

Greater Amman: metropolitan growth and scenarios for sustainable urban development

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GREATER AMMAN: METROPOLITAN GROWTH AND SCENARIOS FOR SUSTAINABLE URBAN DEVELOPMENT

Ahmed ABU AL HAIJA¹, Rob POTTER²

¹ Deanship of Educational Services – Taibah University

² Human and Environmental Sciences, University of Reading

E-mail: alhajja2@gmail.com r.b.potter@reading.ac.uk

Abstract

This paper reviews the development of Greater Amman, Jordan noting that the vast urban expansion that has occurred over the last fifty years has led to the desertification of rare fertile lands, following the fragmented and scattered territorial expansion of the city. The future scenario for planning in Greater Amman is analyzed in respect of proposals outlined in the *Metropolitan Growth Plan* of 2008, which assumes a rapid population growth from 2,200,000 persons in 2006, to approximately 6,500,000 by 2025. The concentration of more than 39 per cent of the national population of Jordan in Greater Amman threatens the transformation of former distinct settlement pattern into a distinctive continuous urban zone, aggravating problems of infrastructural provision, water needs, agricultural lands, and leaving unresolved problems of land inflation, poor urban standards and housing shortages. In conclusion, the environmental implications of the *Amman Metropolitan Growth Plan* are analysed, and it is suggested that an alternative approach is needed, based on clear principles of sustainable urban development.

Keywords: Amman, Urban Growth, Agricultural Lands, Potable Water, Public Standards, Site and Services

Introduction

No one can deny that architecture is generally influenced by the environmental context from which it is derived, including climatic, social, cultural and economic factors. In Arab history, the urban and architectural output was often a mirror of environmental exigencies. Nevertheless, it has given rise to both modest and complicated structures. The introduction of innovative urban and building systems followed by industrial development was essential for the birth of the Functional Schools in the 19th century, followed by the Modern Architectural movement. It also spread in Arab cities such as Amman, Jordan, where the conceptual focus was more on functional and economic issues rather than environmental and traditional ones.

This paper focuses on the phenomenal urban expansion of Amman over the last century, covering the various waves of urban development in relation to international political events. In fact, in its short modern history, Jordan has played an important role in the Middle East region, accommodating millions of Arab refugees, mainly Palestinians in the last century and Iraqis since 2003. Important 'modern' cities such as Amman and Zarka were settled in less than 70 years in the north of the country, and now these cities account for more than 50 per cent of the total Jordanian population, with fast approaching 3,000,000 residents (Statistical Department of Jordan, 2009). The shortage of natural resources in Jordan, compared to some other oil regions, encourages the central government to implement macro-economic programs, inviting private and international investors to contribute to the development of the local economy. The political stability of Jordan has been a fundamental factor of Arab investment attractions, especially in the industrial and tourism sectors. Tourism contributes US\$ 14,190 million to Jordan's economy and accounted for 14.7 per cent (compared with only 10 per cent in 2004) of the country's gross domestic product (GDP) in 2008 (Statistical Department of Jordan, 2009). The capital of Jordan's infrastructure is gradually developing to be competitive with the regional countries, with the expansion of Queen Alia International Airport and improving the transit links, network connections and main services for trade and tourism purposes.

Until 2005, urban planning in Amman adopted a pattern of urban expansion based on low-density urban sprawl, permitting a maximum height of four residential floors, with site coverage less than 50 per cent (GIS, 2010). The presence of refugee camps, high-density residential zones and some slum quarters located mainly in the southern and eastern parts of the city has contributed to the division of the city into two vast zones as previously mentioned: western Amman and Eastern Amman. The process of rapid horizontal expansion of the city has increased the surfaces of the prime infrastructural intervention amplifying land costs, and causing environmental impacts at the biophysical scale. Therefore, there is a danger that losses to biodiversity resulting from these activities could reduce the resilience of ecosystems to withstand climatic variations and their pollution damage (United Nations, 1992). In fact, the diminution of precipitation in Amman in the last 25 years has been recorded at more than 10 per cent (Salameh, 2008).

On the other hand, Amman has experienced a regime of water rationing since 1987, with households receiving water once or twice a week for various durations: "this reflects the fact that Jordan is one of the ten most water-scarce on earth and has long suffered from a structural crisis in the water sector" (Potter and Darmame, 2010: 116). The water supply depends on availability within an area of hundreds of kilometers around Amman, causing an impact at the biophysical scale. In fact: "Amman's use of the Azraq wetland as a ready resource of potable water has destroyed over 90 percent of the nation's most biologically diverse wetland ecosystem" (Greater Amman Municipality, 2008: 53). Therefore, the vast spatial extension of Greater Amman has led to many problems, mainly at the infrastructural and environmental levels.

Approach

Unfortunately, to date there has been a shortage of relevant research on issues relating to principles of sustainable development in respect of Greater Amman. Critical aspects such as the basic infrastructure of the city, public transportation, local resources, urban densities and housing requirements need to be carefully examined and evaluated. The present paper investigates the impact of urban expansion on the environment, employing available data supplied by a number of Jordanian Public Departments, plus data collected personally with the collaboration of some technical staff working in the Greater Amman Municipality. Most of the updated urban analyses were available in the Greater Amman Municipality, as elaborated in the *Metropolitan Growth Plan of 2008*. Therefore, the authors faced problems of data availability regarding particularly traffic analyses between the various zones (origin – destination traffic, for example), the ownership of lands, the surface of lands organized

(built up and new areas) according to the various residential classification in order to evaluate the existing building capacity.

The first section of the paper examines the urban development process over the last 50 years, highlighting particularly the urban expansion adopted by the recent Metropolitan Growth Plan of Amman, which involves an unconventional approach to planning; it elaborates simultaneously a framework of three hierarchical scales: Metropolitan, Planning area and Community-neighborhood. The first section also analyses the process of urban expansion, which has occurred mainly in the northern and southern parts of the city, highlighting the housing needs, building capacity, natural heritage and water needs.

In the second section, reviewing the integrative approach of the *Metropolitan Growth Plan of Amman*, which is in continuous development until 2025, this research evaluates the possible consequences of the planning process, concerning some economic and political obstacles. Therefore, the purpose of this study is to suggest an alternative approach to planning in controlling the infrastructural costs, housing needs, agricultural land conservation and water management, taking into consideration community exigencies and public services. In the words of Moughtin (2005:1): "Any discussion of city planning and urban design, which does not address environmental issues, has little meaning at a time of increasing population pressures on a declining natural resources base, widespread ecological destruction, increasing pollution, ozone layer depletion and climate change.... The long-term survival of the planet as a vehicle for sustained human occupation in anything other than a degraded lifestyle is in some doubt: in these circumstances any discussion of the aesthetic of the city planning in a pure or abstract form unrelated to the environmental concerns could be described as superficial"

The Historical Development of Amman

The recent modern history of Amman started at the end of the 19th century by the settlement of around 2,000 Circassian people (Ziadeen, 2004) escaping from Russia due to socio-political problems. This agricultural community established the historic core, benefiting from the rich soil and water, at the confluence of valleys around the Roman Archeological site in the valley of Ras El Ein (about 600 meters in altitude). Neighborhoods were established on separate hills where new arterial roads connect the urban fabric, following its natural topography (valleys toward hilltops). These neighborhoods have expanded occupying seven hills around Ras el Ein (between 600 and 1,100 in altitude).

The population began to increase gradually after the completion of the Ottoman Hijaz Railway in 1902 (which passes close to Amman's old center and connects Damascus and Medina in Saudi Arabia) and after the foundation of the Municipality of Amman in 1921. In 1946 Amman occupied an area of 31 square kilometers and had a population of 60,000 persons. Several waves of refugees, mostly Palestinians, settled in Amman in the years 1948 and 1967. By 1959, the boundary of the Municipality had expanded to include 50 square kilometers and the population had increased to 246,475 persons (Greater Amman Municipality, 1986). Since that time, several boundary expansions have continued following waves of refugees, as well as asylum-seekers from the wars in Lebanon and Iraq, reflecting the fact that Jordan plays a moderating role in Middle Eastern affairs.

A policy of centralization has been accentuated since 1987 within the creation of the Greater Amman Municipality (GAM), governed by a Mayor nominated directly by the King of Jordan. The new Metropolitan area encompasses 532 square kilometers. Subsequent boundary expansions in 2000, 2001, and 2005 increased the total GAM land area to approximately 680 square kilometers, and the population of Greater Amman had grown to approximately 2,200,000 persons by 2004. In 2006 GAM's geographic boundary increased from 680 to 1,662 square kilometers, thereby annexing the former municipalities of Sahab, Al Mouwaqer, Al Jeeza, Marj Al Hamam and Na'our. In this way, an additional 190,000 residents were absorbed into the city (Greater Amman Municipality, 2008: 47).

Legislation and Urban Planning for Greater Amman

The most important *Master Plan of Amman* was funded by USAID (the United States Agency for International Development) and was largely produced with the involvement of English Planning Consultants. A *Greater Amman Comprehensive Development Plan (GACDP) 1988-2005* enlarged the border of the municipality to include small agglomerations around Amman with a total surface of 532km². The main objective of this plan was essentially to control urban growth in terms of land speculation managed by land owners and the local councils which increased the urbanized areas in agricultural lands, in order to increase profits derived from the cost of lands and urbanization. The

Plan established the norm of a maximum of four stories in residential areas, which is a reasonable maximum building height because on this basis most activities can be accommodated without the need to provide a lift.

The Plan suggested that urban expansion, especially of residential areas, should occur toward the desert east, where the population density is at its highest, as this zone includes slum areas to a greater degree than any other place in the city. Several residential areas in the eastern zone suffer also a shortage of open spaces except within some scattered vacant private lots. But in practice, development followed the opposite directions towards the agricultural lands (see figure 1) (Abu Al Haija, 1995). In fact, a report on the *Growth Plan* (Greater Amman Municipality, 2008: 144) states: "The plan of 1988 included several green areas such as parks, forests, recreation areas and agricultural land within an overall system, unfortunately, the Plan was not implemented and the creation and protection of such a system did not occur".

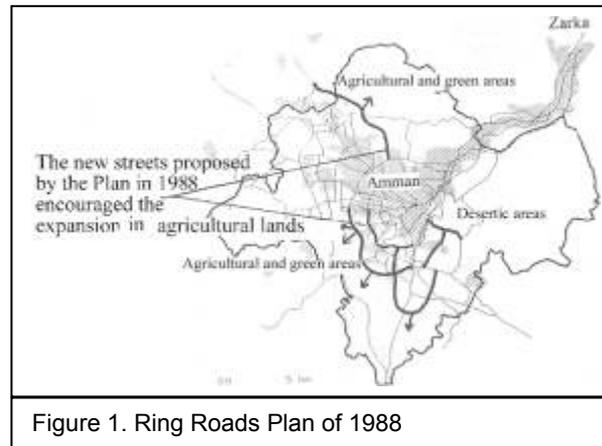


Figure 1. Ring Roads Plan of 1988

Thus, the Plan failed to limit sprawl and to preserve prime agricultural lands: instead, the urbanized areas increased to meet housing needs, permitting expansion in almost all the agricultural lands located to the west and south of Amman. The contradiction of this plan, was that while proposing residential land use in the east, it designated and implemented new primary and ring roads in the north and south-west of the city, encouraging residential expansion in these directions, where the areas were mostly used as agricultural lands. The main report of the *Amman Growth Plan* evaluates the 1988 plan, stating that the Plan was indeed comprehensive, being based on over four years of detailed research and analyses. Therefore, it remains a significant resource for the ongoing planning of the city and its surroundings: "However, little attention was paid to either the political acceptance of its enactment and, as a result, it was never formally adopted. Consequently, planning in Amman has continued to be governed by the city's outdated zoning bylaws, overlaid on its emerging ring and radial road network" (Greater Amman Municipality, 2008: 46)

From 2006 a largely neo-liberal approach to planning in Amman was increasingly adopted. This has been based on intensifying the building density in some old built-up zones, and attracting international funds, partly by taking advantage of Jordan's reputation for safety within the region. The Al Abdali Urban Regeneration Project in Amman is an example of the outcome of the new approach to planning, as the central government gave the private real estate developers the right to be in charge of implementing macro-scale projects within the city. This project will provide a new center for finance and commerce within the city, consisting of hotels, markets, offices, entertainment services and residences. The total area is 350,000 m², which will contain a built-up zone of approximately 1,000,000 m² in a site previously used as the General Quarter of the Armed Forces, about 1,500m away from the old center. The policy of privatizing public areas inside Amman is similar to the experience of *Solider* private society in the reconstruction of the old center of Beirut, from an organizational point of view. *Solider* was established after the destruction of the historic center of Beirut in 1982. The Lebanese Government decided to transform the properties into shares, where the private sector control the process of reconstruction and management according to a neo-liberal agenda of privatization (Daher, 2007: 49)

But several important reflections exist concerning high-rise buildings in view of the existing capacity of infrastructure, and the adaptability of these buildings to local climatic conditions. Issues also exist regarding the local culture of the people with particular attention to matters of privacy, and how these buildings respond to the principles of energy saving and water needs, and how they can be made consistent with the environment assessment law *Number 37* of 2005, which in theory forces architects and engineers to develop environmental studies and analysis for the evaluation of the impacts of projects.

As part of the International Conference organized by the Engineering Association of Jordan in 2008, under the title the *High-Rise Building in Amman*, a planner in charge at the office of Planning of the Amman Municipality recognized during the concluding debate that the Al Abdali Plan was oriented

mainly by political and economic choices, and that several problems are difficult to resolve by adopting technical solutions, such as the realization of towers in already high-trafficked areas. The high-rise building policy assumes importance, especially in the built-up zones. Therefore, since 2000 structures of more than 90 meters in height began to appear in Amman. In 2005 the Twin Towers project began in a high-density urban zone, each building reaching about 150 meters in height, covered completely by glass cladding systems, and occupying some 28,500m² of land.

The recent propensity to place high-rise buildings in chaotic and highly dense zones provokes other infrastructural and environmental problems, which evidences a serious crisis among decision-makers, in adopting a clear future vision of urban development and planning. Problems of traffic and congestion are becoming serious in all parts of Amman, particularly the shortage of pedestrian areas, with the motor car playing a dominant role in the context of the lack of overall an effective public transportation system.

The *Environmental Law Number 52* of 2006, and the norms of environmental assessment have together established general indications in the conservation of natural resources and in respect of the environmental context in project elaboration and implementation. According to these criteria, mainly concerning the traffic implications, high-rise buildings like those in the Al Abdali zone and other similar mixed areas, would find difficulties in being approved. The first concrete result of this law has been the enlargement of the Amman Municipality in the year 2006 to 680km², expanding the borders to protect mainly the agricultural lands. A new *Metropolitan Growth Plan* (MGP) was elaborated in 2008, which is the focus of the detailed case study that follows.

The Amman Metropolitan Growth Plan (MGP): a case study

The Planning Approach to Territorial Extension

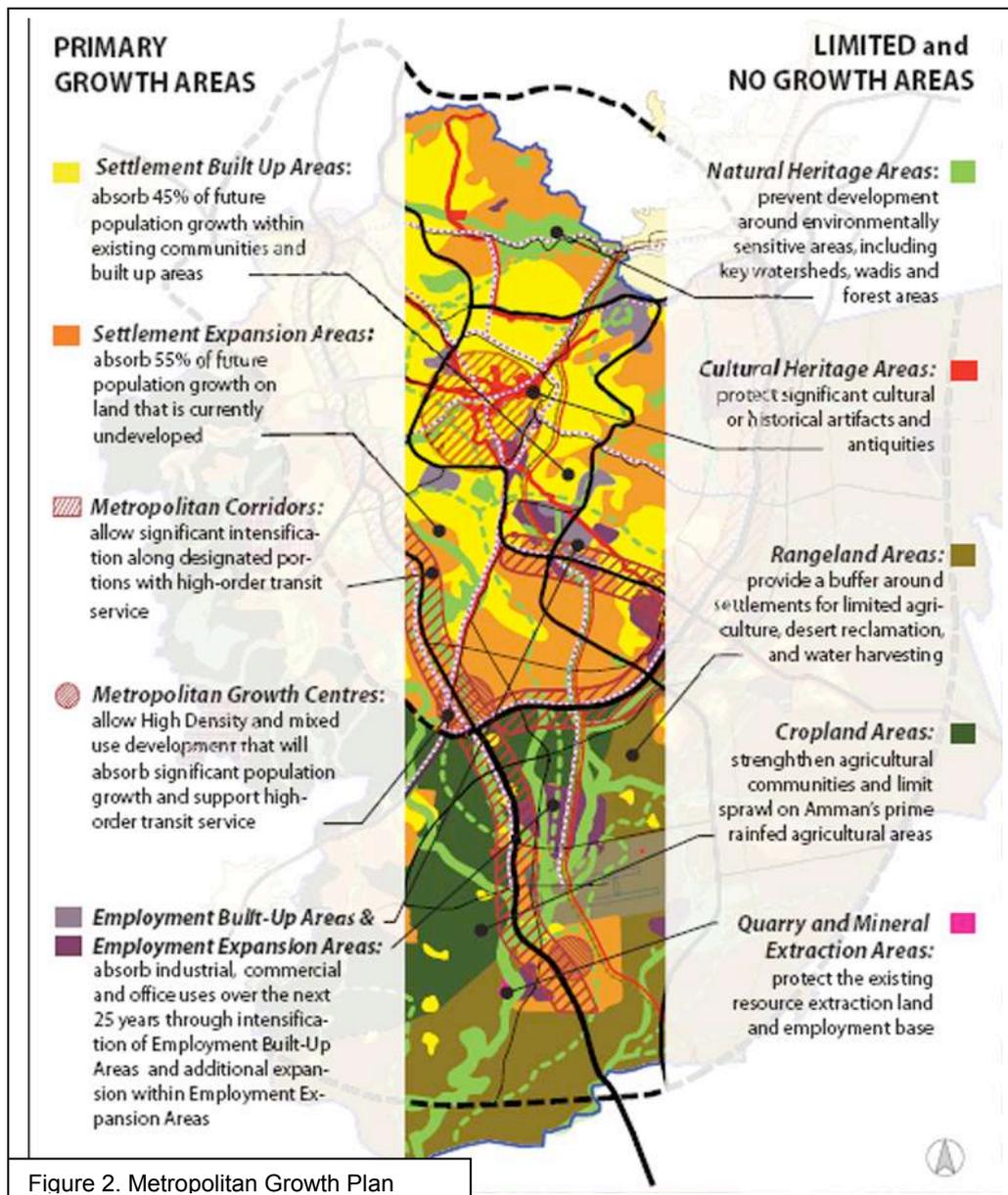
The absence of an adopted and implemented Master Urban Plan for several years and the rapid growth of population called out for a rapid and well-articulated response. The classic procedures associated with the preparation of Master Plans normally requires a long period of technical elaboration and administrative measures for final approval, while the city is quickly expanding. The *Metropolitan Growth Plan* (MPG) for Amman has been presented as a response to these requirements. It is structured at several scales simultaneously in order to guide the planning process for an anticipated population growth of Greater Amman to 6,500,000 persons in 2025. The plan illustrates the location of existing areas accommodating residential and employment uses within the overall Metropolitan Area, as well as the preferred locations for the future expansion of settlement. It also details the projected future locations of new roads, public transit corridors, major natural heritage sites, and areas for more intensive mixed-use development. The plan has been developed according to different layers throughout its duration. Thus, the approval of this Plan also follows the ongoing development of these layers (Greater Amman Municipality, 2008). This “work in progress” plan is divided into three hierarchal scales:

- The Metropolitan scale: relating to 1,662-square-kilometere planning area (Figure 2)
- The Planning Area scale: the Metropolitan zone is divided into eight planning areas to provide a finer scale of planning. Area Plans, when completed, will be based on the Metropolitan Growth Plan and will include elements such as land use and major road alignments.
- The Community scale: this occurs at the level of the 228 existing neighborhoods, and will cover details of zoning and the road network.

The *Master Plan* is being developed in seven planning phases that define a range of Plan Components. These components are: the Plan for tall Buildings, the Corridor Intensification Strategy, the Industrial Lands Policy, the Outlying Settlements Policy, the Airport Corridor Plan, the Metropolitan Growth Plan, Area Plans and Planning Initiatives. The following paragraphs mainly deal with the Metropolitan Growth Plan and related issues of planning densities.

The Approach to Urban Expansion

The Plan establishes the areas designated for future settlement growth, including the intensification of settlements within existing built-up areas and the overall expansion of settlements. Based on data from the Statistical Department of 2007, the Metropolitan Growth Plan (MGP) considers the minimum number of new dwelling units needed by 2025 to be approximately 1,300,000. This figures, of course, relates directly to the population growth which is projected to increase from 2,200,000 to 6,500,000 persons by 2052.



The growth framework proposed in order to meet the demand for land and housing is based on the following components:

The Designation of Built-up Areas:

Tacking into consideration the fact that up to 40 per cent of lands within Amman's built-up area are vacant (according to the Greater Amman Survey, 2008) the MGP proposes growth through both intensification and densification. The plan proposes to accommodate 55 per cent of new housing units within the built-up area, which it calls the "Urban Envelope".

The Designation of Settlement Expansion Areas and the Urban Envelope

Areas for settlement expansion are mainly located within the so-called "Urban Envelope". Only low-density housing development is allowed for future growth outside the Urban Envelope, estimated at some 700,000 additional residents.

The Application of Growth Modelling from the Neighborhood to the Metropolitan scales

The MGP analyzed twenty sample neighborhoods in order to model neighborhood growth patterns before applying this to Amman's full array of 228 neighborhoods.

Density of Areas

These densities were varied among the built-up areas making-up the Urban Envelope, increasing the building capacity as part of the densification and intensification approach. Lower densities were encouraged outside of the Urban Envelope, especially in the main agricultural lands. Planning area A, for example, has a density target of 6.5 units/per net dunum, accommodating upwards of 1,300,000 residents, for a net density of 26.5 persons/dunum. Area H has a density target of 1.2 units/net dunum, accommodating upwards of 170,000 residents, for a net density of 5.5 persons/dunum.

The new densities established by the Plan are generalized by broad areas in order not to detail urban expansion at the macro-scale. Therefore, compared to the existing density in the north of Amman it is clear that a substantial reduction is required in some areas where the density is presently very high. Existing residential densities are classified into four main categories: A, B, C, D. The maximum built-up area that can be occupied is respectively 39 per cent, 45 percent, 51 percent and 55 percent of the lot's surface, with a maximum of 4 floors (15m height) (Urban Regulation, 2005, art. 29). Residential zones A and B are generally located in the north and west of Amman and the residential zones C and D are located in the east and south of the city.

In areas designated as residential (A) the lot's surface should be at least 1,000m². The building index is around 3.7 mc/mq considering the dunum surface plus 25 per cent of internal streets. This theoretical index is flexible according to the topography of land; the maximum 15 m height indicated by the norms are computed starting from the ground floor which stands on the level of the street. All the stories below this level are authorized but not calculated as part of the urban density, while, due to the topographic nature of Amman, the major part of residential buildings are more than 6 stories. In A areas the number of dwelling units per dunum can be approximately 12, considering the average surface of unit 120 m² and the average of person/family in Jordan is 5.4. In zone (D) the lot's surface should be at least 300m². The building index is about 5 mc/mq considering the dunum surface plus 25% of internal streets. The dwelling units per dunum in this area is approximately 17 considering the average surface of unit 120 m². In this case, the expansion areas should diminish more than 50 per cent.

Discussion: Observations on the Approach of the MGP to Expansion

The Loss of Fertile Lands

Three important issues continue to cause the diminution of fertile lands in Amman, and the first is the low density of building. About the 50 per cent of the proposed urban expansion is set to occur on fertile lands, mainly in the north, west and south of the city. Thus, the low-density pattern of building permits urban sprawl. The second issue concerns subdivision plans in rural areas. Residential development is set to continue expanding outside the built-up areas. In fact, new residential quarters can officially be approved outside the urbanized areas according to these Plans, which could be proposed even on prime agricultural areas. The third concerns the minimum parcel size of agricultural land. The Growth Plan recognizes that current residential subdivisions are negatively affecting agricultural productivity as they fragment the agricultural land base, and it mentioned the necessity to elaborate an Agricultural Plan which restrict residential growth in agricultural areas, by establishing regulations for minimum parcel sizes, and by establishing hard boundaries for settlement expansion in agricultural areas (Greater Amman Municipality, 2008, p. 92).

More than 55 per cent of the urbanized areas of Amman are vacant because the owners have left their lands abandoned (GIS, 2010). These are generally fertile lands, and the owners are waiting major offers from developers. The country's legislation continues to permit rural areas to be divided into smaller parcels – a minimum of 4000 m² of land property. This in turn causes limitations in adopting national agricultural policies in terms of production and marketing. Lands also continue to be divided into small portions because of the inheritance law and its consequences.

It is hard not to reach the conclusion that the Growth Plan should urgently prevent additional urban development on prime agricultural lands, possibly using the implementable agricultural belt in the northern and western parts of the city, and freezing the subdivision plans outside of the urbanized areas. The fertile lands of Amman represent an active part of conversion. According to studies conducted by Jordanian specialists in remote sensing and Geographic Information System, the urban areas of Amman have increased in the last 80 years by 509 times the original urban area, while the fertile lands decreased by 86 km², which represents an overall 23 per cent loss. Research concludes that fertile lands will disappear by the middle of the century if urban expansion continues at this rate in

Amman (Al Rawashdeh and Saleh, 2006: 215). For example, presently, the urban area comprises 91.4 per cent of the province of Amman (Statistical Department of Jordan, 2009).

With about three years having elapsed since the adoption of the MGP, it is interesting to return to a sentence cited in the main Report of the Plan (Greater Amman Municipality, 2008: 90), which states: "... the 1988 Plan was never implemented and urban growth occurred in ... agricultural areas". Therefore, the substantial problem of Amman's development concerns the inflation of land prices and the economic possibility of the municipality funding the expropriation of lands for public utilities. Consequently, the development policy should mainly take into consideration these problems in order to avoid other failed experiences, as the implementation success of these plans depends on how and where the new expansion is proposed.

According to agricultural land analyses conducted by the Municipality, approximately one in six households in both high and low-income areas grow their own fruit, vegetables and herbs. On average, these residents occupy up to 15 per cent of their land for urban agriculture, generating approximately JD 1,900,000 annually. Due to the high cost of vacant residential land in the urbanized areas of Amman (for example, the cost of a residential dunum in the north of Amman is about 250,000 - 500,000 JD), the Plan faces a real difficulty of the private owners changing these lands into urban agricultural areas, taking into consideration the limited resources of the municipality in supporting these owners to maintain or run their agricultural lands inside the city. Prioritizing agricultural use in vacant areas inside the city could be unfair, without taking into consideration holistic land policies.

The Standard of Public Services

In light of the shortage of analyses concerning the availability of public services in the city, the Metropolitan Growth Plan does not established specific technical norms for urban standards in the built-up area and the new expansion zones. Therefore all the areas of Amman are being urbanized without limitation of public standard services in relation to extant building densities or the number of residents. Therefore, primary schools, public gardens, sports areas, parking, social and religious buildings are distributed almost casually within the city, depending on public land ownership availability or private donations. The total land area for public service use in Amman is 6,655,086 m² (GIS Department, unpublished data - Greater Amman Municipality, 2010), which is only approximately 3 square meters for each resident.

Most of the land ownership in Amman is private (in fact, about 99 per cent according to the non-published database of the GIS Department in Greater Amman Municipality, 2010), therefore there is a shortage of public open spaces in general, except for some scattered vacant lots. Increasing the open spaces in the built-up areas of Amman or in the new development areas has become one of the biggest challenges facing the MGP.

Water Needs and Network Problems

Recent studies have shown that Amman has a drastic shortage of local aquifers to satisfy its demand for potable water. It receives around 50 per cent of its water supplies from the Jordan Valley, pumping from -225m in the Jordan Valley to the north-west of the city at an altitude of (1035m) (Potter *et al*, 2007). The remaining water demand is met from other aquifers, generally some 50-70km distant from Amman. Because of Amman's growing demand for potable water, and the Government's avowed intention to provide for the basic needs of the population as a priority, in 2009 the Government authorized the Turkish GAMA Energy Company to implement a project to transport 100 million cubic meters per year for the next 10 years of non-renewable water to the city from the Disi aquifer. This aquifer is located in the south of Jordan, and the project will involve the construction of a 325 km pipeline from Disi to Amman.

Most experts consider countries with a per capita water production below 1,000 cubic meters per year to be water-poor. Meanwhile, Jordan's per capita water for the year 2005 was only 146 m³ compared with 846 m³ for the rest of the Arab world (Hashemite Kingdome of Jordan, 2006: see also: UNESCO, 2006; Darmame and Potter, 2008). Accordingly, for most parts of the city, especially its southern areas, water is supplied only one day a week, while other residential quarters in the western area receive water two days a week. Residents store water in tanks or cisterns located mainly on the roofs of buildings. The urban expansion of Amman has, of course, increased the surface of the operational network and has added to the need for control and maintenance. Given the steps that are currently being taken in order to supply the extant population of just over 2 millions with water on the basis of a formal system of rationing, it is difficult to see how a population of some 6.5 millions as envisaged in the Plan could be kept adequately supplied with water at an acceptable cost by the year 2025.

An Alternative More Sustainable Scenario for the Future Development of Amman

The phenomenon of unlimited and largely uncontrolled urban expansion for over fifty years has characterized Greater Amman, which is consequently facing a range of problems relating to infrastructure and environmental sustainability. In short, the city of Amman is not in balance with its regional area and it can be argued that it is not in synergy with its local ecosystem and the natural environment.

Some key concepts of sustainable development need pressing to be considered, such as citizen participation in relation of regional- and local-forms of governance, public transportation policies, site and services schemes, appropriate land use provision, urban densities, building orientation and form (see Elkin, 1991). The Jordanian Master Plans are principally concerned with the physical aspects of development, rather than with issues of metropolitan governance and local community participation. This is a characteristic that could well affect the sustainability of future urban development. The direct democratic election of Local Government representing Ammani citizens, thereby creating concrete instruments of citizen involvement in the planning process, could be a suitable approach leading to effective community participation. The local political coalition have to clarify the physical, economical and social programs with transparency, evidencing concrete actions of public participation. This would mean that "Human development (w)ould take account of nature and natural process" (Ettouny, 1987; see also Potter, 2010).

The urban planning system is still working at a restrictive local level using detailed plans not necessarily controlled by a comprehensive strategy. This urges that the MGP should have already the instruments to control urban development, in order to prevent the creation of any illegal buildings outside the urbanized lands or the approval of Subdivision Plans also on agricultural lands (due to the relatively low cost of land compared to the urbanized areas). This could also avoid the high-cost infrastructural networks due to rehabilitation programs in slum quarters that are continually developing in the periphery of Amman (Abu Al Haija, 2001).

Future urban expansion will occur mainly in the southern parts of the metropolitan area and will be fully contained within the designated Amman Development Corridor. This scenario confirms the tendency of urban expansion towards the agricultural lands, where the comfortable climate and panoramic natural views encourage settlement compared to the desert lands located to the east of Amman. The present paper suggests the efficacy of an alternative scenario with the main goal of alleviating environmental damage, especially in the fertile lands of Amman west, north and south, by orienting future urban growth mainly into the semi-desert zones of Amman east. This scenario has the following advantages associated with it:

- saving the fertile lands located in north, west and south Amman
- facilitating different policies and approaches to urban zoning, considering that vast land areas are not yet subdivided
- controlling urban densities in order to reduce the ecological footprint of the city
- reducing the cost of infrastructure (due to the topography)
- reducing the cost of building (due to the low cost of these lands compared to other zones in Amman (the average cost per dunum in the semi-desert zones is about 10000 – 100000 JD)
- reducing traffic densities in the western and northern parts of the city
- savings in energy by reducing the distances between programmed facilities and public transportation, so encouraging walking and cycling
- connecting the new growth area with the city of Zarka, through the existing highway, without passing through the dense areas of Amman

- permitting the maximum solar gain and energy efficiency, organizing roads and buildings according to prevailing climatic conditions, within appropriate orientation according to the path of the sun
- permitting the local community to take responsibility for initiatives, thereby increasing public participation in the planning process

The site and services approach has much to recommend it in the context of metropolitan Greater Amman, in order to assist with the improvement of low-income housing in Amman east. This approach can be dovetailed with the opening up of new peripheral urban lands as part of the overall approach to planning. Meanwhile in Amman north and Amman west there is currently a surplus of some 30,000 vacant residential apartments. This gap between housing needs and demand on the 'two sides' of Amman is essentially due to the social and economic standing of residents. For the majority who live in Amman east, with the average Ammani family earning only JD 576 per month, life is hard (Statistical Department of Jordan, 2009). And it is clear that the growth in incomes is not anywhere near keeping pace with current levels of inflation.

In the case of Egypt, new cities have been established in the last 30 years in the desert areas. These include Sadat City, Sitta October City and Al Asher Ramadan City, which are located between 25 to 100km from Cairo. These new towns have succeeded in reducing the pressure of urban growth on surrounding agricultural lands adjacent to the Nile, especially in the Cairo Metropolitan area. This policy has other advantages in planning and programming the future expansion taking into consideration relatively low-cost land, and the integration of residential, industrial and commercial land use zones (see Ettouney and Abdelkader, 1987).

The problems of urban planning in Amman continue to be critical in scale due the pattern of land ownership and the interests of private developers in shaping land development and land policies. Other substantial problems concern the cost of land, the pressing housing needs of low-income families, the various slum quarters scattered in several zones, the shortage of potable water, the dearth of public services and healthy apartments. In particular, within Amman there needs to be the realistic control of land costs. However, this is difficult to achieve within the framework provided by the present Metropolitan Growth Plan. In reality both the public and private sectors have to be involved in developing new autonomous and sustainable settlements, based on site and services approaches, the provision of good standards of primary public services and sustainable patterns of natural resource consumption in relation to future development directions and building densities.

References

- Abu Al Haija, A (1995) Jordan, Technology and Residential Forms: Criterion Guides to Planning" (trans.), in Ph.D. Research, Politecnico di Milano, Italy.
- Abu Al Haija, A (2001) Towards comprehensive strategy for solving slum agglomeration: Jordan as a case study (trans), Majallat Al Jamea Al-Islamia. Vol. 9 n.1 part 2, P. 9-59
- Al Rawashdeh, S. and Saleh, B. (December 2006) Satellite Monitoring of Urban Spatial Growth in Amman Area, Jordan. In Journal of Urban Planning and Development. P. 211-216
- Daher, R (2007) Amman: Distinguished Genealogy and Recent Urban Restructuring and Neoliberal Threats. In The Evolving Arab City (3rd Chapter), Tradition, Modernity, and Urban Development, Toutledg.
- Darmame, K, & Potter. R. B. (2008). Social Variation in the contemporary household use of water in Greater Amman: a preliminary research note. Bulletin of the Council for British Research in the Levant, 3, 57-60.
- Elkin, T. et al. (1991) Toward Sustainable Urban Development, London, Friends of Earth.
- Ettouney, S. (1987) Housing Sciences, Community Facilities Planning for Existing and New Community in Developing Countries, Facto, Cairo

- Ettouny, S. & Abdel Kader N.(1987), Notes on Housing and Physical Planning, National Library, Cairo
- GIS, Greater Amman Municipality Department, data base, 2010
- Greater Amman Municipality (1986) *Law of the Grater Amman Municipality n. 67 for the year 1979*. Grater Amman Municipality Press. Amman.
- Grater Amman Municipality (2008) - Amman Metropolitan Growth Plan
- Hashemite Kingdom of Jordan, (2006) *Water in Jordan, (trans) in: http://www.dos.gov.jo/dos_home_a/water.htm*
- Law number 79 for the year 1966, and its later amendments in 1984 and 1993 (*trans.*), *Official Journal of Jordan Press*, Amman
- Law N. 52, (2006) Environmental Law, and relative norms (*trans.*), *Official Journal of Jordan Press*, Amman. In <http://www.lob.gov.jo/ui/laws/listall.jsp>
- Moughthin, C. (2005) *Urban Design Green Dimensions*, Second ed., Architectural Press, Oxford
- Potter, R.B., (2010) *Urbanisation and Planning in the Third World: Spatial Perceptions and Public Participation*, New York: St Martin's Press and Croom-Helm/Routledge: London
- Potter, R.B., Barham, N., & Darmame, K. (2007). The polarized social and residential structure of the city of Amman: a contemporary view using GIS. *Bulletin of the Council for British Research in the Levant*, 2, 48-52.
- Potter, R. B. and Darmame, K. (2010): 'Contemporary social variations in household water use, management strategies and awareness under conditions of 'water stress': the case of Greater Amman, Jordan', *Habitat International*, 34, 115-124
- Salameh, E (2008) *The Influence of Climate Changing on Water (trans.) In Seminar on Climatic Changing in Jordan and Future Provision*, Philadelphia University, Amman.
- Statistical Department of Jordan (2009), in: *Annual Report of 2009 (trans)* http://www.dos.gov.jo/sdb_pop/sdb_pop_e/inde_o.htm
- UNESCO, (2006) *The United Nations world water development report: water, a shared responsibility to the Millennium development Goals*. New York, N10017.
- Urban Regulation n. 21 for the year 2005 (*trans.*), *Official Journal of Jordan Press*, Amman.
- United Nations, (1992) *Conference on Environmental and Development*, New York, United Nations
- Ziadeen, F. (2004) *Amman History and civilization (trans)* Greater Amman Press.