this category of nations.

A quick look inside the Riyadh minibuses is enough to give some idea why SAPTCO's effort at public transportation here in Riyadh failed. The only riders of the private minibuses are expatriate men. It seems that Saudi men are so pleased with their cars that when given the choice, they would never utilize public transportation. Although it would seem a natural to let the women take the bus if 'women-only' buses were available, such is not the case, as the average Saudi male would rather pay for a second car and an underutilized driver from Pakistan or the Philippines, thus causing foreign exchange loss to the country, than allow his women to travel alone on public transport and run the risk of having contact by some man other than the husband or guardian. Again, privacy conflicts with planning efficiency.

An interesting recent development is the announcement that work will soon begin on a light rail system which will follow two routes: a north-south line along Olaya and Bat'ha Roads, and an east-west line along King Abdulla ibn Abdulaziz Road. Given that the two lines both during and after construction will further congest these two very important arterials, reducing capacity significantly, and given that under present cultural assumptions the only potential passengers will be expatriate males, and then only if the light rail system can under-price the private minibuses, which seems unlikely, the proposed light rail system appears to be a very expensive white elephant. Surely further investment in buses and bus route infrastructure by SAPTCO, even if not financially remunerative, is at least cheaper than the light rail system. After all, subsidized buses surely cannot be more expensive than subsidized water.

Problems on the Horizon for Housing

The final issue to be considered in this paper is one that might surprise many in Saudi Arabia: housing. Again and again it has been stated that Saudi Arabia is unique among countries in that it does not have a housing problem (for example, see (Al-

Hathloul and Edadan, 1995: p. 158; Al-Hathloul and Mughal, 1991: p. 269)). In fact, it is frequently said that there are empty houses just waiting for someone to move in to. Although this may have been true at one stage, this is likely to become quite a serious problem in the future.

If one reviews the housing development history of Saudi Arabia over the last 30 years or so, it is apparent that there have been some notable achievements. In the early 1970s when migration to the larger cities of the Kingdom really got underway, the government took two very generous steps. First, the government, through the municipalities, gave free land plots to people who needed them to build their houses. Second, with the establishment in 1974 of the Real Estate Development Fund (REDF), loans were granted to people to build houses on these plots. REDF plots were subsidized in two ways: they charged no interest, and early repayment gained the borrower as much as a 30% deduction in the amount due to repay the loan.

There is little doubt that these twin programs were extremely productive in facilitating a housing boom in Saudi Arabia that lasted well into the 1980s. Furthermore, the REDF is thought to have had a significant affect upon the physical shape of cities, such as Riyadh. Telmesani (1995: p. 188) has demonstrated that the effect of REDF loans has been to significantly increase 'housing consumption levels for middle and lower income households in a manner disproportionate to their income level, and hence allowed them to join upper income households in lower density suburban areas, where larger and higher quality single-family units can be built'. The low gross densities which result, contribute to the very low housing densities that exist in Riyadh, estimated at three dwelling units to the hectare (Telmesani, 1995: p. 196). Furthermore, the REDF scheme, to some extent, reinforced the social segregation in Riyadh that we noted earlier, with the poorer families clustered more to the southeast of the city, while the higher income families are found to a large extent in the north of the city.

Unfortunately, as a result of the low rate of payments on the loans made by the REDF, the institution has become increasingly irrelevant with time. At present, it is estimated that the waiting list for a REDF loan something over 10 years. This effectively cuts off many otherwise eligible borrowers from REDF loans, forcing them to obtain funds through the commercial banking system at

much higher costs.

In talking with younger people in Riyadh, one hears repeatedly that they feel they cannot afford a house, certainly not one of the spatial extent of their parents. Given the current statistical situation here in Saudi Arabia, it seems inevitable that in the future this situation will intensify. Consider the following:

- According to the UNDP Human Development Report (United Nations Development Program, 2002), GDP per capita in Saudi Arabia has declined by an average of 2.5% per year between 1975 and 2002.
- According to Judith Kipper, writing on behalf of the US Council for Foreign Relations (Kipper, 2002), whereas Saudi per capita income was about \$ 16,000 in 1974, it has dropped to only about \$ 6,000 today.
- One result of the slowdown in personal incomes while at the same time living in a consumer oriented society is the calculation by Euromonitor International (2002) that between 1998 and 2002, consumer indebtedness in Saudi Arabia has increased 368%.
- The Seventh Development Plan (Saudi Arabian Ministry of Planning, 2000) predicts that by 2020, the population of Saudi Arabia will be 29.7 million, representing nearly a 90% increase over the first two decades of the century.
- Already the Census reveals that half of the Saudi population is 18 and below, while the average number of children per woman is seven, suggesting that there is no foreseeable slowdown in the rise in the Saudi population.

Despite straightened circumstances, there is virtually no discussion about the need to move to smaller villas and higher density apartments. If such an issue is raised, the standard reply is that it is not compatible with the need for privacy in the Saudi society.

Conclusion

In this paper, consideration has been given to five of the most obvious problems that have accompanied the very rapid increase in urban population in Saudi Arabia: uncontrolled (and probably uncontrollable) urban expansion, an approach to urban planning that was in many ways alien to the society, the problem of providing water to cities in the middle of a desert, traffic congestion and future difficulties that are likely to arise in providing housing to all Saudi

Arabians. In many ways, the Kingdom has coped remarkably well with these problems. Although a number have not been solved, they have been at least accommodated, and as a result it has been accepted that the battle will continue to be fought with such issues in the future.

There is, however, a problem with this approach. One reason that such problems have been accepted has been the faith in the international oil markets, or as in the words of observers a few years ago: 'although petroleum may be only \$ 10 a barrel today, we know surely that within a couple of years, it will be at least \$ 55, and as a result, the future income stream from its exploitation will buy the Kingdom out of whatever difficulties may arise'. It is sometimes difficult to remember that petroleum, like water, is a finite resource. It will not last forever, and when that special store of value that has come in so handy in the past begins to run down, then many very hard decisions are going to have to be made, and almost certainly, certain policies that are at present accepted as part of the ethos of Saudi Arabia may have to be adjusted.

Certainly, much that has been discussed in this paper cannot be thought of as sustainable, at least not in the sense of the definitions presented in the introduction. Renewable resources are being exploited at a far faster rate than they are being replenished by nature. No effort is being made at all to minimize the use of non-renewable resources. Given the delicacy of the local desert environment, local waste absorption limits are being exceeded, and when coupled with the vicarious demands of the building supply industry, the ecological footprint, to use Rees' (1992) term, of Saudi cities is expanding at what is probably an unprecedented rate. Rising expectations lead to increasing levels of consumption, even when personal incomes are in fact declining. Trying to fudge the sustainability criteria by adjusting the definition or ignoring certain unfavorable aspects of urbanization is just not acceptable. Sustainability is like pregnancy, either you are, or you are not.

Similarly, Saudi Arabian planning practice has been seen to be somewhat disappointing, particularly when compared against the four objectives of physical planning listed at the beginning of this paper. The efficient use of infrastructure, because of urban expansion, has fallen short of the ideal. The spatial extension of urban areas has not been contained. Environmental degradation has occurred within Saudi cities despite the heroic efforts of many

expatriate laborers. Little or no effort has been made to preserve this natural environment despite its unique qualities.

In the second paper, an effort will be made to introduce certain solutions to some of the most pressing issues that have been faced by Saudi cities. No effort will be made in that paper to offer solutions to all of the problems. Quite frankly, Saudi problems must be solved by Saudis, which must be the truest form of Saudization imaginable. It is possible, however, to suggest certain routes that can be followed in seeking solutions. They have worked in other places, why not in Saudi Arabia?

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مسح ميداني للمشاكل الحضرية في المملكة العربية السعودية

تشارلز إل شوجيل

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جامعة الملك سعود، الرياض،

المملكة العربية السعودية

(قدم للنشر في ١٩/٤/١٤٢٦ هـ؛ وقبل للنشر في ٢٤/٤/١٤٢٧ هـ)

ملخص البحث. تحولت المملكة العربية السعودية من مجتمع بدوي إلى مجتمع حضري في فترة أقل من نصف قرن. ونجم عن ذلك التحضر المضطرب ظهور عدد من المشاكل الصعبة المتعلقة في هذا التطور العمراني المذهل. وهدف هذه الورقة هو دراسة المسببات الرئيسة وتطویراتها على خمس مشاكل عمرانية أو أكثر: النمو الحضري (الغير ممكن السيطرة عليه)، وتطبيق ما هو معروف بالشكل الدخيل على التخطيط الحضري، ومشكلة توفير المياه للعدد المتنامي للسكان الحضري.

وسوف تتم دراسة هذه القضايا في ضوء مصطلحات يتم تطويرها من خلال المستوطنات البشرية المستدامة، إضافة إلى أهداف التخطيط الحضري والسياسات العمرانية. وسوف يتم مناقشة حلول خاصة لهذه المشكلة في ورقة بعنوان "البحث عن حلول للمشاكل الحضرية في المملكة العربية السعودية".