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Assessing the Urban Sustainability of Riyadh[(1)]

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Abstract. Applying quantifiable criteria to the measurement of the sustainability of human settlements is harder than it initially appears. This paper develops a working definition for the sustainability of human settlements, testing it against the current situation in Riyadh, Saudi Arabia. Riyadh's apparent sustainability only exists because a cross-subsidy exists between one set of urban and/or economic activities (certain urban services) and another (petroleum). This means that the standard for economic sustainability developed is not being met. If indeed a subsidy is involved in maintaining sustainability, then there is a need to adopt various urban policies to reduce superfluous consumption to bring the city back into sustainable equilibrium. An estimate of Riyadh's 'ecological footprint' is used to reinforce the analysis.

Introduction

Sustainability is a much more complex topic to apply in practice than it first appears. Virtually everyone is familiar with the definition of sustainability used by the World Commission on Environment and Development in their 1987 study (WCED, 1987: p. 8), that sustainable development means meeting 'the needs of the present without compromising the ability of future generations to meet their own needs'. Actually, operationalizing this definition and applying it to real-world human settlements situations, however, is much more difficult than one might expect.

The objective of the present paper is to develop a working definition of sustainability of human settlements and then to apply it to the Saudi Arabian capital city of Riyadh. Although this paper will not provide an indisputable answer to the perplexing question of the sustainability of Riyadh, the paper will pose certain questions which, if they can be answered, may lead to such an answer.

The concept 'sustainable development' was initially conceived as a term most relevant to macro economic development (International Union for the Conservation of Nature and Natural Resources, 1980). It is only more recently that it has been applied to a consideration of the quality of development in human settlements (Choguill, 1999: p. 133). Given the world record with respect to urbanization, and the fact that it is in cities where the greatest resource use occurs and from where the most waste products, that is pollution, are generated, it is rather surprising that it has taken so long to apply this important concept to urban areas. It must be remembered that whereas in 1960 there were only 52 cities with 1 million population (UNCHS, 1987: p. 29), by 2015, it is expected that it will be 358 (UNCHS, 2001: p. 3). Overall, world urbanization is expected to increase from 47% in the year 2000 to just under 56% by 2020 (UNHSP, 2003: p. 246). If this world is to survive for the enjoyment of these generations, it is high time to organize a way to insure that cities are indeed sustainable, on the assumption that it is possible to unambiguously define this important concept.

The reason that this is such an urgent issue is that the world's population has increased from 4.1 billion in 1975 (UNCHS, 1996: p. 440) to 6.1 billion in 2000 (UNHSP, 2003: p. 246). In today's world fully 2.8 billion people live in cities (UNHSP, 2003: p. 246) compared with only 1.5 billion as recently as 1975 (UNCHS, 1996: p. 447). This means that in just 25 years, the number of urban residents have increased

(1) This is a slightly revised version of a keynote paper presented at the Jeddah International Urban Forum and Exhibition, 17 April 2006.

by over 1.3 billion. In the abstract, this number may not be very frightening, but it is necessary to remember that this represents the number of urban people that need to be fed, clothed, housed, employed, watered, sanitized, educated, kept healthy, transported and governed. If it is impossible to determine a way to do this in a sustainable manner, the future of urban life on earth looks pretty grim.

What is needed in order to cope with the urban problems that exist and will continue to exist is a set of policies to guide future urban administrators. These policies can only be identified if they can be placed within the framework of the sustainability of human settlements. Thus, this quest toward a workable and operational definition is more than just an academic exercise. It is a guide to urban survival.

Defining Sustainability of Urban Settlements

So, how does one move from assessing the concept of sustainable development to assessing the sustainability of human settlements in order to reap the benefits that go with sustainability? If the concept of the 'sustainability of human settlements' is to have any meaning at all, it must be defined to include staying within the absorptive capacity of local and global waste absorption limits (Foy and Daly, 1992: p. 298), the achievement of the sustainable use of renewable (Daly, 1992: p. 253) and replenishable (Rees, 1996) resources, the minimization in the use of non-renewable resources (El-Serafy, 1989) and meeting basic human needs (Hardoy *et al.*, 1992). Thus, overall sustainability is only achieved if the economic, environmental, social and human sustainability criteria are met (Choguill, 1993; Goodland, 2002).

Examine more closely the parts of this preliminary definition as certain elements of it will be particularly important in the Saudi Arabian context. Focus first on the absorptive capacity of local and global waste limits. Every city uses economic and human inputs and transforms them into basic (and sometimes not so basic) human needs and waste. The waste, in the form of carbon dioxide, nitrogen oxide, mercury, organic waste, builders' rubble, and many, many other undesirable by-products are churned out from the urban productive units and deposited, either intentionally or unintentionally, into the air, land and water above, around and even below the city. Although nature is remarkably resilient in absorbing and purifying many of the urban pollutants, in some cases, the absorptive capacity of nature is overwhelmed, and the surrounding vicinity and areas even much further away are destroyed. Proper managing of such waste is a sustainability requirement that must be included in the present definition.

The achievement of the sustainable use of renewable and replenishable resources is one of the most sensitive and frequently violated components of the sustainability definition. Forests, food and certain fuels can be considered to be renewable in the sense that they are self-producing and self-maintaining, dependent on the sun and photosynthesis. The harvesting of timber for urban construction from forests should be done in a renewable manner, with no more being cut in a period than is re-planted.

Water is somewhat more complex as it must be considered replenishable, that is, for example, that underground aquifers and rivers are dependent upon the accumulation and redistribution of, say, various forms of precipitation. The extraction of water from such sources must not surpass their recharge rate. In the case of underground aquifers, determining what can sustainably be used may require considerable research.

Striving to minimize the use of non-renewable resources is merely a shorthand way of stating a much more complex rule, and one that is very relevant to Saudi Arabia. As suggested by El-Serafy (1989), the sustainable production of non-renewable resources, such as fossil fuels, leads to two types of revenues for the producer. Although producers can use a part of this revenue to support unrelated consumption, the second part, referred to by El-Serafy as the *user charge*, must be devoted to developing replacements for what is being depleted if sustainability is to be achieved and maintained and must not be invested in any other activity regardless of its profitability. In the purer non-renewable resources, their future extraction rates should not exceed the gains that have, over the longer term, resulted from increases in efficiency of use and recycling of these resources.

The meeting of basic human needs is what distinguishes this preliminary set of concepts from a mere consideration of environmental sustainability and transforms it into something which, with further development, may well be applicable to human settlements analysis. Human beings are a part of the system, and have requirements like every other part of the system. If these are not met, then the human

race will disappear, a glaring case of non-sustainability.

In fact, it was the inclusion of this key requirement that first broached the divide between the environmentalists and the urbanists. Mustafa Tolba (1987), head of the United Nations Environment Program, observed that sustainable development necessarily included:

1) 'help for the very poor because they are left with no option other than to destroy their environment;
2) the idea of self-reliant development, within natural resource constraints;
3) the idea of cost-effective development using different economic criteria to the traditional approach; that is to say development should not degrade environmental quality, nor should it reduce productivity in the long run;
4) the great issues of health control, appropriate technologies, food self-reliance, clean water and shelter for all;
5) the notion that people-centered initiatives are needed; human beings in other words, are the resources in the concept.'

Thus, in a single step, the environmental concept of sustainability was extended and linked to economic production, social elements and the human side.

There is, however, another important element that needs to be cautiously included. As a country develops, the first step on the path of improvement may be merely subsistence. No nation wishes, however, to be frozen at this point of the development process, particularly when other nations of the world are already well past that early, basic stage. Therefore, there must be a dynamic element in the definition (Choguill, 1999: pp. 136-38). Societies move from survival sustainability to something at a higher and more humanly appealing level, realizing continually that each time economic progress occurs within a nation or city, the opportunities for truly sustainable development open to the residents of other nations and cities may be constrained. The extent of this constraint is determined by the amount of carrying capacity that various nations, particularly the rich nations, are willing to shift to the poor. In other words, at some stage in the development process, a sharing of development opportunities may be necessary, rather than having all of them accumulated and jealously guarded by just a handful of economically developed nations.

The final point that needs clarification in the development of the definition is that no city or nation can view its sustainability in total isolation from others. Everyone lives on the same planet, of which there is only one, and whatever is done in one city or country has, in almost every case, some effect upon other cities and countries. If electricity generating plants pump sulphur dioxide into the air, the wind might well carry it to a different set of climatic conditions and when it rains in that new place, the rain will fall in the form of dilute sulphuric acid.

Similarly, when the residents of one nation consume more than that nation can produce, such as manufactured goods, the available renewable, replenishable and non-renewable resources of another nation are drawn down. As a result, the aggregate potential for sustainability in the world is reduced. As will be seen later, this factor is quite important in the case of Riyadh and Saudi Arabia.

As a result of these thoughts and amendments, a working definition of sustainable development of human settlements might be 'making 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 and replenishable resources and staying within the absorptive capacity of local and global waste absorption limits so that future generations can meet their own needs'. Every concept within this definition is now measurable. By applying it comprehensively to a specific urban situation, a judgement can be made of the sustainability or otherwise of the human settlements under examination. Consider Riyadh, Saudi Arabia as a way of seeing just how this might work.

Examining the Sustainability of Riyadh

Although reaching a definitive answer to the question as to whether Riyadh is sustainable or not is beyond the data on the city available for this analysis, the use of this operational definition can be illustrated, even if crudely, based on the information that is readily available.

Riyadh is one of the most interesting cities in the Middle East. Whereas 50 years ago, it was little more than an Arab village in the middle of the desert (about 400 km west of the Arabian Gulf, 850 km east of the Red Sea), as a result of the oil boom that began in 1974, it was transformed into one of the fastest growing cities in the world and a major metropolis. Whereas in 1975, Saudi Arabia's capital city had a population of 705 thousand (UNCHS, 1996: p. 10),

its 2006 population is estimated to be 4.5 million (Arriyadh Development Authority, 2006). According to Hayes (1980), during this period Riyadh was expanding so quickly as residents of rural areas migrated to the capital to participate in the new riches that the city was described as 'moving northward' at a rate of over 3 km (2 miles) per year. The change in Saudi Arabia during this period was significant, as from 1974 to 1980, car registrations increased by a factor of 10 and the demand for electricity rose at 50% per year.

Despite this extraordinary record of growth, the Kingdom's government worked relentlessly to improve the welfare of the nation's residents, and to a large extent, succeeded:

- Production and incomes have risen significantly over the last two decades. In terms of Purchasing Power Parity (PPP) US dollars, Saudi Arabian gross domestic product per capita has increased from $ 8,169 in 1985 to $ 10,158 in 2000 (UNCHS, 2001: p. 295). At the personal level, following from these increases in income, something less than 2% of the Saudi population are considered to be in poverty (UNHSP, 2003: p. 265).
- Even over the short time surveyed by the Seventh Five Year Plan of Saudi Arabia (Ministry of Planning, 2000), significant improvements occurred in the number of government and private hospitals in the country, increasing from 279 in 1994 to 308 in 1998. Over the same period, the number of hospital beds increased from 41,827 to 45,032. Between 1980 and 1990 (UNCHS, 1996: p. 513), access to safe water by the residents of the country increased from 91% to 95%, while those with access to safe sanitation increased from 76% in 1980 to 86% in 1990, and then 100% in 2000 (UNHSP, 2003: p. 259). As a result of these various health improvements, the average life expectancy of Saudi Arabian men increased from 52.4 for those born from 1970 to 1975 to 69.9 for those born from 1995 to 2000 (UNCHS, 1996: p. 445), while for women over the same period, life expectancy increased from 55.5 to 73.4.
- Illiteracy rates (for combined males and females above 15 years of age) dropped from 42% in 1980-1985 (World Bank, 1995: p. 299) to 23% in 2000 (UNDP, 2000: p. 158). The Human Development Index of the United Nations Development Program (2000: p. 158) composed of weighted averages of income, adult literacy rates, life expectancy and school enrolments has increased from 0.558 in 1975 to 0.747 in 1998.

These accomplishments are impressive, showing great strides toward improving the human aspects of development over the last three decades. It is apparent, in terms of the earlier definitions, that Saudi Arabian residents are well past the subsistence stage. No more worry about meeting basic human needs. Judging from the number of expensive automobiles and shopping centers in Riyadh, urban residents are well into luxurious and even conspicuous consumption, although as will be seen later, there is a problem on this indicator.

In other areas, the record is not quite so impressive. Average water consumption has increased from 120 litres/person/day to 315 between 1980 and 1999 (Ministry of Planning, 2000), significantly above the consumptions levels of the developed European countries. Given that the Triassic fossil water in the underground aquifers below Riyadh were largely used in an ill-fated attempt to develop a wheat industry based on export, and that even today the UN Food and Agricultural Organization (2004) estimates that the annual water withdrawal in Saudi Arabia is 955% of annual renewable water resources, it is apparent that here the Kingdom has a problem. Water is a replenishable resource that has clearly been over-exploited rather than used in a sustainable manner.

Although the Saline Water Conversion Corporation has been a leading innovator in technology, successfully supplying Riyadh with a significant proportion of its needed water, this is an expensive exercise. In general, desalinated water costs between 5 and 10 times the cost of conventional water-resources development, that is if conventional water resources are available (Murakami, 1995). In the case of Riyadh, such conventional water resources are very limited.

According to the Saline Water Conversion Corporation, the current best technology produces desalinated water for SR 2.36 (US$ 0.63) per m^3. This water requires treatment and transportation to Riyadh, which adds a further SR 0.75 (US$ 0.20) per m^3 to this cost, bringing the total delivered cost to about SR 3.11 (US$ 0.83). The cost can be reduced by 20% if the water is mixed with 20% ground water from the Al-Waseea station 110 km to the north of Riyadh, a process which adds the

necessary salts to make the water healthy. Mixed water, then, can be delivered to Riyadh for about SR 2.49 (US$ 0.66).[(2)]

How much do consumers pay for this expensive water? The cost of water in Saudi Arabia, because of generous subsidies, does not exceed SR 0.15 (US$ 0.04) per m^3 until water usage surpasses 500 liters per day (500 liters is ½ m^3). At its greatest, then, the subsidy is in the vicinity of 94% of cost, although this percentage of subsidy decreases as consumption rises. Thus, Riyadh's water has been provided to consumers at a fraction of the cost of production, something that could only have been done because of that major Saudi Arabian resource, petroleum.

A similar situation obtains in electricity. Although the consumption of electricity is increasing by 4.2% per year (Saudi Arabia Ministry of Planning, 2000), the cost of this service to consumers is still highly subsidized. When an attempt was made to partially remove the subsidies on electricity in April 2000, there was such strong public opposition that the rate rises were withdrawn in October of that year.

The Saudi Arabian Government can only afford subsidies on these utilities, and other urban services as well, considering there is no local property or sales or other local tax to support urban administration, because of petroleum. Anytime the full cost of a service is not met by the beneficiary, there needs to be a subsidy, and subsidies of this type fly in the face of economic sustainability. It seems that another sustainability problem has been identified.

The Kingdom is blessed with what appears to be, at current production rates, 65 years of proven oil reserves, amounting to 261.9 billion barrels (EIA, 2005). Yet, there is a problem here. Even if the reserves are underestimated, amounting to the 461 billion barrels of oil as suggested by Petroleum Minister Ali bin Ibrahim Al-Naimi, which would last 100 years, it has to be remembered that a century is no more than a flash in the overall view of history. Regardless of whether it is 65 years, 80 years or even 100 years, when sustainability is under consideration, time passes very quickly indeed. Certainly there is a problem, as noted above by El-Serafy in consuming all of the proceeds of the oil revenue stream rather than using the user cost to develop new substitutes.

The existence of considerable luxury consumption in Riyadh in the form of expensive cars (run on very subsidized gasoline[(3)]) and a large and rapidly growing supply of major shopping centers was noted earlier. This excessive consumption introduces another problem that one has to take into account when assessing the sustainability of a human settlement.

All urban areas are linked to areas beyond their boundaries, areas that may be the source of food as well as the destination of certain urban pollutants. Rees (1992) has discussed the concept of an 'ecological footprint' as a means of showing such spillover effects. Defined as the land requirement to support the urban population indefinitely (that is, after all, what sustainability is all about) at a given material standard, it is apparent that viewing cities in this fashion makes traditional politically inspired urban boundaries obsolete. As Rees graphically states (1992: p. 125), 'however brilliant its economic star every city is an ecological black hole drawing on the material resources and productivity of a vast and scattered hinterland many times the size of the city itself'.

Rees initially demonstrated this concept on his home city of Vancouver, British Columbia, Canada (Rees, 1996). In 1991, Vancouver had a population of 472,000 and an area of 114 km^2. However, as he noted the average Canadian required over a hectare of crop and grazing land to produce a high meat protein diet, and about 0.6 hectares for wood and paper for various home uses. On average, each Canadian occupies about 0.2 hectares of urban land, consumes 4.2 tons of carbon which produces 15.4 tones of CO_2, therefore requiring an additional 2.3 hectares of forest as a carbon sink. When added together, avoiding double counting, he discovered that the residents of Vancouver, if they could be considered average, needed 2.0 million hectares of land for their exclusive use to maintain the consumption habits. Yet, the city itself only covered 11,400 hectares, suggesting that the city appropriated an area 174 times the actual city size to support its lifestyle.

Since that early study of ecological footprints, information has become available for carrying out the necessary calculations on the wide range of national situations. Is it possible to make similar calculations

(2) The author is grateful to Adnan Tameesh, consusltant to the Saudi Arabian Basic Industries Corporation for the cost data (as of 18 March 2006) upon which these estimates were based.

(3) For example, at a time when the rest of the world was struggling to come to terms with the price of petroleum at a record $75 per barrel, Saudi Arabia's King Abdullah bin Abdulaziz announced on 4th May 2006 that the consumer's price of gasoline at the pumps was to be reduced 30%, bringing the price of 91-octane petrol to SR 0.60 (US $ 0.16) per liter (Arab News, 5 May 2006).

for the city of Riyadh? Indeed it is, and the results are shocking.

Because Riyadh is a city in the middle of the desert, most food and virtually all manufactured goods must be imported not just from other areas of Saudi Arabia, but from other countries. As a result, the size of the ecological footprint of Riyadh is slightly misleading, as part of it is in Brazil, part in South Africa, part in the USA, part in England, part in France, and Japan and Bangladesh and Pakistan and India and many, many other countries.

As seen above, the Arriyadh Development Authority estimates the 2006 Riyadh's population at about 4.5 million. Because of its extremely low density, another sustainability factor that has not been considered here, the city covers 1,782 km², or 178,200 hectares.

The Global Footprint Network (2006) has given estimates for virtually all countries of the world concerning the per capita footprint. Now although it must be acknowledged that the size of the footprint in many rural areas is likely to be quite different than in the big cities like Riyadh, and some cities created different land requirements from others, unfortunately there is no option at present but to employ 'average' footprint figures in these calculations. The latest version of footprint calculations is based on the summation of average land requirements for urban land, CO_2 absorption, nuclear energy production, wood fuel, timber production, fisheries, pasture and cropland. Although it is readily acknowledged that the estimates of land required is only partial (implying that the ecological footprint is probably underestimated) and that certain estimates may be significantly inaccurate, they still provide a sobering set of statistics.

In the case of Saudi Arabia, it is estimated that the ecological footprint per resident, that is the sum of land requirements for the above uses, is 4.5 global hectares per person. The term global is important as the footprint is in various parts of the world. Saudi Arabia's neighbors, as a result of more modest lifestyles, have smaller per capita footprints: Syria's footprint is 1.7 global hectares, Turkey's 2.0, UAE's 2.9, Jordan 1.6, while in the USA it is 9.7.

Therefore, multiplying the footprint coefficient, 4.5 times Riyadh's population of 4.5 million, the size of Riyadh's ecological footprint is 20,250,000 hectares, or 202,500 km². This means that the area required to maintain Riyadh's lifestyle is 114 times the size of the city itself. Just for comparison, the size of Riyadh's ecological footprint is over twice the size of Jordan (Jordan occupies 89,000 km²), is larger than Syria (185,000 km²) and is nearly 3 times the size of Ireland (Ireland covers 70,000 km²).

At this stage, it is possible to take stock of the situation and make some observations concerning the sustainability or otherwise of Riyadh. It must be stressed at the beginning that these are very crude measures that have been applied. They are subject to error and in considerable need in certain cases of refinement.

As a result of extensive subsidies for urban services, in the form of cross-subsidies from petroleum revenue to cities, the economic sustainability of Riyadh is in some doubt. Given the size of the ecological footprint, but also the extent of the human impact of Riyadh, there is some doubt about environmental sustainability. Considerable progress has been made toward meeting human needs in Riyadh, although again much gain has been subsidized from oil wealth, and petroleum is, of course, a non-renewable resource. Although this analysis has not touched on social sustainability, this should be viewed as a product of the other types of sustainability. As long as other elements are in equilibrium, social sustainability usually follows. Yet, if non-sustainability arises within the economic or environmental spheres, it may be threatening to social sustainability where evidence of these failings first appear.

Unfortunately, a city cannot be just partially sustainable. Either it is or it is not. And, if it fails on the environment and economic tests, there is an apparent need for certain new policies to be pursued and new efforts made to bring the city back into a state of sustainability.

Policies for the Future of Riyadh

Although in a *rentier* economy, such as Saudi Arabia, where the revenue stream of a single commodity supports the government and much of the social and human activity within the country, the use of subsidies from petroleum to other sectors is not at all surprising, nor, for that matter, unique to Saudi Arabia. Yet, if economic sustainability conditions are to be met, then there is no place for subsidies. The economic argument is that it distorts the demand for subsidized commodities, such as water or electricity, leading to excessive consumption. A similar argument could be lodged against many of the more

human-progress items listed above, such as education, medical assistance, and even consumption. And, of course, it must never be forgotten that the source of the subsidies, petroleum, is a non-renewable resource. Once it is gone, it is gone forever.

If there was a sincere effort to meet sustainability conditions, what would seem to be required would be to initiate user charges, taxes and other charges for many of the services that today Riyadh's residents (and residents of much of the rest of Saudi Arabia) seem to take for granted. Although the elimination, or at least the reduction, of certain subsidies has been attempted in the past, these efforts have not been successful. Much of course depends upon the transparency with which these financial adjustments are handled. Citizens of a country do have an interest in the public finance side of their municipal governments, where the money comes from and where it goes.

At least a part of the problem in Saudi Arabia is that many of the urban service providers are actually state enterprises. Thus, citizens view water and electricity, for example, as more their right than as a service, and have no incentive to economize on the use of the commodity in question. In other countries, where consumers pay the full cost of a service, either to a privately-owned but government-regulated utility provider, or to the local government for the services they provide, such services, because they have a cost, in fact have a value to the consumer or urban resident. In such situations in other countries, the consumer him- or herself is in a position to make rational substitutions from personal consumption to the consumption of urban services, usually through payments to a private provider or to local government in the form of a direct payment for the service, or through a property or local sales tax. In other words, the consumer reduces the purchases of personal, luxury items and uses the savings in expenditure to pay for the more essential public goods, such as urban services.

If such a policy were successfully initiated in Riyadh, at least three outcomes would result: (1) local government would be in a position to cover its own costs on a sustainable basis and, if given the right to do so, to actually plan for the types of expenditures that urban citizens want rather than relying upon a list from a government ministry about what they are able to spend money on; (2) help urban citizens make rational substitutions between all consumption items as each would be valued on the actual cost of its production; and (3) the ecological footprint of Riyadh would be reduced as services which have real value to the environmental, economic and social well-being would for the first time be offered to consumers on the basis of their actual cost, thus in the longer run reducing the more superfluous consumption.

Although the analysis of Riyadh's sustainability as a settlement is no more than partial, these steps alone would not guarantee urban sustainability for Riyadh. It certainly, however, would be a step in the right direction, moving positively toward one of the fundamental sustainability requirements. Such change might be painful for some, but then change is always difficult. On the other hand, non-sustainability will cause much more pain.

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تقييم الاستدامة الحضرية في الرياض

تشارلز ال شوجيل

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(قدم للنشر في ١٤٢٧/٨/١٦هـ؛ وقبل للنشر في ١٤٢٨/١/١٥هـ)

ملخص البحث. يُعتبر تطبيق المعايير الكمية لقياس استدامة مستوطنات بشرية أكثر صعوبة مما كان يُعتقد. يتطور من خلال هذه الورقة تعريف عملي للمستوطنات البشرية يتم فحصه على الحالة الراهنة في مدينة الرياض بالمملكة العربية السعودية.

إن الاستدامة في مدينة الرياض لم تكن لتتواجد لولا الدعم التبادلي بين الأنشطة الحضرية والاقتصادية (بعض الخدمات الحضرية) والآخر (النفط)، وهذا يعني أنه لم يتم تحقيق معيار الاستدامة الاقتصادية الذي تم تطويره. وإذا كان للدعم الحكومي علاقة في الحفاظ على الاستدامة، فإن الحاجة ماسة لتطبيق سياسات حضرية متنوعة تعمل على تقليص النفقات الهائلة لتقود المدينة إلى توازن مستديم. وتم استخدام تخمين البصمة البيئية لمدينة الرياض، وكذلك دعمًا للتحليل.