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AMMAN URBAN REGION PLANNING GROUP

URBAN DESIGN CHAPTER

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CHAPTER III-3 URBAN DESIGN

3 OBJECTIVE

To improve the design of the urban places.

3.1 MEANING OF THE OBJECTIVE

Urban places may at one level of analysis be defined as spaces and structures in which special functions are performed—commercial, industrial, residential, cultural, and so on. A good urban form is one through which these functions may be performed with utility, convenience, and aesthetic satisfaction. Each criterion may be defined as follows:

3.1.1 By utility is meant that:

- infrastructure can be provided efficiently,
- available urban space, both vertical and horizontal, is used efficiently,
- maintenance costs are minimized, and
- each function has adequate space.

3.1.2 By convenience is meant that:

- trip time is minimized,
- services are located in relation to the frequency and intensity of use,
- structures and their spaces have complementary uses, and
- circulation serves urban spaces.

3.1.3 By aesthetic satisfaction is meant that:

- parks and open spaces are provided and accessible,
- areas having cultural significance are protected and accessible,
- areas of natural and man-made beauty are protected and accessible.

3.2 THE PRESENT SITUATION

The growth of urban places in the Region can be illustrated by the historical growth of Amman.[1/]

3.2.1 Historical Development

Although the city has existed at its present site since ancient times, by 1900 it consisted only of a small settlement clustered along the sides of the Seil Amman. As such, it was much like other urban places in Jordan: small and serving primarily an agricultural hinterland.

3.2.1.1 However, in 1921 Amman became the capital of Transjordan and began to attract immigration from surrounding communities. Even so, it remained small in both population and land area. By the end of World War II, its total population of 56,000 was still concentrated around the seil on only 2,500 dunums of land. Its population density was 22.4 persons per dunum, an overall density which has remained steady over most of its development.

3.2.1.2 During the period 1946-1953, growth became more rapid, largely concentrating along the Salt Road to the Northwest and the Wadi Es

1. See Maps III-3-1 through 6 which show Amman's developmental stages and Table III-3-1 which analyzes each period.

Sir Road to the west. Due to natural increases and migration, the population doubled, reaching 115,000. However, due to an equal increase in built area,[1/] densities increased only to 25.0 persons per dunum.

3.2.1.3 Expansion during the next nine years followed already established patterns along the Salt and Wadi Es Sir Roads. However, the areas between on Jabal Amman, Jabal Lwebda and Jabal Hussein also began to infill. Low income settlements arose along the Desert Road and at the entrances of the Amman-Zarqa corridor. Although population continued to increase at a high average of 13 percent per annum, equal increases occurred in built areas, and most sections of the city remained relatively uncrowded.

3.2.1.4 Further expansion of the built area in Jabal Hussein and Jabal Amman continued during 1962-1972. The Amman-Marka-Zarqa corridor continued to infill. City-wide densities remained low. This constant density is somewhat misleading, however, as much of the actual population growth occurred in single years as a result of migration. As a result, pockets of very high densities developed. During this decade, the bulk of the main road network was also developed, increasing from 45 to 57 kilometers.

1. Built area is defined as the urban area which is surrounded by continous development. Open parks and vacant space within areas of development are included in the calculation of built areas.

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1. Built area is defined as the urban area which is surrounded by continous development. Thus parks and vacant space within areas of development are included in the calculation of built areas.

3.2.1.5 The present population of about 823,000 lives in a built area of 38,000 dunums. The City's total major road network is now 64 kilometers. But as the result of rapid expansions of high income settlements, the city-wide density has actually dropped to 21.7 persons per dunum. Despite that low density, large low income settlements with very high densities——which reach extremes of 150 persons and average between 40 to 75 persons per dunum——exist throughout the city.

3.2.1.6 Early development concentrated on the more fertile agricultural lands to the north. The arid south did not develop until later and then mainly as the result of the establishment of refugee camps. These growth patterns have continued.

3.2.1.7 The sections following consider current urban growth trends, the impact of terrain on development, and the development of specific areas within the urban fabric.

3.2.2 Urban Expansion

Urban growth has been characterized by uncontrolled expansion of upper income and further densification of low income areas. As shown in the aerial photos attached, much of this upper income expansion has occurred between the Municipality of Wadi Es Sir and the Um Uthaynah section of Amman. A corridor of development has also formed between Jabal Hussein and Sweileh.

Much of this sprawl consists of relatively isolated high rise structures, occupying over

TABLE III-3-1

HISTORICAL DEVELOPMENT OF AMMAN

PERIOD YEAR	POPULATION PERSONS	BUILT AREA Km^2	BUILT AREA Dunums	DENSITY Persons/ Dunum	TOTAL LENGTH OF MAIN ROAD NETWORK Km
1946	56,000	2.5	2500	22.4	26.5
1953	115,000	4.6	4600	25.0	26.5
1962	255,000	10.0	10000	25.5	45.0
1972	550,000	21.0	21000	26.2	57.0
1979	823,000	38.0	38000	21.7	64.0

Source: AURPG Analysis

40 percent of the total plot area.[1] These tall structures are often surrounded by agricultural land still in production. Access and services have not followed master plans, where they exist, but generally have been developed to suit the needs of private developers.

3.2.2.1 Meanwhile, high land prices combined with planning regulations requiring plot sizes that are unaffordable to low income groups, caused further densification of the existing, unplanned low income settlements. A comparison of the growth of various settlements is shown in Table III-3-3.

3.2.2.2 Many of the latter settlements were fully built-up in 1973 despite the fact that the city's built area occupied only 28 percent of master planned subdivisions. Areas such as Jabal Al Nadef were 79 percent built-up, while Jabal Al Ashrafiyeh was 100 percent built-up. By the end of 1978, densities along the slopes of Jabal Al Nadef were estimated at 75 persons per dunum and 62 persons per dunum in Jabal Al Nuzha where in 1973 only 17 percent of the land area was vacant. (See Map 7 showing natural densities of Amman).

1. The building ratios quoted were derived from an analysis of the average plot sizes and building areas in the expansion area between Amman and Wadi Es Sir and between Amman and Sweileh. See Table III-3-6. As shown below, building codes allow a building ratio of only 30 percent in these areas.

3.2.2.3 In other more established areas such as Jabal Amman or Jabal Lweibdeh which were also almost fully developed in 1973, densities remained low, ranging between 12 and 20 persons per dunum. In those areas, development stopped and moved to vacant areas of the city to the north and northwest.

3.2.3 Urban Profiles

Figure ____ shows a profile of Amman taken from Jabal Hussein to Jabal Al Ashrafiyeh. The profile shows the changes in building types from one section of Amman to another and serves to illustrate the physical changes in neighborhood composition from one district to another. The more substantial buildings found along the tops of Jabal Hussein, Lwebda, and Amman generally belong to higher income households, while the smaller structures found along the slopes of of Jabal Al Ashrafiyeh are those of low income groups.

3.2.3.1 The change in building types is also indicative the planning practices followed in different districts. The larger plot sizes and building types found in Jabal Lwebda and Amman resulted from the planned development of those areas. However the settlement along the slopes of Jabal Al AAshrafiyeh is largely unplanned. It is also located in an area of unstable geological formations caused by settlement in limestone formations and movement in the flexure along the seil.[1]

1. Geological conditions of urban areas is further discussed in relation to urban design in section 3.3.18.

3.2.3.2 The relative heights of buildings in comparison to surrounding topography is also indicated by the profile. Much of the city center around the Sakf Al Seil Street consists of one or two storey commercial structures; many of which date from the earliest periods of Amman's development. However due to the construction of the Seil Street, and the resulting change in elevation of the street, many newer structures in the area have basement levels.

3.2.3.3 The buildings at the tops of jabals tend to be relatively constant in their heights due to planning restrictions to three floors. The buildings along the slopes of jabals frequently have more floors due to the additional building height which can be obtained due to the uneven terrain. Although 1921 planning legislation prohibits construction of buildings on steep slopes,[1] the more recent planning and building codes actually favor construction on slopes. Under current and proposed planning and building codes the total area of buildings which is below the highest level of a sloping site is exempted from calculations of floor ratios which are used by the code to determine the height of a building.[2] Thus extra floors can be added before

1. Article 63 of the Town, Village and Country Planning Law (1921) specifically prohibits construction of buildings on steep slopes. However it does not state actual slope conditions under which construction can not occur. Thus this article of the law is rarely enforced.

2. Article 37 of the Proposed Amman Planning and Building Code of 1979.

height restrictions are applied. The code further permits construction to a height equal to the height which would be permitted on the plot of land to the rear of the plot which is at a higher elevation.[1] As a result, buildings on plots with steep slopes requiring larger quantities of excavation can be constructed to greater heights than if they were on plots with milder slopes. This massive excavation of the sides of jabals is becoming very common even though it is prohibitied by planning legislation.

Include

(1) Amman profile

(2) Photo of Urban form

(3) Figures illustrating Articles 37 and 39

1. Article 39 of the Proposed Amman Planning and Building Code of 1979.

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3.2.4 Urban Public Open Space.[1]

Urban areas suffer greatly from the lack of public open space. As indicated in Map 8 which shows the location of public facilities, there is presently only 1,053 dunums of public open space in Amman or about 1.2 square meters of open space per capita.[2] This compares very poorly with the standards of public open space found in other primate cities which range from 5 to 40 square meters per person.[3]

3.2.4.1 While there is practically no public open space within urban areas, there are large amounts of vacant land within the built areas of urban centers. In Amman, vacant land accounts for 54 percent of the total planned areas. Furthermore within built-up areas, 46 percent of the master plan area, there are also large vacant areas. (See Map 9 showing vacant areas within the built-up area as of December 1979). While much of this unused land exists in newer sections of the city, there are smaller pockets of vacant land in practically all areas. Since much of this land is surrounded by development, it is already serviced with municipal water, sewerage, electricity and paved road networks.

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1. A broad definition of public open space is used as follows: land publicly owned which can be used for parks, gardens and playfields.

2. It should also be noted that much of this open space is located in the Sports Center which is mostly devoted to a club which has a restricted membership and high entrance fee.

3. Urban Land Policies and Land-Use Control Measures. Vol. VII. Global Review. United Nations, New York. 1975.P.79. Cities within the United Kingdom provide between 26 and 44 square meters of public open space, while those in the United States provide around 20 square meters of open space. Standards in other developing countries vary, but generally require between five and ten percent open space.

3.2.4.2 In some cases, this land has not developed due to adverse topographic conditions such as very steep slopes. However the primary reasons are due to high land costs and to some extent, planning regulations. Once an area is designated a particular zone, the subdivided land values increase. Nevertheless, rigid planning regulations do not allow development of plots less than a specified size.[1] As a result, the total costs of these plots becomes too high for most potential home builders to develop. Thus, they are forced into dense unplanned settlements or to seek less expensive land in the urban periphery which is outside municipal development controls. Rujm Al Khrabsha which is a new development between the University of Jordan and the Amman Municipal boundaries is an example of this form of development. It is outside municipal controls and is developing without master plans for street networks. Individual buildings do require permits from the Ministry of Municipalities and Rural Affairs.

A similar case exists for development of commercial plots within existing planning zones. When a plot of land is designated commercial in an area that was residential, property values can soar from JD20 to 30 per square

1. See Articles 27 through 36 of the new Amman Planning and Building Code (1979) which specify minimum plot sizes allowed in each zone.

meter to more than JD150 per square meter.[1] Thus the total costs of a plot can rapidly exceed the capacity of small businessmen to develop the land. As a result, many locate on residential plots leaving commercial properties vacant.

3.2.5 The Location of Social Infrastructure and Small Shops.

The location of social infrastructure and retail establishments catering to daily needs are not always related to neighborhoods having the greatest population densities. The number and location of these facilities are presented in Table 4. With exception of schools, most social infrastructural facilities such as parks, community centers, and health care facilities are not located within easy access of residential areas. Access is here being defined as pedestrian schools, parks and shopping areas selling food and goods and serviced required on a daily basis and as vehicular for other daily needs but requiring a maximum trip time of 28 minutes. See Table 5.

The average distance to a health care facility, i.e., clinic or hospital, is 1.2 kilometers, a distance which could be walked, but which would be difficult for a sick or elderly person to manage. (See Table 4.)

1. Estimates of increases in land values are from real estate agents.

However, many neighborhoods lack even primary health care facilities. Areas having high population densities such as Jabal Al Nazal, density 62 persons per dunum, and Jabal Al Nadef, density 75 persons per dunum, lack even basic health care facilities and must travel up to three kilometers to find these facilities. While these are extreme cases, similar conditions exist in other areas.[1]

The location of schools with regard to neighborhoods having high densities is uniform throughout Amman. Although in many cases, the distance to primary schools exceeds 400 meter, the distance a primary school child can easily walk, the average walking distance to a school is 0.6 kilometers which is not excessive.[2]

However in spite of their good spatial distribution, the location of many schools is poor in terms of the safety of pedestrian access. Many front onto major roads having high traffic volumes such as the schools around Second Circle in Jabal Amman. Recent school construction trends would seem to indicate a worsening of the problem as indicated by the construction of the school between Jabal Amman and Lwebda between major traffic arteries.

1. Health care facilities are further discussed in the Social Justice Chapter.
2. No attempt was made to differentiate schools according to type of school since there is no locational data about age groups within neighborhoods which could be used to compare against school location.

TABLE 5

RANGES OF TRAVEL AND PREFERRED DISTANCES

RANGES OF TRAVEL

Modes of Travel	Speed Km/hr	Time (min)	Distance m	Maximum Distance m
Walking	4	6	400	
		14	1000	
		28	2000	2000
Bicycling (flat ground)	16	15	2000	
		30	8000	8000
Motorized	30	30	15000	
		60	30000	30000

PREFERRED DISTANCES

Activities/Facilities	Frequency of travel	Distance (m)
Education		
Primary	Daily	400
Secondary	Daily	1000
Recreation (Social)		
Children - Local	Daily/Weekly	400
Adolescents- Local	Daily/Weekly	1000
Adults - Local	Daily/Weekly	400
- Regional	Occasionally	over 30000
Shopping		
Local-Food, Good/ Services	Daily/Weekly	400
Regional	Daily/Weekly	1000
Employment		
-Low Income Groups	Daily walking	2000
	motorized	15000
-Other Income Groups	Daily	30000

Source: Horace Caminos, & Reinhard Goethert, Urbanization Primer. MIT Press, Cambridge, 1978. p. 61.

As has been previously stated there is almost a complete lack of parks, gardens and recreational centers. Furthermore the distance required to reach the few existing public parks is too great to allow daily use of them. Their location also does not relate to other public use facilities such as schools, religious centers or historic areas. As shown by Map 8, none of the existing public open spaces are near to schools. There is no public open space in central business districts or near to retail centers.

The only exceptions are the planted areas within traffic circles. However there is no safe pedestrian access to these circles. Pedestrians are forced to fight through traffic since there are no controlled crosswalks.

Due to the radial development of Amman, most neighborhoods do have pedestrian access to shopping areas catering to daily needs. However as previously mentioned, due to land costs as and zoning requirements, many small businesses selling food are located in residential buildings, and only have temporary use permits in spite of the fact that they serve important daily needs.[1/]

1. According to recent municipal estimates these are roughly 250 firms of various types in this category.

3.2.6 Existing Zoning and Subdivision Planning[1]

Since the zoning and subdivision practices of the major urban centers follow those of Amman, an analysis of the present practices and their implementation was made of Amman. These practices serve to illustrate conditions which exist in other urban centers, particularly Zarqa.

The following sections discuss residential zones, commercial zones, and industrial zones and circulation as they relate to zoning and subdivision practices. Also the new Amman Planning and Building Code (1979) which supercedes the existing Amman Code and may be used as a model for other urban areas is also discussed in terms of its potential impact on urban areas.

3.2.6.a Existing Residential Zones

The present zoning practice[2] is to divide residential areas into subdivisions according to plot sizes. The current master plan areas of Amman are shown in Map 10, while the minimum standards in each zone are presented below.

1. Zoning practices are here defined as administrative sections on urban areas over which there are regulations controlling the type of use, permitted, heights, and other physical controls. Subdivisions are smaller sections of zones and are comprised of streets, plots and blocks all of which form distinct entities within zones.

2. Prior to July 1979, zoning practices were based on a 19__ Planning and Building Code. However as of July 1979 that code was superceded by the Amman Planning and Building Code of 1979.

TABLE 6

EXISTING SUBDIVISION REGULATIONS, 1978[1]

Zone	Minimum Plot Size (m^2)	Maximum Building Ratio %	Minimum Frontage (m)	Setbacks Front (m)	Setbacks Sides (m)	Setbacks Rear (m)	Maximum Height (m)	Maximum Height Floors
A	1,000	30	25	5	5	7	12	3
B	750	33	20	4	4	6	12	3
C	500	40	15	4	3	4	12	3
D	300	40	13	3	2.5	2.5	12	3
Central Commercial	200	-	12	-	-	4	12 [3]	
Linear Commercial	300	60	12	-	4[2]	4	12 [3]	
Local Commercial	400 (A+B) 200 (C+D)	50	15	Same as zone located in			12	3
Heavy Industry	1,000	75	25	4[4]	4	5	16	
Light Industry	400	50	18	3	2.5	2.5	12	

1. Source: Amman Planning and Building Code, 19__.
2. Four meter setbacks are required only of plots having depths greater than 15 meters.
3. Height restrictions are either 3/4 of the width of the street, plus the front setback or 12 meters.
4. Front setbacks are four meters or 1/4 of the width of the street, which ever is greater.

TABLE 7

EXISTING SUBDIVISION: DECEMBER 1979[1/]

ZONE	AVERAGE PLOT AREA m^2	AVERAGE BUILDING AREA m^2	BUILDING RATIO	NUMBER OF DOORS
A	856	365	43%	2
B	650	300	46%	2.5
C	582	260	45%	2.5
A	1173	551	44%	1.5
C	705	360	51%	2.5
D	283	111	39%	2
D	336	176	53%	3
D	80	78	90%	
C	471	311	66%	4
B	597	258	43%	2.5
	75	68	93%	1
	485	474		

Source: Aerial photo analysis of existing subdivision
AURPG, 1979

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As shown in the master plan map, the existence of a zone in a particular location follows income groups and age of the settlement. The older parts of Jabal Amman and Jabal Lwebda, even through they contain substantial buildings, are classified by the Municipality of Amman as "C" zones to conform with the smaller plot sizes found in them. These are also among the older residential zones of Amman. Newer subdivisions have generally been zoned "A" and "B" such as extensions of Jabal Amman and Shmisani.

Practically all of the master plan low income areas or "D" zones are all located in the southern and southeastern portions of the city. The central business district built along the seil effectively serves as the major demarkation between "D" residential zones and other residential areas. Since the 300 square meter minimum plot requirements are beyond the affordability of many low income households,[1] substantial numbers of unplanned low income settlements[2] have developed along the sides of Jabal

1. Refer to Table __ in the housing chapter which compares minimum planning standards with minimum incomes required to afford housing at those standards.

2. These are four major categories of planning definitions used to describe residential neighborhoods within urban areas: a) planned refugee camps recognized by the UNRA, b) unofficial camps not recognized, however both generally have regular street networks, C) unplanned on squatter settlements, and d) planned neighborhoods where develop has followed master plans.

Al Nadef is a prime example of this type of spontaneous development. Within this settlement, average plot sizes range about 80 square meters, while just a few meters away at the top of the jabal in the planned area plot sizes range 336 square meters. The densities in these two areas also provide striking comparisons: along the slopes of Jabal Al Nadef they are 75 persons per dunum, while at the top densities are 15.4 persons per dunum.[1]

An analysis of several existing subdivisions (shown in Table 7) was made through aerial photo interpretation. It is significant to note that this analysis of 485 plots randomly selected through urban areas, shows a great deal of variation from planning regulations. For example, in Shmisani, an area classified as an "A" residential zone, the average plot sizes are 830 square meters less than permitted by the planning regulations. Similarly, the average plot sizes in the "B" zone of Jabal Hussein are only 650 square meters, while within the older "C" zone of Jabal Amman, the average plot size ranges 705 square meters.[2] These variations from the official regulations would seem to indicate that the present zoning practices do not follow market trends regarding the price of land, and the desireability of location near to the center of Amman, and the need to provide plots small enough to be afforded different income groups. They also indicate a lack of administrative control over subdivisions.

1. See Map 7 which shows natural densities of Amman.
2. The minimum plot sizes in "B" zones are 750 square meters while the minimum plot sizes in "C" zones are 500 square meters.

Furthermore the classification of zones appears to be arbitrary. The average plot sizes within the "C" and "D" zones of Jebel Hussein fall within the same range, i.e., 500 to 750 square meters. By contrast, the plots in the "C" zone of Jebel Lwebda and Jebel Amman exhibit large differences averaging 471 square meters in the former and 705 square meters in the latter.

Construction practices also do not follow the standards set by the existing building and planning code. Building ratios range from 39 percent of plot area in the steep slopes of the "D" zone of Jebel Amman to 90 percent in the unplanned low income settle on the sides of Jebel Nadif. The maximum building ratios are consistently violated in all zones including the "A" and "B" zones in new areas such as Shmisani and Jebel Lwebda and Hussein.[1] Aside from merely violating codes, these increased building ratios seriously reduce private open space in areas where there is no compensating public open space.

3.2.b Proposed Residential Zones

The Amman Planning and Building Code (1979) is a step in the direction of development of a comprehensive planning and building code for urban areas.

1. The building ratio violations may be caused in part due to confusion over setbacks and building ratios. If the minimum setback requirements in an "A" zone 1,000 square meter plot are subtracted from the total plot area, 48 percent of the plot area remains, which conforms fairly closely with present building practices in "A" zones shown in Table 2.

Recognizing the need for greater zoning diversity, it creates two new residential zones: the Green Housing Zone and the Popular Housinf Zone. (See Table 8). The first can be developed in any residential zone providing that plot sizes are large enough. Setback and maximum building ratios are the same as those in existing residential zones. The only modifications between Green Housing Zones and existing residential zones are the more restrictive building height limitations. However, the zone allows larger buildings having greater ground coverage through maintaining the same maximum building ratio to plot size.

The Green Housing Zone is not likely to be very popular with developers because of the total costs of the minimum plot size and because of the height restrictions which limit buildings to two floors. The zone may also not be effective in preserving green areas due to the fact that Green Housing Zones can be located in any residential zone[1] and therefore may not grouped together. Furthermore since larger building areas are permitted, the total percentage of land reserved for areas is not increased. Finally, minimum plot frontages required by the code do not utilize infrastructure efficiently. A 2,000 square meter plot with a frontage of 40 meters requires effectively 37 percent more infrastructure than a 2,000 square meter plot with a frontage of 25 meters.[2]

1. See Article 30 of the new Amman Planning and Building Code(1979
2. Infrastructure is defined as road networks,water supply, sewerage, surface drainage and the land required for installation of those services.

TABLE 8

PROPOSED PLANNING AND SUBDIVISION REGULATIONS
Source: Proposed Amman Planning and Building Code (1979)

Zone	Minimum Plot Area (m^2)	Minimum Building Ratio %	Minimum Frontage (m)	Setbacks Front (m)	Setbacks Sides (m)	Setbacks Rears (m)	Maximum Height (m)	Maximum Height Floors
Green Area"A"	2000	36	40	same as "A" zone				2
Green Area"B"	2000	42	40	same as "B" zone				2
Green Area"C"	1200	48	25	same as "C" zone				2
Green Area"D"	800	52	20	same as "D" zone				2
A-Residential	1000	36	25	5	5	7		3 1/
B-Residential	750	42	18	4	4	6		3 1/
C-Residential	500	48	15	4	3	4		3 1/
D-Residential	300	52	13	3	2.5	2.5		3 1/
Popular	150	-	10	2	-	2		3 1/
Commercial Central	150	85	10	2.5	2.5	2.5	72	3/
Normal "A"	600	70	22	2/	2/	4	72	4/
Normal "B"	600	70	22	2/	2/	4	72	4/
Normal "C"	400	70	15	2/	2/	4	72	4/
Normal "D"	200	70	12	2/	2/	4	72	4/
Normal"Popular"	100	70	10	2/	2/	4	72	4/
Heavy Industrial	2000	50	40	10	5	5	24	300%of p
Light Industrial	1000	50	20	6	4	4	24	300%of p

1. Note that commercial and high rise structures can exceed these height limitations.
2. Front and side setbacks are not allowed on plots having depths less than 18 meters. Plots greater than 18 meters in depth require 4 meter side setbacks.
3. Heights are also restricted by floor percentages of plot area. The floor percentage of a plot of 200m^2 or less is 600% of the plot area plus 1% for every square meter greater than 200 m^2.
4. Heights are also restricted by floor percentages. The maximum floor percentage of plot less than 600 m^2 is 600%. while for plots greater than 600m^2 it's 600% plus 1% for every 20m^2. The plot is greater than 600m^2 providing that the total floor percentage cannot exceed 850% of the plot area.

Plots with narrower frontages generate more private open space at the rear and front of the plot.

The establishment of the Popular Housing Zones is a recognition of the need for smaller sized for low and middle income families. However the current minimum plot size of 150 square meters is still beyond the affordability of families whose incomes are below JD2,500 or the 80th percentile of urban household incomes.[1] The setbacks and frontage requirements for Popular Housing Zones plots are not efficient in terms of development of private open space or in utilization of infrastructure. As is shown in Appendix A under the proposed standards, the total land requirement for development of a 150 square meter plot serviced with 12 meter wide streets is 246 square meters or 1.64 times the plot area. However, the total land requirement at the same standards for a 1,000 square meter plot is only 1.28 times the plot area. See Table 9.

The impact which planning regulations new Amman Planning and Building Code, 1979, will have on circulation requirements and the provision of infrastructure is analyzed in greater detail in Appendix 1. However in summary, present planning standards do results in higher development costs due to inefficient plot ratios and excessive circulation requirements. For example, the infrastructure costs of a 150 square meter plot almost doubles when street widths are increased from 6 meters to 12 meters.

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1. See Table ___, in the Housing Chapter which shows that the minimum income required to afford a 50 square meter house on a 150 square meter plot is JD2,500 per annum.

TABLE 1

SUBDIVISION LAYOUTS: IMPACT PLANNING REGULATIONS HAVE ON CIRCULATION AND INFRASTRUCTURE REQUIREMENTS

SE BER	ZONE	MINIMUM PLOT SIZE m^2	SECONDARY STREET WIDTH m	PRIMARY STREET WIDTH m	RATIO OF PLOT LENGTH TO WIDTH	BLOCK LENGTH m	% OF CIRCULATION %	UNIT INFRASTRUCTURE COST PER GROSS AREA JD/m^2 1/	DENSITY 2/ (INCLUDING 5% OPEN SPACE) (Persons/Hectare)	TOTAL COSTS OF INFRASTRUCTURE PER PLOT JD/Plot	TOTAL LAND REQUIREMENT PER PLOT INCLUDING CIRCULATION AND OPEN SPACE m^2
	Residential										
.	A	1000	10	12	1.6	250	15.2	3.72	530	4662	1253
.			* 12	* 12	1.6	250	17.0	4.12	520	5232	1262
.	B	750	8	10	2.28	216	12.9	3.22	760	2769	860
.			10	12	2.28	216	15.5	3.79	710	3575	943
.			* 12	* 12	2.28	216	17.3	4.52	690	4360	905
.	C	500	6	8	2.0	180	12.2	1.71	111	1033	624
.			8	10	2.0	180	15.5	2.02	106	1270	628
.			* 12	* 12	2.0	180	20.4	4.93	100	3305	670
.	D	300	6	6	1.77	156	14.8	2.14	179	600	374
0.			6	8	1.77	156	15.8	2.24	177	640	376
1.			8	10	1.77	156	19.9	2.62	168	1047	398
2.			* 12	* 12	1.77	156	24.7	5.98	157	2554	427
3.	Popular	150	3.5	6	1.50	140	14.1	4.09	361	758	165
4.			6	6	1.50	140	20.1	5.34	334	1069	220
5.			6	8	1.50	140	21.2	5.57	329	1232	223
6.			8	10	1.50	140	26.3	6.65	307	1452	226
7.			* 12	* 12	1.50	140	34.2	8.31	272	2047	246
8.		75	3.5	6	1.33	120	18.9	5.91	679	583	[illegible]
9.			6	6	1.33	120	26.7	7.66	620	842	142
0.			6	8	1.33	120	27.9	7.93	600	865	122
1.			8	10	1.33	120	34.1	9.32	544	1247	127
2.			* 12	* 12	1.33	120	43.2	11.37	460	1846	145
3.			12	12	1.33	240	40.5	10.69	467	1470	127
4.			12	12	2.00	244 2/	36.4	9.61	523	1239	126

* Minimum street width allowed by planning regulations
1. Cost of paved streets, curbs, sidewalks, water and sewerage
2. Plot ration of length to width changed from 1.33 to 2.00

However when plot ratios of length to width are increased, thereby reducing plot frontages, infrastructure costs decrease as does the total land requirement per plot. As is shown in the last two examples on the table, the increase of the ratio of length to frontage of a 75 square meter plot from 1.33 to 2.00 results in a 20 percent reduction of total infrastructure costs and a 7 percent reduction in total land requirements.

Using above analysis, the most efficient plots proposed by the code are located in the "B" zone which has plot ratios of 2.28. The least efficient and thereby the most costly to developers and end-users are the "A" zone plots having ratio of 1.6 and the Popular Housing Zone plots having ratios of 1.5.

3.2.c <u>Existing Central Commercial Zones:City Centers.</u>

The problems of city centers can be characterized by Amman's city center where conditions have reached the point at which if significant improvements are not made, the entire district will cease to function as a viable center of Amman and the Region. The conditions which have lead to this situation are due to legal and administrative procedures such as rent control which have frozen development, topographic limitations, and the growth patterns of the city generally.

As was shown in Amman's historic development, all major traffic arteries converge on the central area of Amman bringing large volumes of through traffic to the central area's narrow streets. In addition over 90 percent of the workers in the city center commute to work from other, which during rush hours increased traffic congestion.

All of this traffic is forced to used streets, which due to confines of the surrounding jabals, are narrow and unable to handle the volumes of traffic which passes over them. For similar reasons, pedestrian sidewalks are too narrow for the large number of pedestrian that use them. Thus many forced to compete with vehicular traffic in streets. Furthermore these pedestrian system are not interlinked, but are interupted by major traffic arteries. Finally there is a serious shortage of parking areas as well as offstreet stopping areas for service taxis.

Presently the city center has a gross area of approximately 400 dunums. It is comprised of mainly small commercial establishments which account for 73 percent of all businesses.[1] Over 66 percent of these small businesses have total areas of 300 square meters or less.

Buildings within the center show four major stages of development somewhat reflecting the growth of Amman. Twenty-three percent have been built within the last ten years; another 12 percent are between 10 and 20 years old; 39 percent were constructed between 20 and 30 years ago, while the remainder date from earlier periods.

Rent control has had a major impact on the central city as over 93 percent of all establishments rent their premises. However rents tend to be low. Renters tend to fall into two major categories: those who paid annual rents of below JD300, roughly 48 percent, and the remainder who paid between JD300 and 1,000. By comparing these rents with length of

1. The source of much of this data is a survey conducted by the students of the Department of Architecture of the Faculty of Engineering and Technology University of London in 1979.

rental periods some indications of the impact of rent control can be shown.

Roughly fifty percent of all renters are fairly new having rented their premises for less than ten years. It is likely that this group is paying the higher rents greater than JD300 per annum. Nevertheless, over three fourths of all firms rent their space for less than JD42 per month or between JD0.100 to JD0.420 per square meter per month. Rents in newer retail districts outside the city center can run six or seven times that amount.

There would also appear to be a good deal of mobility among business in the city center, since only 23 percent of the structures were constructed in the last ten years. However, fifty percent of the business have occupied their present location for less than ten years. This would tend to indicate that changes in the types of businesses in the city center and that they are changing locations.

Aside from holding rents at abnormally low levels, rent control has also resulted in the lack of maintenance of the central business area. Over 85 percent of the buildings were found to be in various stages of deterioration.[1] They had either structural faults, or had lacked comprehensive maintenance to keep their appearance in good condition.

The congestion of the city center is further worsened by the lack of loading and unloading facilities. Over 57 percent of the firms surveyed lacked facilities on their premises for receiving such merchandise. As a result, they are forced to unload goods on pedestrian sidewalks which

1. Op. Cit. 1978 University of Jordan survey.

interupts their business and blocks access in the front of their stores.

Land use in the city center is very extensive due to the physical constraints imposed by the steep slopes of the jabals which define the center's space. In 1973, the city center provided an estimated 14,600 jobs of which 13,400 were commercial or retail. It had a total of 11,300 establishments, the bulk of which employed three employees or less. As a result, the average number of jobs per dunum was 110, while the average ground area per job was only nine square meters.

Based on a total plot area of 237 dunums and an average utilization ratio of 2.0, the city center could support an additional 10,000 more jobs. However without major structural changes in the city center, such an increase would intensify congestion in the area.

Steps have been taken by the municipality to improve the functioning of the city center. A penetration road system is being developed from Amman to Zarqa. When completed, it should draw much of the traffic along the Amman-Zarqa corridor away from the center. Furthermore the construction of ring roads is also providing links between the various radial arms which have characterized Amman's development. However, there is still a need to improve traffic flows in the center, particularly the pedestrian network. There is a need to encourage property owners to improve their buildings and to stop further deterioration of the area. Finally there is a need to encourage a greater diversity of the type of shops in the central area as most of the prestigious shopping areas are now located outside the central area.

TABLE 10

LAND USE AND BUILDING USES: AMMAN CITY CENTER

	1973[1]	%	1979	%
Built-up Areas (Dunums)	323	81%		
Vacant Land "	74	19%		
Ground Areas (total)"	397	100%		
Number of Establishments				
Commercial-Retail	8020	78%		73%[2]
Offices	3020	27%		16%
Others	40	-		11%
Total	11330	100%		100%
Number of Jobs				
Commercial-Retail	20340	58%		
Offices	13430	38%		
Others	1230	4%		
Total	35000	100%		
Floor Area				
Commercial m^2	280000	90%		
Residential m^2	30000	10%		
	310000	100%		
Families	500	-		
Population	3500	-		
Jobs per Establishment	3			
Jobs per Dunum Ground Area	110			
Ground Area per Job	9			
Utilization Ratio (Total Floor Area to Ground Area)	0,78			

1. Source: Amman Penetrator Road Corridor Development Study (August 1974).

2. Dept. of Architecture: Jordan University survey of 4,000 establishments (1979)

3.2.d Proposed Central Commercial and District Commercial Zones.

While the proposed planning and building code attempts to rectify conditions in commercial areas, many of the existing problems already described will not be corrected. While others may actually be created.

In central commercial zones, the minimum 2.5 meter setbacks in the front and rear of the buildings will nor result in sufficient space for servicing commercial buildings, e.g., allowing truck access for loading and unloading goods, or for providing adequate open space or ventilation between buildings. Figure____ shows the impact which the proposed regulations will have regarding open space, heights and serviceability. As indicated, the five meters which could result between buildings at the rear plots is too small for service vehicles to pass, particularly if one vehicle is already parked at the rear.[1] When a commercial building is developed on a sloped site, the 2.5 meter rear setback is likely to develop into a severe environmental problem. If the setback is observed at the lowest level of the excavated plot as shown in Figure____, it will be too narrow to be used for vehicular servicing. Thus it is likely to develop into a refuse dump and an ideal place for breading of rodents. Such an area will also be too narrow to provide adequate ventilation for interior portions of the building.

1. See Article 33 of the new Amman Planning and Building Code (1979)

Unless barrier wall are constructed at the high level of the site, the narrow 2.5 setback could also cause serious accidents resulting in severe injuries if a person happened to fall into the narrow setback area.

Equally, the setback provisions in Normal Commercial Areas of 4 meters at the rear of the plot are not likely to be particularly effective in providing light and ventilation, particularly if commercial areas are to be intermingled with residential areas as the code permits. For example, a building with an effective height of 15 floors, 13 floors allowed by floor areas calculations and additional parking and attic floors, could be constructed on a 600 square meter plot having a total height of 50 meters. However the distance at the rear between adjacent buildings would only be a mere 8 meters, resulting in a narrow canyon between the two buildings.[1] See Figure_____.

Conditions would be somewhat better where commercial plots adjoin residential plots at the rear as the distance between buildings would be 11 meters.[2] However buildings of this height in residential neighborhoods would destroy the character of the area, increase traffic flows and would greatly reduce the light and ventilation received by surrounding residential plots.

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1. See Article 34 of the new Amman Planning and Building Code, 1979.
2. This is however only true in "A" residential zones were 7 meter setbacks are required at the rear of residential plots and 4 meter setbacks at the rear of commercial plots. In other residential zones, the distance between buildings would be less due to reduced setback requirements.

3.2.e Existing Conditions in Industrial Zones

A survey conducted of the Marj Al Hamman industrial zone and aerial photo interpretation of the Marka industrial zone give indications of the current conditions in industrial zones regarding the size of firms, number of workers and the ground area per worker.[1] Although Jordan's industrialization is relatively new, the comparisons with international standards can be made. In Marj Al Hamman, the average plot area per worker is 167 square meters, while international standards for total land consumption per worker including plot areas, streets and other uses range about 100 square meters per worker.[2]

Plot areas within industrial zones tend to be much greater than minimum plot sizes allowed by planning codes, which range 2,000 square meters. The average plot size in Marj Al Hamman is 5,704 square meters while in Marka it is much larger, 7,741 square meters.[2] While these statistics in themselves may not represent standards, they do indicate greater land requirements fper worker than is normally found in industrial zones. These greater land requirements are partly explained by large vacant areas within industrial plots which have been left for future expansion.

1. Mining and quarrying firms were excluded from the surveys as were repair shops.

2. Urban Land Policies and Land-Use Control Measures. Vol. VII. Global Review. United Nations: New York. 1975. P. 53.

While the development of industrial estates are a new feature within the region, most industrial location has been linear along major roads rather than concentrating in industrial zones. The average distance which a frim is away from a major road is less than 0.3 kilometers in both Marj Al Haman and Marka. This locational pattern has been due to existing land ownership and availability of infrastructure. Infrastructure in particular has been a locational problem for new industrial firms. Many firms have not had access to water or electricity and have had purchase water from tankers and generate their own electricity. Therefore there has been a strong locational preference for major roads which facilitate truck access. The other major locational criteria has been land ownership, most developers have built on their own land rather than seeking to locate in industrial estates, which frequently lack infrastructure.

Based on the Marj Al Haman survey, several industrial firms are creating environmental problems ranging from solid waste disposal problems to the generation of dust and noise. With the exception of the phosphate mines and other mining activities, these problems have generally been localized, as the total number of firms is small and they are widely dispersed. However as industrial activity intensifies, these problems may become more acute due to the lack of buffers between industrial zones and other zones. An example of such a potential problem can be found in the northern residential zones of Zarqa where industries are beginning to locate just north of the municipal boundaries outside of municipal planning controls.

TABLE 12

EXISTING CONDITIONS IN INDUSTRIAL ZONES

Industrial Zone		Mars Al Haman[1/]	Marka[2/]
Total Number of Firms		42	65
Average Plot Area (m^2)		5704	7741
Average Building Area (m^2)		1834	2374
Average Building Ratio %		32	31
Total Number of Workers		1430	N.A.
Average Number of Workers per Firm		34	
Average Plot Area per Worker(m^2/worker)		167	
Mode of Transportation Used by Workers			
Public Buses	%	20	
Factory Transport	%	67	
Taxis	%	3	
Others	%	10	
Environmental Problems			
Solid Wastes	%	85	
Liquid Wastes	%	18	
Noise	%	36	
Dust	%	16	
Average distance of firm from a main road (Km)		0.30	0.27

1. Source 1978 AURPG Survey
2. Source 1979 AURPG Aerial Photo Interpretation

TABLE 13

TABLE

INDUSTRIAL ZONES: CIRCULATION, INFRASTRUCTURE,[1] INFRASTRUCTURE COSTS

ZONE	MINIMUM PLOT SIZE m^2	SECONDARY STREET WIDTH m	PRIMARY STREET WIDTH m	BLOCK LENGTH m	% OF CIRCULATION %	UNIT INFRASTRUCTURE COSTS PER GROSS AREA JD/m^2	TOTAL COSTS OF INFRASTRUCTURE PER PLOT JD/Plot	TOTAL INFRASTRUCTURE COSTS IF 10% OPEN SPACE IS RESERVED FOR GREEN AREAS JD/Plot	PERCE INCRE IN CO DUE T ADDIT OF OP SPACE %
Heavy Industry	2000	12	12	800	13.3	3.50	8066	9117	13.0
		16	16	400	17.1	4.40	10606	12061	13.1
		20	20	400	20.6	5.23	13185	15085	14.4
	3000	12	12	400	11.7	3.08	10461	11797	12.8
		16	16	400	15.2	3.89	13756	15595	13.4
		20	20	400	18.4	4.65	17100	19487	14.0
	4000	12	12	400	9.7	2.53	11218	12615	12.5
		16	16	400	12.6	3.22	14754	16640	12.8
		20	20	400	15.3	3.88	18338	20793	13.4
Light Industry	1000	12	12	200	18.0	4.70	5729	6524	13.9
		16	16	200	22.8	5.85	7584	8713	14.9
		20	20		27.3	6.90	9487	11000	15.9

1. Infrastructure includes roads, basic on-site surface drainage, water supply and sewerage

TABLE

INCOME REQUIRED TO AFFORD A HOUSING UNIT AT CURRENT STANDARDS[1]

ZONE		POPULAR		D		C		B		A		GREEN ZONE A	
1. Annual Income Required	(JD)	3662	2556	5388	3401	7920	4357	10476	5316	12642	6831	23928	11369
2. Monthly Income Required	(JD)	305	213	449	283	660	363	873	460	1053	569	1994	947
3. % of Income Spent on Housing	(%)	25	25	25	25	25	25	25	25	25	25	25	25
4. Monthly Payment Required	(JD)	76.29	53.25	112.25	70.86	164.97	90.77	218.40	114.91	263.37	142.30	498.51	236.86
5. Down Payment	(%)	25	25	25	25	25	25	25	25	25	25	25	25
6. Yearly Interest Rate	(%)	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
7. Repayment Period	(Years)	20	20	20	20	20	20	20	20	20	20	20	20
8. Total Cost of Housing Package	(JD)	11721	8182	17246	10886	25346	13946	33555	17655	40464	21864	76592	36392
9. Land Cost	(JDm^2)	10	10	10	10	10	10	10	10	10	10		
10. On-Site Infrastructure Cost	(JDm^2)	9.61	9.61	7.35	7.35	5.83	5.83	4.92	4.92	4.64	4.64	3.65	
11. Construction Costs	(JDm^2)	60	60	60	60	60	60	60	60	60	60	60	
12. Floor Area of House Allowed by Code[2] (m^2)		109	50	156	50	240	50	315	50	360	50	720	
13. Average Household Size	(Persons/Plot)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	
14. Density	(Persons/Ha.)	246	246	143	143	94	94	66	66	50	50	27	
15. Park and Open Space	(%)	3	3	3	3	3	3	3	3	3	3	3	
16. Circulation	(%)	40	40	31	31	24	24	21	21	19	19	15	
17. Plot Size	(m^2)	150	150	300	300	500	500	750	750	1000	1000	2000	
18. Width of Streets[3]	(m)	14	14	14	14	14	14	14	14	14	14	14	
19. Block Length (10 Plots Per Side)	(m)	100	100	130	130	140	140	180	180	250	250	400	
20. Plot Ratio (Length to Width)[4]		1.5	1.5	1.77	1.77	2.20	2.20	2.26	2.26	1.6	1.6	1.25	

1. Current standards used are those of the proposed Amman Planning and Building Code (1979).
2. Based on maximum building ratio allowed by the proposed Amman Planning and Building Code.
3. Minimum street width allowed by the proposed code in areas serving 6 plots or more.
4. Established by the code.

An estimate of the total land and infrastructure requirements of industrial zones is presented in Table 13. The infrastructure costs are the costs of road networks, water supply and sewerage. The table also gives an indication of the total increase in infrastructure costs due to the addition of open space to or around and industrial zone. Generally the costs are about 14 percent greater, than if no provision were made.

3.2.f Existing Conditions of Circulation.

The present conditions of circulatory systems[1] in urban centers are deteriorating, presenting increased hazzards to residents and reducing the efficiency of those systems.

Traffic statistics from the Department of Statistics indicate that the rate of increase in traffic accidents in urban areas is about 11 percent per annum. In 1960, there were only 853 traffic accidents in urban areas, however, by 1976 the latest year for which statistics are available, that number had increased to 6,873. If current trends persist, by 1985 the number of traffic accidents is projected to increase to 10,995. It is also significant to note that the number of accidents involving pedestrians has been increasing at a similar rate. By 1985, accidents involving pedestrians will equal more than 50 percent of all traffic accidents.[2]

1. Circulatory systems are defined as street networks and pedestrian walkways and staircases.

2. Unpublished Traffic and Accident Statistics from the Department of Statistics, 1960-76.

While many of these accidents are caused by poor driving habits, conditions are exacerbated by poor design of subdivisions, the lack of a hierarchy of circulation and a neglect of pedestrian networks. Subdivision design has generally not restricted vehicular movement within neighborhoods. Residential plots front onto collector streets as well as major thoroughfares. While this condition has been partially the result of the topographic conditions, it has also been due to the lack of a planning hierarchy of circulatory networks and the lack of coordination of street networks of one subdivision with another. For example, there is a lack of cross town streets leading from one jabal to another. Traffic is forced to utilize neighborhood streets which were not designed to carry heavy traffic volumes. The cross town traffic from Jabal Amman along Jabal Lweibda to Jabal Hussein is a prime example of these types of traffic problems. While some these conditions will be solved for outlying districts by the ring road systems, they will still remain in central areas of the city.

The primacy of the pedestrian as the basic unit of circulation has been largely neglected in residential neighborhoods and central business districts. Cars park along residential streets blocking sidewalks and force pedestrians onto the same streets which carry crosstown traffic. The intensity of pedestrian traffic in city centers such as along King Talah and King Feisal streets in Amman is too great for narrow sidewalks and forces pedestrians onto streets. Throughout city centers, pedestrian networks of staicases and walkways exist, however they are not linked together. They are continually interrupted by high intensity vehicular traffic.

TABLE 14

TRAFFIC AND ACCIDENT STATISTICS

YEAR	1960	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978 1/	1985
Total No. of Accidents	853	3414	3853	2959	4106	4312	4911	5368	6873	7430	8195	10995
Number of Fatalities	78	241	209	271	295	283	284	253	329			
Number of Injuries	715	2791	2200	N.A.	1969	2520	3294	3602	4029			
Number of Accidents Involving Pedestrians	417	N.A.	N.A.	1962	1797	1693	1821	1891	2211	2452	2720	5625
Number in Amman	128	2185	1838	1928	1815	2771	3072	3006	3656	3510	3717	5165

Slope 10.29
24.12
10.94

Source : Department of Statistics.

1. Periods since 976 were projected

The new Amman Planning and Building Code attempts to rectify these problems by requiring 14 meter wide roads in all areas. However it does not specify the need for pedestrian access, nor does it provide for a hierarchy of circulation. Furthermore, in many neighborhoods streets of these widths have a high land requirement often equally more than 25 percent of the gross land area.

In most urban area, particularly Amman and Zarqa, there is a major lack of parking facilities in spite of the fact that only about 20 percent of urban households own automobiles. The problem is further compounded in residential areas by the conversion of private parking spaces into commercial facilities and the practice of parking along streets instead of private space. Furthermore in newer district shopping centers, such as the development at Firas Circle, parking provisions were not included in the original development plans nor were shops required to provide parking as a prerequisite prior to obtaining a merchant or building permit.[1/]

Since most of the development of central business districts occurred prior to the development of recent intense traffic flows, they experience acute shortages of parking. Their problems are further intensified by the lack of areas for taxis and service taxis to discharge their passengers. At present, due to traffic regulations which prohibit stopping along major streets in central commercial areas, taxis must discharge their passengers illegally.

1. In some areas this problem has been solved by using vacant land for parking lots and by parking along setbacks.

Municipal Governments have developed several approaches to their parking problems. They are constructin parking structures in central business districts. However since their budget are restricted, the rate of construction has been slow. The Municipality of Amman is also temporarily using vacant plots in commercial areas as parking lots.

The parking problems in newer areas are likely to be alleviated by planning and building codes which require on plot provisions of parking spaces. However the code should be more stringent in some of its parking requirements. For example, in "C" and "D" zones only one parking space is required for every two dwelling units [1] in spite of the fact that the minimum plot sizes for the two zones are 500 and 300 square meters respectively.

Furthermore, Article 19 of the code allows the development of structures without parking facilities if topographic conditions do not permit their construction. While it is questionable why any structure should be permitted under such circumstances, the article is likely to be abused. The additional fees which must be paid if parking facilities are not provided are much less than the capital costs of providing on plot parking. The current capital costs of construction parking facilities within the central area of Amman are roughly JD80 to JD90 per square meter. However under Section B of Article 48, a prospective builder is only required to pay a maximum of JD24 per square meter to be excluded from providing on-site parking. Furthermore since the fee is fixed by law, it will not keep pace with the rate of inflation of construction costs, which are averaging at least 10 percent per year. Therefore the fees will become even less effective in providing alternative parking solutions.

1. See Article 16-A-3 of the new Amman Planning and Building Code, 1979.

The total parking requirements for Amman's city center are estimated to range from a low estimate of about 10,720 parking spaces to 13,400 spaces. The low estimate is based on the following city center characteristics:

+ Presently the city center has an estimated 34,600 employees of which an estimated 20 percent drive their own cars to work which equals a parking requirement of 6,920 parking spaces or parking for 52 percent of the firms located in the city center.

+ There an estimated 13,400 firms in the city center. If 25 percent of the firms require an additional parking space, a need for an additional 3,350 spaces is generated.

Therefore the total parking requirement would be 10,270. The high estimate is based on providing each firm with one parking space.

Along Alf Soil Street there is an estimated dunums of vacant or unused land. This land would provide roughly 1,460 parking spaces if all structures built on it were required to have lower level parking facilities. However there would still remain a parking deficit of ____ spaces which would have to be by other means.

3.2.7 <u>Existing Conditions of Historic and Culturally Significant Areas.</u>

Map 8 also shows the location of existing historic structures within urban centers which are protected by the Department of Antiquities. They include such areas as the Roman Theatre and Cidedal in the city center of Amman, and bronze age towers located in several other areas. There are also numerous other sites in other urban centers protected by the same legislation. While these areas are protected by planning acts[1] as well as the

1. Article 15 of the Town and Country Planning Act of 1921.

Antiquities Law of 1976,[1] they have suffered from enchroachment by other developments. The Roman Theatre is surrounded by parking; much of the approach and view of the Citadel is restricted by housing which has been built along the slopes of the jabal; and bronze age towers are surrounded by housing.

While archaelongical sites are protected, the interpretation of the legislation has not been yet extended to protect areas of recent historic interest. There are numerous buildings in older parts of urban areas which demonstrate the recent historic growth of urban centers. For example within Amman, there are buildings in the central business district which stem from the architectural period of the 1920's. Much of the central area of Salt is comprised of structures which date from the early 1900's onwards. These significant facades are being allowed to deteriorate to the point where many may not exist by the end of the plan period. While the ancient churches and mosques of Madaba are being protected by the antiquities law, much of the surrounding village, which makes up a significant part of the character of Madaba, is deteriorating or being enchroached upon by featureless modern construction.

The current interpretation of the antiquities law excludes from protection significant cultural and social features of urban areas in the region. Mosques are a central focus of the identity of the Region. However, they are being surrounded by indiscriminate urban development obstructing views of them and surrounding them with noisy, rapidly moving vehicular traffic. Many, such as the central mosque

1. Under the Antiquities Law, Law No. 12 of 1976, the Minister of Tourism and Antiquities establishes boundaries for archaelogical sites in cooperation with the Department of Lands and Surveys (Article 4-A). Under Article 5, the Minister can expropriate such a site. He can also restrict the owner of such a site from making any use of that land which is contrary to the furtherance of the law. As such the law is far-reaching enough to be used to create urban historic sites.

in Amman, have only limited pedestrian access. Views of others could be potential obstructed by construction of high rise buildings in their vicinity.

Pedestrian networks of interlinked walkways and staircases are another indigenous feature of urban areas in the Region. But many, particularly those in the Amman central business district, are dirty and poorly maintained. They are interrupted by major arterial streets and are not linked together with safe pedestrian crossings. Public open spaces with seating areas are not enterpered within the network

Finally present legislation does not protect areas of aesthetic beauty within urban areas such as significant promontories overlooking the city. Additionally there is a lack of protection of environmentally sensitive areas within the urban fabric. Aquifer recharge areas are being built upon while urban sprawl is rapidly engulfing agricultural lands.

3.2.8 Building and Planning Standards.

The rigidity of building and planning standards force large segments of urban populations to occupy 'illegal' housings.[1] The minimum plot sizes imposed by planning and building codes in master planned developments acts as a serious constraint to the access of housing.[2] As previously shown in the analysis of land requirements and in the housing chapter, the costs of these requirements are beyond the affordability

1. Illegal is defined as being ineligible for a longterm building permit under current planning and building standards.
2. See Article 27 through 32 and 45 and 46 of the new Amman Planning and Building Code, 1979.

of the bulk of urban households. When plot sizes are determined by market forces such as land availability, densities, and land costs, plot sizes in low income neighborhoods are much smaller than in nearby planned neighborhoods. The same condition also exists in "A" and "B" zones where land costs can exceed the capacity to develop plots which have been determined by the planning standards imposed by present codes.

While requirements for stone facing on all buildings have provided urban areas with an uniform, almost maintenance free character, rigid imposition of such standards also excludes low income households from obtaining housing.[1/] Stone facing on a simple, single storey house having a floor area of 35 square meters can increase the construction costs by as much as 30 percent over the costs of using concrete block construction. It would be far more equitable in terms of providing access to housing if stone facing were only required in "A" and "C" residential zones, commercial zones, and in industrial zones.

The imposition of stone facing standards also tends to limit the development both technologically and aesthetically of urban character. Heavy dead loads resulting from stone facing restrict building spans and all but eliminate the possibility of long span cantilevers. Furthermore, the use of pre-cast concrete and other technological innovations are greatly restricted by the design limitations of stone facings. As a result the urban form is very much limited to a type of construction which can support the heavy loads imposed by stone facing.

1. See Article 20 of the new Amman Planning and Building Code,197

The requirements for minimum street widths of 14 meters, result in more costly infrastructure and in subdivisions which do not reflect social and cultural urban forms. It has already been demonstrated that excessive road widths push the costs of infrastructure and land beyond the reach of all but the upper 20 percent of urban households. However, these requirements also result in social changes in the neighborhood makeup. Natural neighborhood gathering places such as the landings of staircases and junctions between houses disappear due to the greater amount of land in the neighborhood being devoted to paved streets.

3.2.9 Private Sector Urban Design Decisions.

Many urban design decisions which shape urban areas occur mainly in the private sector, often outside the control of planning authorities. While town planning legislation and building codes have been in force since the early 1920's, municipal governments often lack the capacity monitor development within their jurisdictions. They are faced with severe budgetary constraints and a lack of sufficient staff.[2/]

Municipal authorities have been further constrained in their efforts to monitor their cities' growth by the lack of jurisdiction over lands surrounding their municipalities. Several examples this form of development exist throughout the region: housing growth of the outskirts of Madaba, the small industrial area developing north of the Zarqa city limits, the sprawl between Jabal Amman and Wadi Es Sir, the conurbation developing between Sports City and Suweligh and the

2. Budgetary constraints and lack of staffing capacity are further discussed in the Administrative and Fiscal Chapters, and therefore are only mentioned here.

growth of the southern outskirts of Amman. In spite of the initial decision to build outside the restrictions imposed by municipal governments, once established, these private developments demand connection to municipal water supplies, electricity and other urban services. Eventually, even though in unplanned areas, these private developments become part of the urban fabric.

3.2.10 Urban Design and the Individual

Urban design solutions have lacked provisions for children. Planning and building codes as well as current construction practices through minimum frontage requirements and through maximizing on-plot construction have not encouraged the development private open spaces which serve as play areas for small children. Five meters or less setbacks in the front and sides of buildings and seven meters rear setbacks result in very little private open space left on the plot.

Furthermore several provisions of building codes create built-in hazzards for children. Residential areas can be constructed in industrial zones without buffers between them. Such mixed use development represents a serious hazaard to small children, due to the heavy reliance of industrial areas on large trucks. Furthermore, the health hazzards to small children resulting from industrial pollution are much greater in industrial zones.

A second potential risk to children exists in high rise construction. High rise buildings can be consructed in any residential zone with only marginal increases of setbacks. For example, a high rise building can be constructed in a "D" zone with an effective height of eight floors.[1/]

1. See Article 42.D. of the Amman Planning and Building Code, 1979. A structure with a gross floor area of 880 square meters can be built, on a 400 square meter plot yields floor However a parking floor and an attic floor can also be added and be excluded from building ratios.

However the codes only require setbacks to be increased from 2.5 to 2.75 meters, an increase that would not be noticeable.

As previously discussed in section 3.3.6., the lack of concern for children in urban design solutions is manifested in the lack of neighborhood parks within walking distance of residential areas and schools. In most neighborhoods, the only public play areas are streets and vacant lots.

There is a lack of public gathering places and recreation areas for families. The need for such places in the urban center is demonstrated by the popularity of forests and shaded green areas along major roads of the region for picnicing. However, these places are only accessible to families owning their own means of transportation and require long travelling times to reach them. Thus, even for families with cars, they can be used only infrequently. There are no such green areas within urban centers where families can gather during holidays or in evenings.

3.3.18 Seismic Risks in the Region.

Jordan has had a long history of earthquakes, due to the fact much of it lies within the Rift Valley. Ancient cities such as Jerash and Azark were destroyed by earthquakes. In more recent history, a 1929 earthquake in Amman caused considerable damage to structures, while an earthquake in the Jordan Valley in April of 1979 measured "5" of the Rickter Scale and "3" in Amman.

Several fault lines exist in the region. Flexure line rans along the Amman Seil through the city's center. Many of these formations are subject

to movement which can cause severe damage to buildings not designed to withstand seismic loads.[1]

A current building design practices as well as planning and building codes do not require earthquake resistant design. The new Amman Planning and Building Code of 1979 does not refer to seismic loading, nor does it require that special precautions be taken in the design of buildings to resist earthquakes. Current zoning practices also do not have provisions restricting heights and building forms in areas of suspected earthquake activity such as the city center.

As a result, buildings with free-standing columns carrying upper floors are designed which are particularly susceptible collapse during earthquake action, as are buildings with variable geometries which are likely to be damaged due to alternative periodic vibrations caused during earthquake. The new building code allows construction of high rise buildings in any zone without also requiring that these buildings be designed earthquake resistant. Thus they create hazzards not only to the occupants of the building, but also to surrounding structures.

1. It is not the purpose of this section to discuss seismic activity in any detail, merely to point out that it exists.

3.3 Proposals for the Plan Period: Urban Design

The proposals for the plan period stem from the analysis of the existing conditions of urban design in the Region and are aimed at supporting the objective. These proposals are divided into four sections:

- Targets,
- Guiding Principles,
- Programs,
- New Procedures.

3.3.1 Targets for the Plan Period

The following targets are proposed to improve the conditions of urban design within the Region:

1. Increase the amount of public open space within the urban areas of the Region from less than 1 dunum per thousand population to 3 dunums per thousand population.

2. Reduce circulatory systems as a percentage of gross land use in a neighborhood from 20 to 25 percent to 15 to 18 percent.

3. Provide all new subdivisions with a minimum of 2 to 5 percent open space.

4. Designate between 5 to 10 dunums of vacant land within existing neighborhoods as public-use open space. This land can continue to be privately owned, but must be developed into public-use facilities.

5. Provide 7,600 new parking space within Amman city center by 1985. Similar targets should also be set for Zarqa, Salt, and Madaba.

6. Access to social infrastructure, i.e. schools, community parks, etc., should be within easy walking distance, range 400 to 1,000 meters or not require a trip greater than 28 minutes.

3.4.2 Guiding Principles

As a result of the analysis of the existing conditions within urban areas of the Region, the following guiding principles support the overall objective of urban design, i.e., to improve the functioning, convenience and aesthetic performance of urban centers, and provide a framework for realizing the targets proposed above:

1. Promote the development of both public and private open space within the urban areas of the region.

2. Promote the development of pedestrian systems in central business districts, district retail centers and in residential zones.

3. Promote the development of central business districts within the major urban centers of the Region.

4. Promote subdivision planning which provides land, infrstructure, and open spaces efficiently at costs affordable to all income groups within urban areas of the Region.

5. Encourage private sector participation in the creation of public use facilities such as small parks, outdoor cafes, public open space within commercial and residential areas, parking facilities, etc.

6. Develop integrated neighborhoods for various income groups and various complimentary urban activities.

7. Plan urban areas for high rise structures which compliment other urban areas.

8. Develop green areas around urban centers which protect environmentally sensitive areas, provide separation between residential and industrial zones and protect agricultural areas.

9. Develop historic, culturally significant and significant aesthetic area zones within urban centers which protect these zones and restrict development around them.

The following sections propose programs, projects, standards and interventions which further describe and support these guiding principles and meet the targets for improvement of urban design which have already been proposed. Many of these programs are interlinked with each other and are aimed at comprehensive improvement of urban areas.

3.4.3 PROGRAM: Develop an urban park system

The previous description of existing conditions in urban areas has shown that there is a serious lack of public open space, and that available open space is not easily accessible to residential areas. Therefore to support the development of increased open space and to meet the proposed target of 3 dunums of open space per 1,000 persons, it is proposed that an urban park system be created.

Such an urban park system should be integrated within the existing fabric of urban areas as well as new areas which may be added to urban centers. Therefore the following locational criteria are proposed for development of the system:

i. Emphasis should be given to developing urban parks near to neighborhoods having high densities.

ii. Urban parks should be located within easy walking distance or residential areas, generally within one half a kilometer of the center of these residential areas.

iii. Urban parks should be developed in conjunction with public use facilities such as schools, religious facilities, and national buildings such as parliament.

iv. Urban parks should be developed around archaelogical and historic sites.

v. Urban parks should be developed as extensions of pedestrian walkways in city centers and residential areas.

vi. Urban parks should be developed in areas which provide significant views of urban centers and particularly significant historic and cultural areas.

vii. Urban parks should be located on steep slopes which would be difficult to develop for other purposes. These parks could retain a semi-agricultural nature, be privately owned and be used an orchards.

The basic resource for developing these urban parks is the vacant land within built-up areas of urban centers. (See Map 9 for location of these vacant areas.) Much of this land is privately owned. However in many cases, large plots have remained vacant for long periods in spite of the fact that infrastructure is readily available. The primary constraint to municipalities in obtaining this land for urban parks is the cost of it.

Therefore six specific interventions, some of which enabling legislation already exists, are proposed to facilitate the development of the system:

i. Divert some of the funds generated by the proposed Land Improvement Fund for the purchase of land for urban parks. The Land Improvement Fund and its operation is further discussed in Technical Paper _____.

ii. Develop an unused infrastructure tax to be imposed on land which is serviced by infrastructure but has not been developed. This tax could be enacted on its own merits, or could become a part of proposed changes in property taxes. It would serve several purposed such as encouraging the development of vacant plots, recovering the capital and possibly recurrent costs of infrastructure, and providing a financial resource for purchase of land for urban parks.

iii. Enact the Municipality of Amman's "Law of Planned Neighborhood Areas Within the Boundaries of Amman Municipality," (1979). This law would allow municipality to develop planned area on either publicly owned land, or land which is expropriated, and sell the development at a profit which could be used for purchase of urban parks. The law's jurisdiction should be expanded to include other municipalities as well. However, in its present state, the law has only been proposed and is waiting for further definition and approval by the government.

iv. Municipalities should seek ways of formally leasing vacant lands to be used as parks and playfields. Lease payments could be paid through taxes on unused infrastructure or property taxes. Such properties could be leased for fixed periods, such as 30 years, at which time lease agreements could be terminated for renegotiated.

v. Existing zoning powers should be used to redesignate vacant areas as parks and open space. Within these redesignated areas private public use facilities should be encouraged such as commercial parks, outdoor cafes, small craft shop arcades, etc.

vi. Use existing planning legislation which allows planning committees to expropriate up to 25 percent of the total area of any plot without paying compensation to landowners for construction or widening of roads, development of public square or gardens, development of parking areas, or location of schools more efficiently to develop parks within new subdivisions. Since the expropriation authority has only been used for the development of road networks, it may be necessary to broaden the law's scope so that it can also be used for expropriation free of charge of land for parks and gardens. This legislation will be primarily used in the development of parks in new subdivisions.

vii. Enact the Ministry of Finance's proposed modifications for expansion of property tax laws which would improve the ways taxes are calculated and which would tax land which is in master plan areas but not developed.

These interventions would broaden local government's capacity to provide urban parks and other services. They should be enforced at the municipalities level, and taxes collected be controlled at that level. They are further discussed in the Administrative Chapter.

Although there is a large amount of vacant land within urban areas, it would be difficult and very costly to obtain large parcels of land which are well located in relation to other urban uses due to the sporatic location of vacant plots. Furthermore the costs of assembling such large pieces of urban land would be so large that they would mitigate against any action being taken at all. Therefore to alleviate these economic and locational problems, it is proposed that up to 60 percent of the total urban public open space requirement be provided in large urban/regional parks on the periphery of urban centers where land costs are lower than in central areas. Secondly, it is proposed that 20 percent of the requirement be developed by private developer as commercial parks, open space reserves in central business districts and as public use facilities within subdivisions. The ramining 20 percent would be developed by municipalities within built areas as small parks which could range in size from one dunum to 50 dunums. These percentages are not suggested as being fixed local conditons. The following standards for urban parks are proposed in Table _____.

TABLE 16

RECREATION AND OPEN SPACE STANDARDS

TYPE OF FACILITY	DISTANCE FROM DWELLING (KM)	MINIMUM AREA DUNUMS	LAND NEED PER PERSON (m^2/PERSON)
1) NEIGHBORHOOD GATHERING PLACE [1]	0.5	0.2	
2) NEIGHBORHOOD PARKS	0.9	5	2
3) CENTRAL BUSINESS DISTRICT PARKS	N.A.	NO MINIMUM	NONE
4) PLAYGROUNDS	1.6	10-15	5
5) CITY PARKS	3.2	20-40	[illegible]
6) THEME PARKS [2]	N.A.	NO MINIMUM	N.A.

1. GENERALLY FOR VERY DENSE AREAS WHERE THERE IS NO POSSIBILITY OF PROVIDING LARGER FACILITIES
2. WHICH GENERALLY REPRESENTED A THEME CULTURALLY OR HISTORICALLY SIGNIFICANT OR RELIGIOUS FACILITIES.

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3.4.3 Urban Parks Projects

Table 17 shows the total urban parks requirements for the four major urban centers in the region: Amman, Zarqa, Salt and Madaba. These projections were based on the providing urban parks for the two largest municipalities, Amman and Zarqa which comprise about 86 percent of the urban population, at a standard of 3 dunums per 1,000 population. Since the other two urban centers are much smaller and have easy access to rural areas, lower standards were used to project their open space requirements.

A total of 3,351 dunums of urban parks is required to provide the 1979 urban population with the above minimum standards of urban parks. One thousand nine hundred ninety two dunums of that amount will be required for urban regional parks.[1] A further 679 dunums will be need to be developed by municipalities within existing neighborhoods, while the remaining 679 dunums will be developed privately on new subdivisions.

1. Since Salt and Madaba are essentially rural, having much smaller populations, it was not deemed necessary to provide them with urban/regional parks. These settlements already have access to rural areas.

TABLE 17

TOTAL URBAN PARK REQUIREMENTS

URBAN CENTER	POPULATION 1979	STANDARD DUNOMS/1000	TOTAL PARK REQUIREMENT	URBAN REGIONAL PARKS	PUBLIC URBAN PARKS	PUBLIC-USE PARKS
			DUNOMS	DUNOMS	DUNOMS	DUNOMS
AMMAN	823,100	3	2469	1481	494	494
ZARQA	283,943	3	851	511	170	170
SALT	30,506	0.5	15.0	—	7.5	7.5
MADABA	31,070	0.5	15.5	—	7.8	7.7
TOTAL			3351	1992	679.3	679.2

SOURCE: AURPG ANALYSIS.

The following projects which are presented in various levels of detail serve to illustrate how the Urban Parks System Program could be implemented. Very specific details of the development of urban parks for Amman for the five year period, 1980-85, are presented in the first section while locations are suggested in the second section for other parks.

a) Urban parks for Amman. Based on the standards proposed above, i.e., three dunums of public open space per thousand population, the Municipality of Amman would require a total of 2,469 dunums of urban parks. This total open space requirement is divided into the following specific components:

1. Urban/Regional Parks.

1,481 dunums to be developed as urban/regional parks along the periphery of Amman. These parks would be located in water recharge areas such as Wadi Abdom and should eventually run along the Zarqa River to the central business district at the commencement of Alf Seil Street. Play fields for various sports activities, picnic grounds, public gardens and natural urban forests comprised of low maintenance trees should be developed within the park reserve. Portions of it could also be reserved for agricultural uses.

Private concessions could be encouraged to develop stands selling food, to provide ponies for bridle rides, and to provide other amusements which complement

the functioning of the park. Although it is not included in project estimates, it should be possible to develop an urban zoo in conjuction with this park. However land requirements for a zoo are not included in the park land requirements.

2. Public Parks. Four hundred ninety four dunums of land are required for smaller parks within the built area of Amman. These parks should range in size from one dunum in very dense areas where there is little vacant land to 50 dunums where more land is available. The small "vest pocket" parks ranging in size from one dunum to 10 dunums should be located along pedestrian systems and next to schools and religious centers. Larger parks should be interpersed throughout the built area.

The proposed location of these urban parks is shown in Map _____. These locations were determined through a sieve mapping technique in which densities, available vacant land, location of public facilities and topographic conditions were compared with each other.

The following development standards are proposed for these parks:

++ Small vest pocket parks should include paved or gravelled areas for informal gatherings, low maintenance trees and shrubs for shade, play structures for small children, street lights, retaining walls where necessary to accommodate changes in elevation, and pedestrian access points.

+++ Larger urban parks ranging in size from 10 to 50 dunums should include playfields, picnicing areas, gravelled pathways, access for pedestrians, linkages with public transportation systems and parking facilities.

+++ Natural, low maintenance materials should be used for all types of park facilities. Such materials would include: stone, gravel pathways, rock, wood, trees, shrubs and flowering plants. Larger urban parks should also provide both men's and women's toilet facilities constructed out of durable, low maintenance materials.

3. Public-use Parks. Due to the high costs of acquiring land, public use parks should be developed by private developers. A total of 494 dunums of land should be developed in this fashion. Since the land will continue to be owned privately, these public use facilities should provide the developer with some rate of return on the costs of the land. Methods of providing this rate of return could include allowing developers to add additional floors if ground area in commercial areas is left open. This ground space could be used for sidewalk cafes and for small vendors provided that no permanent structures are constructed over it.[1] Privately owned park systems can be developed within subdivisions which are jointly owned by individual plot holders but are open to public use.

1. Special regulations now used by the Municipality of Amman already practice these setback procedures.

Loans from commercial banks but guaranteed by municipalities or the central government could be used to finance these parks.

Where topographic conditions permit, such as along the slopes of jabals, commercial and parking structures can be developed on lower levels with small roof-top parks on upper levels. Some prime areas for this form of developement exist along the southern side of Alf Seil Street in the central business district where there is a 15 to 20 meter change in elevation between the level of Alf Seil street and the next street south. As has been proposed by the consultants for the Municipality of Amman, the Abgaly bus station represents another prime location for a mized use urban park facility. The total change in elevation over the site would permit the developement of parking structures at lower levels, commercial establishments at middle and upper levels and roof top parks at the roof level. Such a park system would link together the proposed post office, existing religious centers and residential areas.

b) <u>Other Urban Parks Project Proposals:</u> In addition to the park listed above the following specific locations are suggested for urban parks. The feasibility of each would have to be studied in further detail.

i. Develop the phosphate mine into a metropolitan regional park. When the mines are moved, about five years, the cost of developing that land for other uses will be excessive. However, it could be developed into a forested recreational area which would support the further development of the Amman-Zarqa Corridor.

ii. Develop the areas which have been excavated into the hillsides by rock crushers along the Naur Road in the southwestern areas of Amman and other areas into combinations of parks and high rise residential structures. The Naur Road development would provide a dramatic entrance to Amman due to the sharpness of the excavations made by the rock cutters.

iii. Develop green belts between the new residential districts being developed and emerging industrial zones.

iv. Develop the Wadi Abdom recharge area into an urban forested area.

v. Develop the large vacant area within the center of Salt into an urban-public use park. Within the park, private concessions could be encourage to develop. Such a park would give Salt a central focus and would support the development of tourism in Salt.

vi. Develop the wadi between the extension of Jabal Amman and Jabal Lwebda into an urban forest park. This area also acts as ventilation corridor for the central area of the city. This urban forest park would support the road network already being developed. The two would become an urban forest parkway with vehicular traffic, pedestrian footpaths in the forested area, and bicycle paths.

vii. Develop the vacant land at the top of Jabal Lwebda overlooking the new school being built in the wadi between Jabal Lwebda and Jabal Amman into a public park. The park could be terraced and linked to the school with pedestrian so that children could reach the school without crossing the streets.

Estimated Cost of Urban Parks Program

The estimated costs of the urban parks program are presented in Table 18. These costs are based the costs of land and the costs of developing urban parks. The total cost of the five year program is estimated to be JD24.1 million. Roughly JD21.1 million of that amount will have to be met through public expenditure either budgetary or through the resources of the Land Improvement Fund. If these funds were borrowed at commercial rates, 8.5 percent over 20 years, they represent an annual total budgetary requirement of JD2.2 million or an annual per capital expenditure on parks and open space of JD1.91.

3.4.4 PROGRAM: REVITALIZE CENTRAL BUSINESS AREAS

Rent control laws, changes in commercial business structure and land constraints have lead to the deterioration of central business districts within the Region. However these areas represent a major employment source and provide large portions of urban and rural populations with retail and commercial services. They also act as the central focus for urban areas. In Amman, the central business district acts as a central point of reference for both the region and the nation.

Therefore it is necessary to revitalize central business districts within the region. This major improvement of central areas should be initiated in Amman and Zarqa, and to a lesser extent in Salt and Madaba. The following development standards or actions are proposed to achieve the revitalization of central business districts:

TABLE 15

TOTAL ESTIMATED COSTS OF URBAN PARKS, AMMAN, ZARQA, SALT AND MADABA IN 1985

CITY	PARKS CATEGORY	TOTAL LAND REQUIREMENT DUNUMS	TOTAL COST (JD'000)	TOTAL NON-RECOVERABLE COST (JD'000) 1	ANNUAL COST (JD'000) 2	ANNUAL COST PER CAPITA JD (AE
AMMAN						
	REGIONAL/URBAN PARKS	1481	4547			
	PUBLIC PARKS	494	12,350			
	PUBLIC-USE PARKS	494	2470			
	TOTAL	2469	19,367	16,897	1,785	2.07
ZARQA						
	REGIONAL/URBAN PARKS	511	1,177			
	PUBLIC PARKS	170	2,805			
	PUBLIC-USE PARKS	170	510			
	TOTAL	851	4,492	3,982	420	1.43
SALT						
	PUBLIC PARKS	7.5	112			
	PUBLIC USE PARKS	7.5	23			
	TOTAL	15	135	112	12	0.39
MADABA						
	PUBLIC PARKS	7.8	116			
	PUBLIC USE PARKS	7.7	24			
	TOTAL	15.5	140	116	12	0.31
GRAND TOTAL		3,350	24,134	21,107	2,229	1.91

1. THIS IS THE TOTAL AMOUNT WHICH MUST BE MET BY MUNICIPAL GOVERNMENT AS THE COSTS OF PUBLIC USE PARKS ARE FULLY RECOVERABLE.
2. AMMORTIZED AT 8.5% OVER 20 YEARS.

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i. Divert non-central business district traffic away from the district.

ii. Develop a system of pedestrian malls where vehicular traffic has been excluded which links together existing pedestrian walkways and staircases with pedestrian malls.

iii. Develop a series of parking facilities, both public and private, which receive vehicular traffic intended for central business areas. Pedestrian access should be provided between these parking facilities and pedestrian malls.

iv. Provide passenger pickup and alighting points along major arterial streets for public service vehicle----buses and taxis.

v. Provide convenient pedestrian crossing at intersections.

vi. Require merchants facing onto pedestrian networks to clean and maintain pedestrian walkways.

vii. Plant trees and shrubry along pedestrian malls and walkways.

viii. Where possible separate pedestrian and vehicular traffic through changes in levels resulting from existing topographic conditions. If level changes are not possible traffic lights and other control devices.

ix. Provide small permanent seating areas throughout the pedestrian network in shaded areas and in small urban parks.

x. Require all business to provide parking facilities as required by building codes or to pay for the capital costs of developing these facilities elsewhere. Merchants in existing structure should provide a portion of capital costs of parking facilities through increases in merchants taxes or through property taxes. (See Chapter ___ Fiscal Structure).

xi. Encourage the development of small sidewalk cafes in shades areas throughout the central business district, but primarily in conjunction with pedestrian malls and networks.

xii. Provide improved street furniture such as seating areas, garbage collection points, signs, and separate garbage collection facilities for businesses.

xiii. Develop open air markets and souks with adequate pedestrian access, nearby vehicular access, paved pedestrian streets, water supply, drainage, refrigeration, nearby parking, sanitary facilities, sheltered arcades and separate servicing facilities for loading and unloading merchandise.

xiv. Provide where necessary loans to building owners to improve their buildings in central business districts. Where necessary revoke merchants permits from businesses which refuse to maintain and improve their structures.

xv. Encourage a greater diversity in the quality and variety of business located in the central business district.

Since these improvements will benefit the businesses in central business districts more than it will benefit businesses located in other areas, the capital costs of these benefits should be borne by business fronting onto improved pedestrian malls. However since these added costs could also act as a initial deterent to development of central business districts, the initial capital costs should be funded through municipal budgets. However these capital costs should be recovered from benefitting business through merchant's taxes, or other financial mechanisms.

Article 41 (D) of the Municipalities Law allows municipalities to recover up to 50 percent of the costs of surfacing a street from property owners along both sides of the street. Therefore legal precedents exist which could be used by municipalities to recover at least 50 percent of the capital costs of pedestrian malls. The remaining 50 percent could be recovered through betterment taxes[1] or other procedures such as licensing fees.

3.4.5 Revitalize Central Business Areas: Projects.

The following projects are proposed for implementation of the program to revitalize Central Business Areas: Amman Pedestrian Mall, Amman Parking, Zarqa Pedestrian Mall. The following sections describe these projects in more detail.

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1. Article 52-4 of the Town, Village and County Planning Law allows collection of fees from property owners if the value of their land increases because of a municipal development project, in this case a pedestrian mall. Such fees are collected as a percentage of the increase in land values after completion of the project and can be collected on the following basis: 30 percent in the increases of land values within 500 meters of the project and 10 percent of the increase if theland is locate more than 500 meters but less than 1,000 meters. The fees go to the municipality or village unless the project is outside such a jurisdiction in which case they go to a reserve in the Government Treasury.

   Although the legal principle has been established for some time, it has not been used by municipalities to secure additional development revenues. It could,however be used in this case.

a. Amman Pedestrian Mall. - Based on the criteria stated above, it is proposed that a pedestrian mall be developed along King Talal Street from the present Municipality Building to the intersection of King Talal Street and Prince Muhammad Street. The pedestrian mall should also extend along King Feisal Street to the intersection of King Feisal Street and King Hussein Street. The short streets between pedestrian mall on King Talal street and Alf Seil street would also be closed, traffic on them would be limited to service vehicles only. The existing pedestrian networks which runs from the vegetable market to the areas behind the Central Mosque should also be improved.[1] (See attached Map___ for the location of these proposed pedestrian malls.)

When completed the pedestrian mall would have a total length of approximately 680 meters along King Talal Street and 300 meters along King Feisal Street. The improved existing pedestrian network would have a total length of 660 meters, while the short streets closed due to the development of the Pedestrian Mall would have a total length of 530 meters.

All vehicular traffic should be excluded from these pedestrian malls. Stores servicing requirements for loading and unloading merchandise can be handled through lower level service ramps where topography permits such as the around the vegetable market. Where there is not enough change in elevation to permit the development of lever level servicing ramps,

1. These proposals have been developed in cooperation with Dr. Magdy Jewfick of the Department of Architecture of the Faculty of Engineering and Technology of the University of Jordan.

stores can receive merchandise either through rear streets or at specified times of the day.

As a separate project, the vegetable market should be improved through provision of pedestrian pavement, removal of service vehicles, installation of sanitary facilities, provision of improved shops along covered arcades and planting of trees.

To support the pedestrian mall and to provide vehicular acces, Alf Seil Street should be widened to allow four lanes of traffic moving in both directions.[1] All non-central business district traffic should be diverted away from the city center. One possible method to divert traffic destined to Jabals Amman, Lwebda and Hussein away from the city center would be to construct a tunnel running from Wadi Haddah to King Hussein Street. A new road would have to be constructed along the wadi to the tunnel. Such a road would also provide access to low income communities now living in the area. The road would link up with the Penmetrator Road now under construction. The total feasibility of such a project should however be studied in detail and in relation to other transportation projects before it is started.

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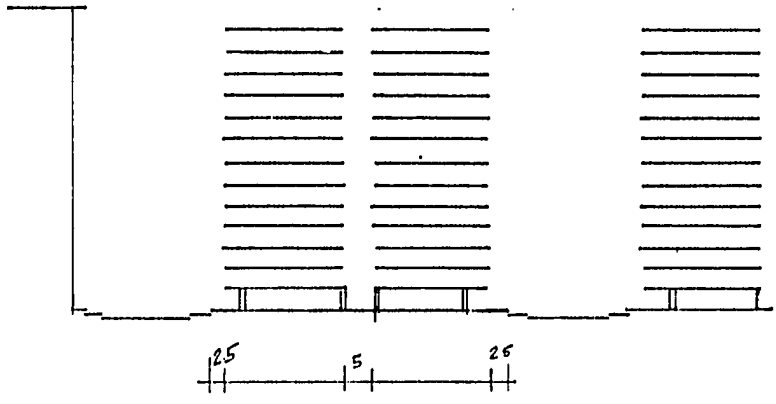
1. Although land is costly around Alf Seil Street, under current planning legislation, Planning Committees can expropriate up to 25 percent of plot area for (1) construction of new roads or widening existing roads, (2) development of public squares or gardens, (3) development of public parking areas, and (4) location of schools. See the Town, Village and Country Planning Law of 1921.

Within the city center, traffic coming from East could be diverted along the street running parallel to King Talal and King Feisal Streets to intersection of King Feisal and King Hussein Streets. Traffic coming from the north could be diverted along Basman Street and Prince Muhammad Street.

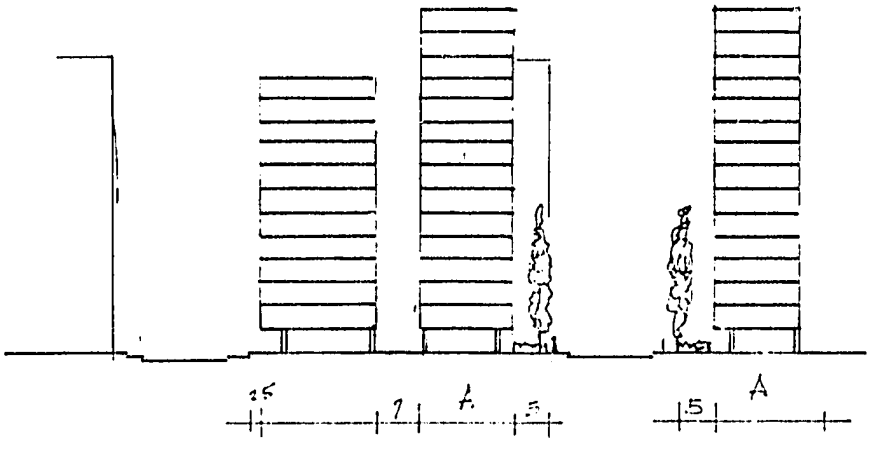
If the full volume of traffic can not be diverted along Prince Muhammad Street, then as shown in the map, it poposed that the western half of King Feisal Street continue to be vehicular and the eastern half be converted to a pedestrian mall. However, the vehicular portion of the street in front of the central Mosque should be narrowed to one lane of traffic moving west. The remainder of King Talal street should be developed into a mall in front of the mosque. It will also be necessary to study the feasibility of widening and improving the alignment of the other streets shown in Map____.

Central Business District Revitalization Project Phasing and Standards

Since construction of all of the proposed pedestrian mall system would be a large project, it is proposed that the mall be constructed in phases. The first phase should be the improvement of the vegetable market into a souk and the development of a pedestrian mall from the market to the Central Mosque. The second phase should be the development of a pedestrian mall along King Talal Street running from the intersection of King Talal Street and Prince Muhammad Street to the open area in front of the Central Mosque. The third phase would be the continuation of the pedestrian mall along King Talal Street. The final stage would be the construction of the pedestrian mall along King Feisal Street.



COMMERCIAL AREAS ALLOWED IN CENTER OF OPEN SPACE
NO SERVICE AREA



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Pedestrian mall materials should be of natural stone or other natural materials and should require little or no maintenance. Green planted areas with stone benches or low stone walls should be incorporated into the mall to provide areas for relaxation. If vehicular traffic is allowed in portions of the mall, there should be traffic diversion devices such as traffic bumps, and other traffic control measures to slow traffic to a maximum of 20 to 25 kilometer per hour. As reasonable intervals sanitary facilities should be constructed in protected areas.

Jordanian sculptors should be encouraged to design urban sculptures for the pedestrian mall.

b. Amman Parking Projects. There an estimated 13,400 businesses in the central business district, if each were supplied with a minimum of one parking space as is required by the building codes, there would be a total space requrement of 322 dunums. Since there are only about 500 dunums in the entire city center such a land requirement would be almost impossible to meet. Therefore the following assumptions were made to arrive at a more reasonable parking estimate:

i. Roughly 30 percent of the city's 60,000 automobiles use the city center daily,

ii. Since many of these trips are of short duration, it is assumed that the average frequency of use of a parking space is three. Therefore the total parking requirement is 6,670 spaces,

iii. This parking requirement yields a total space requirement of 167 dunums, however since there are an estimated 30 dunums of vacant

land along the Alf Seil street which could be used for development of private single level parking the total public parking requirement is reduced to 137 dunums.

iv. Therefore if the Municipality of Amman develops five storey parking structures, the total ground requirement is 27 dunums. These assumptions are shown in Table _____.

These parking structures should be located at the entrances to the city center and should be conveniently located for pedestrians going to the proposed pedestrian mall. Proposed locations of these structures are shown on Map____, which also shows the pedestrian mall proposals.

The private parking spaces can be provided along Alf Seil Street due to the 2.5 to 3 meter change in elevation between the surface of the street and the lower ground elevation. Therefore, as is being done now informally, lower level parking facilities could be developed with upper levels being devoted to shops and businesses. It is also possible in some areas to construct three and four storey parking ramps above the underground level.

Due to the high costs of land around Alf Seil Street, estimated at over JD1,000 per square meter; it is recommended that the bulk of these parking facilities be constructed on private land. Four and five storey parking facilities can also be constructed by the Municipality of publicly owned land. Rough cost and land area estimates are provided in the following section. However traffic flows, soil conditions and other feasibility questions would have to be further analyzed prior to actual construction.

3.4. Cost Estimates of Public Parking Projects: Amman and Zarqa.

Table ____ shows preliminary 1980 cost estimates of providing 5,400 parking spaces in Amman and 520 parking spaces in Zarqa. The total costs of the parking facilities in Amman is estimated to be JD35.2 millions, while those in Zarqa are estimated to be JD1.0 millions.

c. Zarqa Pedestrian Malls Project. The existing pedestrian systems in the central area of Zarqa should be strengthened through linking them with safe pedestrian mall and through establishment of community parks along their routes.

The existing pedestrian systems require mainly improved pavement such as natural stone or brick, improved drainage, garbage collection facilities and sanitary facilities. Studies of traffic patterns should be made of the narrow streets running parallel to the existing networks to determine methods of traffic flows to permit the development of expanded pedestrian networks through creation of a mall running the length of the central business area and terminating in a park in the area presently vacant adjacent to the central portion of the Zarqa.

Zoning powers or other legislative powers such as the "Law of Planned Neighborhood Areas Within the Boundaries of Amman Municipality"[1] should be used to either purchase this area or to require its developers to provide park space on a portion of the site. One method of obtaining a portion of the site might be for the city to cede little used street to the developer in return for well located park land.

1. In this case the jurisdiction of the law would be expanded to allow the development of Planned Neighborhood Areas within other Municipalities.

TABLE _____

A. PROJECT COSTS AMMAN PEDESTRIAN MALLS (1980 COSTS

	JD
PHASE I	85,000
PHASE II	113,000
PHASE III	73,000
PHASE IV	58,000
TOTAL BASE COSTS	329,000

THESE COSTS INCLUDE: (a) DEVELOPMENT PEDESTRIAN PAVEMENT

(b) LANDSCAPING

(c) SMALL LOANS FOR REPAIR OF BUILDINGS FRONTING ONTO THE MALL.

COSTS NOT INCLUDE: (a) COST OF WIDENING AND IMPROVING STREET ALIGNMENTS FOR STREETS WHERE TRAFFIC IS DIVERTED

B. PROJECT COSTS ZARQA PEDESTRIAN MALLS (1980 COSTS

SUBTOTAL JD 164,500

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PARKING REQUIREMENTS AMMAN & ZARQA

1. AMMAN CITY CENTER

a) THERE ARE AN ESTIMATED 60,000 CARS IN AMMAN	
b) ASSUME 30% USE THE CITY CENTER DAILY WHICH YEILDS A TOTAL PARKING REQUIREMENT OF	20,000 CARS
c) THE ASSUME FREQUENCY OF TURNOVER OF CARS WITH IN PARKING FACILITIES IS ASSUMED TO BE 3	
d) THEREFORE THE TOTAL REQUIREMENT IS	6670 PARKING SPACES
e) AT 25 m²/SPACE THE TOTAL FLOOR SPACE REQUIREMENT IS	167 DUNUMS
f) THERE IS APPROXIMATELY 30 DUNUMS OF PRIVATE VACANT LAND WHICH COULD BE USED FOR SINGLE LEVEL PARKING	30
g) THEREFORE THE PARKING SPACE DEFICIT IS	137 DUNUMS
h) IF THIS REQUIREMENT WERE MET BY 5 STOREY PARKING FACILITIES THE GROUND REQUIREMENT WOULD BE	27 DUNUMS

PARKING REQUIREMENTS

2. ZARQA CITY CENTER

a) 7710 cars in Zarqa

b) [illegible] 30% use the city center 1542

c) [illegible]

[illegible]

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TABLE ____

COST ESTIMATES OF PARKING PROJECTS : AMMAN AND ZARQA

COST ESTIMATES :

1. AMMAN PARKING STRUCTURES			JD '000
a) LAND COSTS	27 DUNOMS @ JD 100/m²		27,000
b) SUPERSTRUCTURE COSTS	137,000 m² @ JD 60/m²		8,220
c) TOTAL COST (1980)			~~35,220~~ 35,220

COST ESTIMATES ZARQA

ZARQA PARKING STRUCTURES

a) LAND COST * 2.5 DUNOMS	2.5 X 100000 JD	250 000	JD
b) SUPER STRUCTURE COSTS			
	13 000 X 60 =	780 000	JD
c) TOTAL COST		1.030 000	JD

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3.4.5 Planned Integrated Neighborhoods Program.

Planned integrated neighborhoods for various income groups should be developed. Planned integrated neighborhoods are here defined as neighborhoods having access to shopping areas, schools, religious facilities, open space, social facilities, as well as residential areas.

The need for this kind of neighborhood development is clearly demonstrated by the lack of growth in land area of lower income neighborhoods. The need for such neighborhoods are also demonstrated by the lack of integration of social facilities with residential areas. It is further indicated by the inefficient usage of land and infrastructure in existing neighborhoods.

Authorized planning authorities such as municipalities, the Housing Corporation, and possibly other groups should be allowed to develop planned integrated neighborhoods having building and planning standards which are lower than present and proposed planning and building codes.[1] These standards should be geared to the affordability needs[2] of the income groups for which such neighborhoods are developed. While the actual planning and development of planned integrated neighborhoods should be left to authorized planning authorities, regional planning authorities should maintain oversite over the location and regional impact of the development of integrated planned neighborhoods.

1. The Town Planning Law (Provisional Law No. 79 of 1966) is generally permissive with regard to establishment of planning and building standards. The standards are to be set by Master Plans or by regulation (see Articles 34(2)- building standards; Article 28(1)- subdivision permits. Article 27 lists the number of different categories where standards are to be set according to Master Plan. All that is required to lower standards under the Amman Planning and Building Code is an amendment to the Code detailing such standards on the addition of a special provision to the code stating that the above conditions could be waived.
2. See the Housing Chapter for the definition of affordability needs.

The following actions and standards should be used in the development of planned integrated neighborhoods:

i. The standards used for plot sizes, means of access, built areas, open space, and access to community facilities should be designed to meet the needs of the income groups for which these communities are designed.

ii. Emphasis should be given to providing access to public transport facilities particularly for low income groups.

iii. Pedestrian circulatory modes should be the primary mode of access to residential plots.

iv. A hierarchy of circulatory mode should be established which separates pedestrians from vehicular traffic. Such a hierarchy is proposed in Table_____. It establishes the pedestrian as the primary mode of transportation in residential areas. In low income areas, where vehicle ownership is low, pedestrian traffic is the only mode of traffic.

v. Generally the total circulation requirement as a percentage of the total land area of the planned integrated neighborhood should be in the range of 15 to 18 percent. Table____ shows how these circulation standards can be met for different plot sizes through increasing plot ratios of length to width and decreasing street widths in neighborhoods where traffic intensity is low.

vi. Plot proportions should emphasize the development of private open space for activities such as gardening, relaxation, etc. Private open space is generally maximized through provision of longer narrower plots having ratios of length to width greater than 2.0. Plots of these dimensions are also more

TABLE

REDUCTION OF CIRCULATION REQUIREMENTS AND TOTAL INFRASTRUCTURE COSTS THROUGH CHANGES IN LOT SIZE AND STREET WIDTHS

ALL CASES INCLUDE 3 PERCENT OPEN SPACE AND 3 M² PER PERSON PARKING

LOT SIZE m²	RATIO OF LENGTH TO WIDTH	STREET WIDTH SECONDARY m	STREET WIDTH PRIMARY m	PERCENT FOR CIRCULATION[1] %	TOTAL COST OF INFRASTRUCTURE JD
1000	1.6	12	12	17.0	4467
	2.0	12	12	16.3	4711
	2.5	12	12	14.9	4249
750	2.25	12	12	16.6	457
	2.50	12	12	16.3	455
500	2.00	12	12	14.1	627
	2.50	12	12	15.4	611
	2.50	8	10	15.7	637
300	1.77	12	12	24.1	485
	2.50	12	12	21.6	424
	2.50	8	10	16.0	415
150	1.50	12	12	31.6	260
	2.50	12	12	27.2	248
	2.50	8	10	20.3	221
	2.50	6	8	16.5	211

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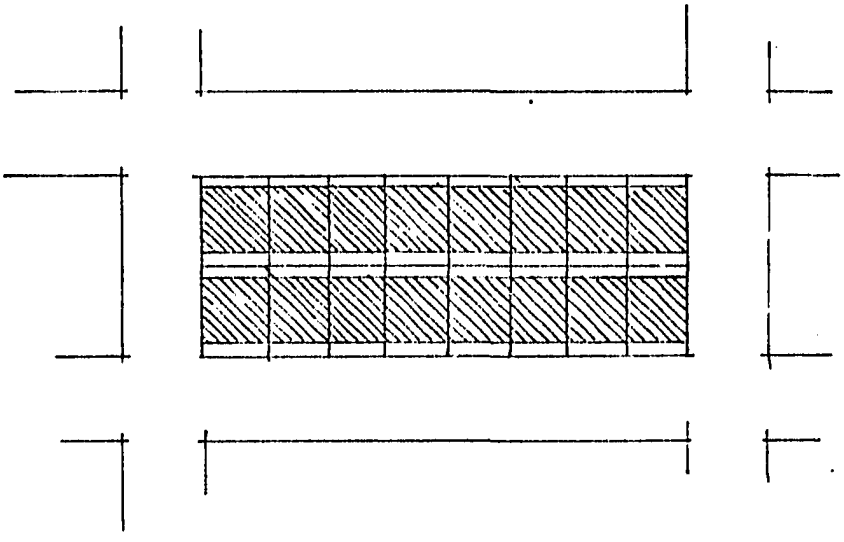
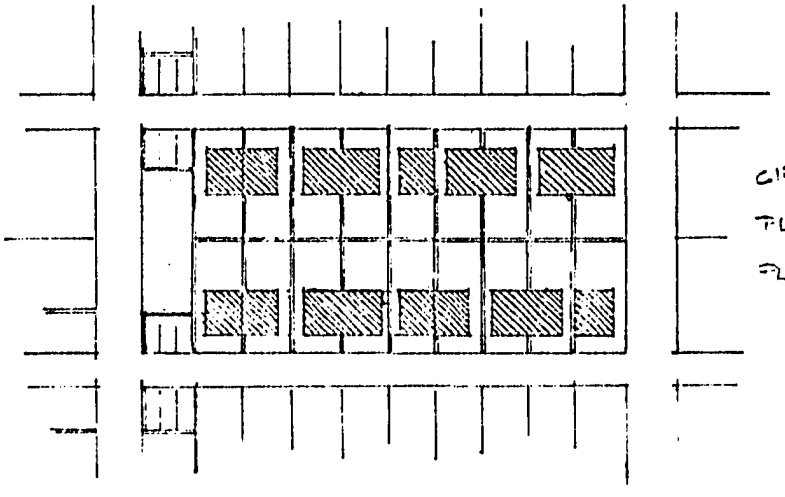
efficient in usage of infrastructure such as road networks, water supply, sewerage, drainage, and electrical supplu. (See Appendix 1 for further discussion of these points.)

vii. Parking provisions should be included in all residential developments. Individual on-plot parking spaces should be provided for each dwelling unit on plots having an area greater than 150 square meters, unless other provisions are made elsewhere. Communal parking facilities should be provided for neighborhoods comprised of smaller plots which are intended for low income households where car ownership per household is low. If this were done, it would not be necessary to provide on plot parking. However, the parking lots should provide at least one space per plot in all neighborhoods having plots greater than 150m.[2]

viii. Minimum open space standards should be linked to affordability as previously defined. However as shown in the Housing Chapter, it is possible to design housing for the households at the 20th percentile and still provide from two to five percent of the gross land area for open space and provide an additional three square meters per person (3 dunums per 1,000 persons) of park and community facilities. The land and infrastructure costs of these open space and park facilities can be afforded by low income groups and can be provided within 25 percent of the gross land area of a subdivision. Since municipalities already have the authority expropriate to 25 percent of the land area of a subdivision for public uses without compensation, park and open space requirements can be met without increases in budgetary provisions through more design of subdivision layouts which use land more efficiently.



CIRCULATION 42 %
PLOT RATIO 1.5
PLOT AREA 150 m²



CIRCULATION 31 %
PLOT RATIO 2.5
PLOT AREA 150 m²

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These public open spaces should be developed at the rear of plots through control of boundary walls or at the juncture of pedestrian walkways and vehicular/pedestrian streets.

ix. Shopping areas catering to daily needs such as grocery stores, meat markets and vegetable markets should be planned within neighborhoods. Since the designation of commercial areas results rapid increases in land values, small shops should be permitted on residential plots.[1] The primary restrictions for such small shops should be locational. They should be located where parking is available, and where service vehicles do not interrupt pedestrian footpaths.

x. Small industrial firms should also be permitted in planned integrated neighborhoods as long as they are not sources of pollutions.

3.4.6 Planned Integrated Neighborhoods: Projects

Specific project proposals following the above standards are made in the Housing Chapter for groups having incomes below the 80th percentile. However the following areas should be considered for specific development:

a) The infill area on the eastern side of Amman between the railroad and the King Road.

b) Expansion and development of the squatter areas in the northwestern area of Zarqa which now comprises 30 percent of the land area of Zarqa. The jurisdiction over the area is presently disputed between a private land owner, the government and the municipality. This dispute should be resolved and the area developed.

c) Infill of existing settlements along the Amman-Zarqa Corridor.

d) Development of sites abandoned by rock crushers into combinations of green areas and residential areas.

1. These shops provide both primary and secondary income sources for low income households. Furthermore many small businesses providing foodstuffs do not have a sufficient turn-over of their merchandise to afford the high rents and development costs which are common in commercial areas.

3.4.7 Subdivision Planning Program

As stated in the guiding principles, subdivision planning should provide infrastructure, land and open space, both public and private, efficiently. The following proposals suggested as methods to improve the performance of subdivision layouts. They are intended primarily for private developments, but they also reinforce proposals made regarding planned integrated neighborhoods and planned high rise zones.

i. The number of zones in subdivision planning should be increased to include the following special zones:

a. Environmentally sensitive areas such as aquifer recharge areas, wadis, unstable geological formations and others,[1]

b. Agricultural areas,

c. Green belts and public open space

ii. The minimum parcel of land which can be subdivided, both inside and outside planned areas, should be increased to 10 dunums in planned areas and 100 dunums outside master planned areas. The reasons for increasing the minimum size of parcel which can be subdivided is to restrict small uncoordinated subdivisions isolated from existing development and to ensure that when parcels of land are subdivided road networks, infrastructure, _____, _____

1. While there is no general category of environmentally sensitive zones in current planning legislation, there are a number of related zones where development is limited or prohibited: forest zones, Chapter 10 of Agricultural Law, No. 12 of 1973 (articles 89-116); Grazing areas from the above law (article 118) which includes areas within municipalitites; National Parks generally under the Ministry of Agriculture except for antiquities which are under the Ministry of Tourism and Antiquities; Building on Steep Land in Planned Areas, prohibited under Article 63 of the Town Planning Law.

open space and social infrastructure can be linked with efficiently with existing provisions. Under present legislation the smallest parcel of land which can be subdivided outside planned areas is 1 dunum.[1] However the population of a one dunum parcel of land is too small to efficiently provide physical and social infrastructure.

iii. Guidelines should be established whereby certain large planned developments can be made by both public and private developers.[2] Under such guidelines conditions for standards of development and boundaries of land use zones would be waived. A system of issuance of development permits might allow such flexibility while providing for the guidelines required. Such a system would be similar to those now used in Great Britain and in many states in the United States. However, it would have to be modified to fit the less complex situation found in Jordan. A partial list of the type of guidelines which would be require is presented below:

a) Who may qualify for such developments,
b) The types of development which would be permitted in planned developments,
c) The minimum area which would be required to qualify for such planned developments,
d) Environmental and topographic conditions which must be met under such planned developments,
e) The type of access to physical and social infrastructure which would be required under such planned developments,

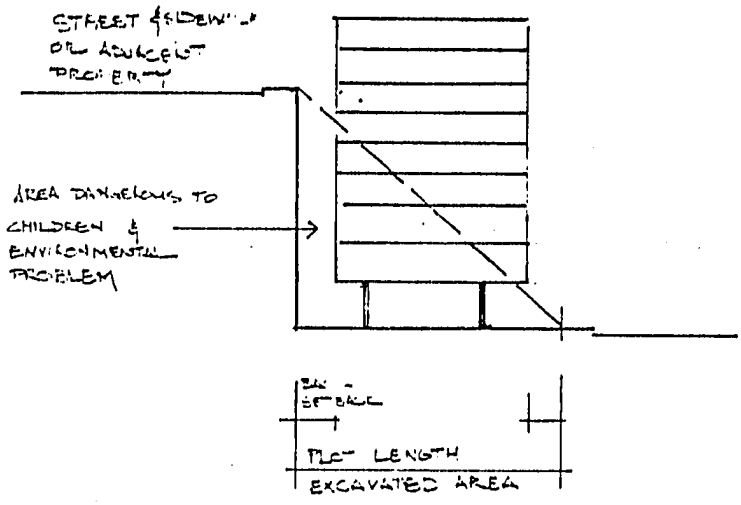
1. Source, Legal Counselor, Ministry of Municipalities and Rural Affairs, June 2, 1979.
2. Such legislation has been proposed in the Planned Neighborhood Law of the Municipality of Amman, and in the Planned Integrated Neighborhood proposal of this chapter. Within these planned developments standards such as minimum plot sizes, setbacks, access requirements and building ratios are not enforced. However in place of these provisions, open space and other public use facilities must be provided.

TABLE

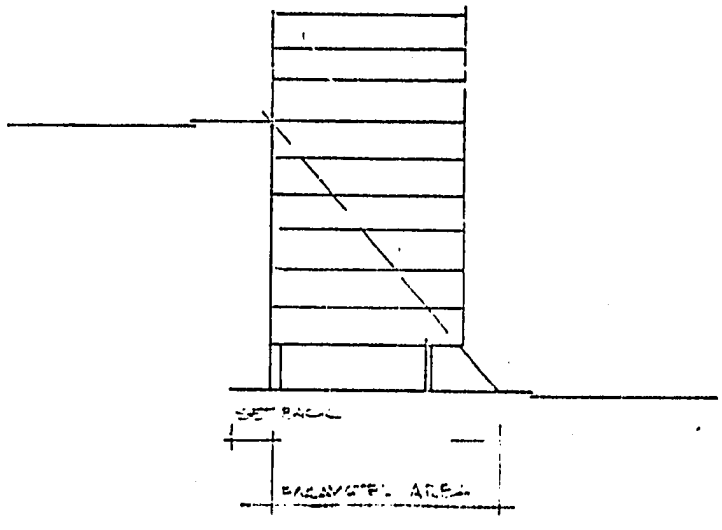
CIRCULATION MODES, USERS, ROAD CHARACTERISTICS[1]

MODES	TYPES	USERS PEDESTRIAN Km/L	CHARACTER	AUTOMOBILE CAPACITY Km/hr	CHARACTER V/L/h	CONTROL	ROAD CHARACTERISTICS WIDTH m	LANES m	GRADES %	FUNCTION	ACCEPTED SPACING m
Pedestrian	Paths	4	Pedestrian Circulation and Social Functions, Children Playing, Strolling Leisure		Not Applicable		3-4	N.A.	80	Serves mainly as pedestrian access to interior plots and to communal parking. Secondarily for limited and controlled access of service and emergency vehicles.	80-200
Pedestrian	Malls	4	Pedestrian Circulation and Social Functions, gathering places, street vendors, strolling and shopping		Not Applicable		3-30	N.A.	Less than 10%	Serves as pedestrian access to shopping areas Secondarily may provide limited vehicular access for service, public transport and emergency vehicles.	no limit
Pedestrian (dominate) and vehicles	Residential Street, Local Streets, Neighborhood Streets	4	Pedestrian Circulation and Strolling	16 24	Pedestrians dominate	Traffic control devices such as traffic lamps, changes in layout	5-9	2 (1 parking)	32	Gives access to residential property	80-200
Vehicles and Pedestrian	Collector Street	4	Pedestrian Circulation	30	300 Vehicles dominate but do not control	Controls are established such as crosswalks, traffic lights, etc.	10-16	3	5 to 15	Provides through traffic, may delineate a neighborhood, give access to communal parking lots, pedestrian paths, service streets, local streets, residential streets	400-800
Vehicles and Pedestrian	Inter-community Minor Arterial, Primary Street	4	Pedestrian Circulation	60	600 Vehicles dominate 900	Strict Controls for pedestrian safety, traffic lights, changes in grade	16-28	4	5	Provides access to the locality from intra-community highways, serves as main focus on spine of development.	1200-1600

1. Adopted from: Urbanization Primer by Horacio Caminos, Reinhard Goethert. MIP Press, Cambridge. 1978. P.87.



PRESENT METHODS OF EXCAVATION



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f) Guidelines for occupancy and sale of planned unit developments. It should be noted that special legislation may be required regarding sale and parcellatio of planned unit developments since they could conceiveably differ from existing practices.
g) Control of land uses surrounding the planned unit development, but not in it,[1/]
h) Other guidelines as required.

iv. Procedures should be established which would allow variations in existing planned areas. Such variations would be permitted in areas smaller than planned unit developments shown above. These procedures should list the steps which must be followed to receive a variation from planning practice and should list the conditions under which such variations could be granted. Generally Local Planning Committees or the Amman Region Planning Council or Municipalities should have the authority to grant such variations.

v. Green Housing Zones, Green belts and public open space zones should be spatial located and the uses permitted in such zones clearly defined. Planning regulations for such zones should permit cluster development as long as open space and green area requirements are perserved.

vi. Acceptable practices for development of terrain having variable topography should be defined. For example, guidelines should be developed for the following.

a) Maximum cutting of hillsides permitted,
b) Maximum gradients or slope upon which development can occur,
c) Maximum road gradients which will be permi
d) Minimum access requirements for developmen on terrain of variable topography.

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1. The control of development around planned developments is necessary since surrounding development might destroy the positive benefits of planned developments. The nature of this control would have to be tailored to fit the type of planned development. For example, a planned commercial development would have different requirements than a residential development.

vii. Subdivision planning should seek more efficient land use, i.e., circulation, open space, access and public facilities, under existing legislation. Current planning legislation allows expropriation without compensation of up to 25 percent of plot area for streets, gardens, parks and schools. As has been shown earlier, this provision is adequate for development of circulation networks, 3 to 10 percent open space and an open space standard of three dunums per 1,000 persons. What is required is more efficient street layouts, plot sizes, and street spacing.

viii. Subdivision planning should encourage maximum development of private open space. Greater private open space would increase acquifer recharge capacities, reduce runoff and flooding problems, and increase the amount of green areas. Generally plots having ratios of length to width greater than two increase private open space in the front and rear of plots.

ix. As is specified in proposed planning and building codes, plots having areas greater than 350 square meters should provide on-plot parking spaces.

3.4.8 Program: Development of Zones for High Rise Structures[1/]

Existing planning practice allows the development of high rise structures in any residential zone with only small modifications in setbacks. As a result, haphazzard developments of high rise structures occurs without adequate open space and circulatory provisions.

1. High rise is defined as having more than three floors.

Therefore two program of designating areas for high rise structures are proposed to help alleviate the problems which are being encountered: Residential high rise zones and commercial high rise zones.

The first, residential high rise zones are intended for structures which are primarily residential in character. However complimentary commercial uses such as restaurants and food stores would be permitted in ground floors. The following standards and guidelines should be used for development of residential high rise zones:

i. One parking space should be required per dwelling unit. The development of landscaped or underground parking lots should be encouraged.

ii. Where possible ground floors should be used for residences, shops or offices.[1]

iii. Shopping areas catering to daily needs should be developed within 250 meters of residential zones.

iv. Private open space in addition to parking, should be provided at minimum standards of 7.5 square meters per person.[2] Private open space standards for non-high rise residential structures on "A" and "B" zones plots range higher than 25 square meters per person.

v. The minimum open space standards of three dunums per 1,000 proposed under the urban parks proposal should be maintained for high rise residential zones.

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1. Shops and offices should provide additional parking depending on the type of establishment, number of employees, and intensi of its probable clientelle.

2. For the purposes of calculating private open space standards, a standard household size of 6.5 persons per dwelling should be assumed.

vi. Private open space standards should be used for control of building heights in residential zones.

vii. A mix of high and low rise structures should be encouraged provided that open space standards are met.

viii. Maximize the usage of streets through providing off street parking.

ix. Provide entrances to individual and groups of high rise buildings both vehicular and pedestrian on secondary streets.

The following standards are proposed for commercial high rise structures.

i. Provide parking for retail and office space as proposed by the Amman Planning and Building Code. However, such parking facilities should be provided in either landscaped parking lots or parking structures. Where construction of parking facilities is not possible due to the terrain of the site, the full capital costs of providing parking elsewhere should be provided by potential developers.

ii. Where buildings are designed to be office structures, ground floors should be developed into shops, restaurants, and the like.

iii. Minimum rear setbacks of 3.5 meter should be provided to allow service vehicles to unload merchandise.

iv. Building codes should encourage the development of landscaped open space in front of commercial structures. To compensate property owners for the loss of ground area due to such open space provisions, the construction of additional floors should be permitted.

v. Social facilities such as day care centers, post offices, primary health care centers, libraries, etc. should be established nearby.

vi. Pedestrian access should be provided and linked together with safe pedestrian crossings at traffic intersections.

vii. Adequate areas for street vendors should be provided so that they do not block pedestrian access routes.

viii. Restaurants and cafeterias should be encouraged to locate in retail areas to compliment pedestrian and shopping activities.

3.4.9. Development of Historic, Culturally and Aesthetically Significant Areas

As previously noted urban places in the region have numerous areas of historic and social interest. In addition to promoting indigenous culture, these areas also represent a significant tourist resource which is not being fully tapped. Amman now serves as a tourist center for much of the Arab world, however, it has numerous areas, such as the central business district, which if development were controlled could become the central focus of modern Middle Eastern culture.

The Town, Village and Country Planning Law specifically provides for the preservation of areas of historic interest, Article 15, while the Antiquities Law, Law No. 12 of 1976, allows the Minister of Tourism and Antiquities to expropriate land to set up such areas. However, the interpretation of these laws has been mainly restricted to archaelogical and historic sites. Areas of significant cultural and aesthetic importance, such as areas around the Central Mosque in Amman, the pedestrian network in the city center and promontories overlooking the city scape, have been exclused from protection.

Therefore, it is proposed that special districts be created around such areas which would restrict development in the vicinity of such important areas and would, where appropriate, promote the tourist value of these districts. These districts should accomplish the following:

i. Restrict building heights around religious facilities and historic sites to heights which do not restrict views of those sites.

ii. Restrict development surrounding such sites to residential, commercial, and industrial uses which compliment such sites.

iii. Where appropriate encourage private concessions to operate on or adjacent to such sites providing that they do not interfere with the functioning of such sites. Rents from private concessions selling food, handicrafts and related items would provide a method for municipalities to recover a portion of the development costs of establishing such districts.

iv. Ensure that adequate sanitary and garbage disposal provisions are made on or adjacent to such sites.

v. Ensure that parks and green areas are provided around religious centers and important public facilities.

vi. Provide funding through guaranteed loans from existing banking institutions for the maintenance and improvement of properties on or adjacent to such districts.

Although specific legislation does not exist providing for the development of such zones, it could be created as a portion of building and planning codes, existing Town, Village, and Country Planning Laws or Antiquities Laws.

3.4.10. Historic, Culturally and Aesthetically Significant Areas Projects

The following is a partial list of projects which should be developed into historic, culturally and aesthetically significant

districts within urban areas of the region. The feasibility of each would have to be studied in further detail as to the method of establishing individual districts, the areas of the districts, and type of planning control needed for each district.

1. A historic and culturally significant district around the Central Mosque of Amman linking together existing religious centers, proposed pedestrian malls, and archaelogical sites. In addition to cultural uses, the district would generate tourist traffic in the central area and would support the development of other retail activities.

2. Aesthetically significant district on the top of Jabal Lwebda overlooking the cityscape. This district would support proposals made for parks in the jabal. Its development could include sidewalk cafes or small restaurants which would generate additional revenues for maintenance and extension of the facility.

3. A historic and culturally significant district in the central portion of Salt. Within the district, property owners would be granted loans to restore historic buildings. The entire district would be linked to an urban park which would be developed in the central area of the city.

4. A historic and culturally significant district around the ancient churches and mosques of Madaba. Small urban parks and areas for handicraft and food vendors could be created within the district to encourage tourists to lengthen their stay. Funds could also be provided to property owners to rehabilitate historic structures.

Program: Development of Building Codes and Design Practices for Earthquake Resistant Construction

A program should be initiated to develop building and planning codes as well as design practices for earthquake resistant construction. Such a program should be carried out by geologists, civil engineers specialized in earthquake design, architects with similar backgrounds, planners, and public health specialists knowledgeable in disaster mitigation and relief activities.

The first phase of the program should be determining the actual severity of the earthquake risk. If not available, the location of faults should be identified on maps and their relative risk to development assessed. If necessary, a secondary program of monitoring these faults should also be established to provide warnings of impending seismic action.

Once the seismic risk is determined, the second phase of the program should be the development of appropriate building codes and design practices to resist earthquakes.

The third phase which should occur concurrently with the second phase should be the establishment and location of zones where earthquake risks occur. Within these zones, building restrictions such as height restrictions and others should be developed which reflect the severity of the earthquake risk.

The fourth phase of the program should be the development of strategies and programs for disaster mitigation and relief. The first, disaster mitigation, should focus on developing the public's awareness of the potential earthquake risk and teaching them

procedures to follow in the event of an earthquake. The second portion of the program would be the development of relief procedures which would be followed in the event of an earthquake.

The primary bodies which should be involved in developing these should include the Ministry of Public Works, the Ministry of Municipalities and Rural Affairs, the Municipalities, the Ministry of Health, the Royal Scientific Society, the Geological Department of the University of Jordan, and others experienced in earthquake problems.

Program: Professional Accredidation and Codes of Practice

As construction technology becomes more complex, there will become a greater need to formalize design processes. At present, there are no formal procedures for registering architects and engineers. The only requirements for practice in Jordan are that the candidate must have graduated from an accredited architectural or engineering school and must work for an engineering firm for one year. The accreditation process is left entirely to the procedures followed by the country in which the school is located. There are no reciprocity agreements which would provide standardized accreditation procedures. As a result, there is much variation in engineering design theory and practice used in Jordan.

While variation in itself is not an issue, problems arise in the construction and design process. Furthermore, the building permit application procedure and assignment of responsibility for the construction process are more complicated. For example, in the event of a structural failure, questions arise such as whether the

building codes were at fault, or did the design engineer use faulty design practices, or was the engineer competent in the first place. A similar question about competency also arises with the building permit inspector and his capacity to evaluate different design practices which could be shown on building permit applications.[1/]

Therefore, it is recommended that the Society of Engineers should adopt a formal registration procedure for architects and engineers. These procedures should result in licensed architects and engineers whose legal responsibilities for their designs have been defined. Secondly, these registration procedures should recognize local conditions of practice and should provide a standardized method of evaluating architects and engineers with varying educational backgrounds.[2/]

1/ In order to obtain a building permit, the design engineer is required to submit a sample of the engineering design calculations used in the building design. Then presumably, the building permit applications inspector checks those calculations to see if they conform with standard acceptable practices.

2/ Under present practices an architect or engineer who graduates from a non-accredited school cannot be registered in Jordan. However, most accreditation procedures provide methods for evaluating such cases and provide alternative routes for such a professional to be registered. Therefore, the individual architect or engineer is not penalized for variations in education systems over which the individual has no control.

The Society should also recognize that architects, planners, and engineers all perform separate design functions and therefore require separate registration procedures and codes of practice.

Similarly, the Society should adopt, or at least recommend, acceptable codes of engineering design practices. It should also adopt a professional code of ethics.

Program: Training Seminars

An ongoing program of providing practicing professional planners, architects, and engineers with up-to-date information on planning innovations occuring elsewhere should be initiated, possibly by the University of Jordan, the Royal Scientific Society, and the Society of Engineers. In particular, planning officers from municipalities should be encouraged to attend. However, due to the lack of planning capacity within municipalities, these seminars should have short sessions which are spread over several months.

Some of the topics which these seminars could cover are:

i. Regional planning

ii. Municipal planning, allocation of finance, and development of municipal financial resources.

iii. Legal and administrative planning procedures

iv. Planning in relation to natural resources such as water resources

v. Planning in relation to environment

vi. Others

APPENDIX 1. URBAN DESIGN

The Impact Planning Regulations have
on Circulation and Infrastructure Provision.

APPENDIX 1 URBAN DESIGN

The impact which planning regulations proposed in the Amman Planning and Building Code of 1979 will have on circulation requirements and the provision of infrastructure[1] are shown in Table ___. Layouts for each residential zone using the simplest grid pattern were analyzed using different street widths,[3] but maintaining plot frontages required by the regulations.[2]

The percent circulation shown in column (7) is the additional area required to provide plot access. The variations in the amount of circulation required represent the impact different street widths, plot sizes and ratios, and block lengths have on the total land requirement for different subdivision layouts. Generally, circulation as a percentage of total land requirements increases as plot ratios approach unity and as block lengths shorten. They also increase as street widths increase.

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1. Infrastructure is here defined to include paved roads, surface water drainage, sidewalks, water supply and sewerage. The latter two exclude plot connections.

2. The plot ratios shown in column (5) are the ratios of the length to width resulting from the frontage requirements of the planning regulations. The block lengths shown resulted from the general practice of designing blocks having eight to ten plots on one side of a block.

3. Secondary streets are defined of designing streets giving direct access to plots, while primary streets are defined as providing neighborhood access.

The unit infrastructure costs shown in column (9) are the unit costs of providing infrastructure per gross area of the subdivision. Unit infrastructure costs can be found by dividing the total costs of infrastructure into the total area of the subdivision, or as was done in this case, from unit costs of road, water and sewerage construction. Generally unit infrastructure costs increase as plot sizes decrease due to the greater intensity of use represented by smaller plots. However total infrastructure costs per plot reduce with decreases in plot size since the total infrastructure costs of the project are being borne by more households. (See column (12).

The total land requirement per plot shown in the last column is the total land requirement needed to provide access, open space and a plot size at a particular density. Total land requirement and also the costs of land and infrastructure increase drastically as the standards of street widths increase. However the impact of these increases is proportionately greater for smaller sized plots. A 75 square meter plot requires 93 percent more land area for circulation having 12 meter wide roads than a 500 m^2 plot which only requires 34 percent additional land.

In residential zones "A", "B" and "C" it is possible to provide access and open space within a subdivision within 25 percent[1] of the total land area. It is also possible to provide access and open space within zone "D" and the Popular zone within the percent reserved for public uses, however to do so, the amount of circulation must be minimized through reduced street widths. If the minimum standards of street widths imposed by the planning regulations are used in the subdivision of Popular zones having plots of 75 and 150 square

1. Municipalities are allowed by current planning law to expropriate 25 percent of the total area of a subdivision for public uses such as access, open space, etc.

meters, the total circulation requirements increase to 34 and 43 percent respectively. However, if pedestrian footpaths and local collector streets are combined with 75 square meter plots as is shown in case number 18., the total circulation requirement is only 19 percent leaving an additional 6 percent of land for other public uses.

Similarly, total infrstructure costs increase as circulation increases. Using the same 75 square meter plots, cases 18 through 22 show how total infrastructure costs increase over 180 percent from JD583 to JD1,646. However as shown in cases 23 and 24, when plot frontages are decreased, thereby increasing plot ratios, both the area required for circulation and the total costs of infrastructure decrease. Thus under current planning regulations, the most efficient plots in terms of provision of access and infrastructure are those in zone B while the least efficient, aimed for lower income groups, are the 150 square meter plots proposed for the Popular zone.

There is clearly a need to reduce planning standards in areas aimed for low income groups, particularly since these groups are unlikely to rely on single family autos for transportation. These reduced standards should allow plot access by means of low intensity vehicular streets or pedestrian footpaths having widths of 3.5 to 4 meters[1] and neighborhood access roads of 6 to 8 meters wide. Similarly frontage requirements should be relaxed to allow more efficient plots in terms of access and infrastructure. Parking provisions should be made off street either on individual plots having areas greater than 150 square meters or in off-street parking plots.

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1. Roads having these widths allow passage of taxis and emergency vehicles, but maintain a pedestrian character in the neighborhood.

IMPACT ALTERNATIVE LAYOUTS HAVE ON CIRCULATION AND INFRASTUCTURE

Three common types of layouts are analyzed in Table 2, the grid, cul de sac loop. Similar standards of street widths, plot ratios and area, and number of plots have been used for each layout. Of the three, the cul de sac requires the least amount of circulation and results in the lowest total infrastructure cost. It also requires the least amount of additional land per plot for circulation and open space.

TABLE

INCOME REQUIRED TO AFFORD A HOUSING UNIT AT CURRENT STANDARDS[1]

ZONE		POPULAR		D		C		B		A		GREEN ZONE A	
1. Annual Income Required	(JD)	3662	2556	5388	3401	7920	4357	10476	5316	12642	6831	23928	11269
2. Monthly Income Required	(JD)	305	213	449	283	660	363	873	460	1053	569	1994	947
3. % of Income Spent on Housing	(%)	25	25	25	25	25	25	25	25	25	25	25	25
4. Monthly Payment Required	(JD)	76.29	53.25	112.25	70.86	164.97	90.77	218.40	114.91	263.37	142.30	498.51	236.86
5. Down Payment	(%)	25	25	25	25	25	25	25	25	25	25	25	25
6. Yearly Interest Rate	(%)	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
7. Repayment Period	(Years)	20	20	20	20	20	20	20	20	20	20	20	20
8. Total Cost of Housing Package	(JD)	11721	8182	17246	10886	25346	13946	33555	17655	40464	21864	76592	36392
9. Land Cost	(JDm^2)	10	10	10	10	10	10	10	10	10	10		
10. On-Site Infrastructure Cost	(JDm^2)	9.61	9.61	7.35	7.35	5.83	5.83	4.92	4.92	4.64	4.64	3.6[illegible]	3.65
11. Construction Costs	(JDm^2)	60	60	60	60	50	60	60	60	60	60	60	60
12. Floor Area of House Allowed by Code[2]	(m^2)	109	50	156	50	240	50	315	50	360	50	720	50
13. Average Household Size	(Persons/Plot)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	[illegible]
14. Density	(Persons/Ha.)	246	246	143	143	94	94	66	66	50	50	27	27
15. Park and Open Space	(%)	3	3	3	3	3	3	3	3	3	3	3	3
16. Circulation	(%)	40	40	31	31	24	24	21	21	19	19	15	15
17. Plot Size	(m^2)	150	150	300	300	500	500	750	750	1000	1000	2000	2000
18. Width of Streets[3]	(m)	14	14	14	14	14	14	14	14	14	14	14	14
19. Block Length (10 Plots Per Side)	(m)	100	100	130	130	140	140	180	180	250	250	400	400
20. Plot Ratio (Length to Width)[4]		1.5	1.5	1.77	1.77	2.20	2.20	2.28	2.28	1.6	1.6	1.25	1.25

1. Current standards used are those of the proposed Amman Planning and Building Code (1979).
2. Based on maximum building ratio allowed by the proposed Amman Planning and Building Code.
3. Minimum street width allowed by the proposed code in areas serving 6 plots or more.
4. Established by the code.

TABLE

IMPACT ON CIRCULATION, INFRASTRUCTURE COSTS AND LAND REQUIRED PER PLOT FOR OPEN SPACE AND PARK PROVISION

	ZONE	MINIMUM PLOT SIZE	SECONDARY STREET WIDTH	PRIMARY STREET WIDTH	BLOCK LENGTH	PERCENT CIRCULATION	UNIT INFRASTRUCTURE COST PER GROSS AREA	DENSITY INCLUDING 3% OPEN SPACE AND PARK PROVISION of 4m² PER PERSON.	TOTAL COST OF INFRASTRUCTURE PER PLOT	TOTAL LAND REQUIRED PER PLOT (Including circulation, open space and park provision)
		m^2	m	m	m	%	JD/m^2	Persons/Hectare	JD/Plot	
1.	Popular	75	3.5	6	120	16.7	5.17	52.8	655	127
2.			6	6	120	23.5	6.72	48.4	931	139
3.			6	8	120	24.7	7.00	47.6	985	141
4.			12	12	120	39.0	10.25	38.1	1799	176
5.		150	6	6	140	20.1	5.74	29.1	1320	230
6.			6	8	140	21.2	5.99	28.7	1397	233
7.			12	12	140	34.2	9.00	23.8	2533	281
8.			12	12	280	31.5	8.31	24.8	2244	270
9.	D	300	6	6	156	14.8	4.21	16.9	1673	397
10.			6	8	156	15.8	4.45	16.6	1793	403
11.			12	12	156	26.3	6.91	14.5	3193	462
12.	C	500	8	8	180	14.6	3.97	10.5	2536	639
13.			8	10	180	15.5	4.18	10.4	2702	646
14.			12	12	180	20.6	5.40	9.7	3721	689
15.	B	750	8	10	216	12.9	3.47	7.3	3208	924
16.			10	12	216	15.5	3.79	7.0	3609	952
17.			12	12	216	17.3	4.17	6.9	4066	974
18.	A	1000	8	10	250	12.6	3.16	5.5	3845	1217
19.			10	12	250	15.2	3.72	5.3	4672	256
20.			12	12	250	17.0	4.12	5.2	5292	1284

TABLE

IMPACT ON CIRCULATION, INFRASTRUCTURE COSTS AND LAND REQUIRED PER PLOT FOR OPEN SPACE AND PARK PROVISION

	ZONE	MINIMUM PLOT SIZE m^2	SECONDARY STREET WIDTH m	PRIMARY STREET WIDTH m	BLOCK LENGTH m	PERCENT CIRCULATION %	UNIT INFRASTRUCTURE COST PER GROSS AREA JD/m^2	DENSITY INCLUDING 3% OPEN SPACE AND PARK PROVISION of $4m^2$ PER PERSON. Persons/Dunum	TOTAL COST OF INFRASTRUCTURE PER PLOT JD/Plot	LAND REQUIRED PER PLOT (Including the open space) m²
1.	Popular	75	3.5	6	120	16.7	5.17	52.8	65[illegible]	127
2.			6	6	120	23.5	6.72	48.4	93[illegible]	139
3.			6	8	120	24.7	7.00	47.6	98[illegible]	141
4.			12	12	120	39.0	10.25	38.1	1799	176
5.		150	6	6	140	20.1	5.74	29.1	1320	230
6.			6	8	140	21.2	5.99	28.7	1397	233
7.			12	12	140	34.2	9.00	23.8	2533	281
8.			12	12	280	31.5	8.31	24.8	2244	270
9.	D	300	6	6	156	14.8	4.21	16.9	167[illegible]	
10.			6	8	156	15.8	4.45	16.6	179[illegible]	
11.			12	12	156	26.3	6.91	14.5	2193	
12.	C	500	8	8	180	14.[illegible]	3.97	10.5	[illegible]36	
13.			8	10	180	15.5	4.18	10.4	2702	
14.			12	12	180	20.6	[illegible].40	9.7	3723	
15.	B	750	8	10	216	12.9	3.47	7.3	320[illegible]	
16.			10	12	216	15.5	3.79	7.0	360[illegible]	
17.			12	12	216	17.3	4.17	6.[illegible]	406[illegible]	974
18.	A	1000	8	10	250	12.6	3.16	5.5	[illegible]845	1217
19.			10	12	250	15.2	3.72	5.3	[illegible]672	1256
20.			12	12	250	17.0	4.12	5.2	5292	[illegible]

TABLE 2

COMPARISON OF THE EFFICIENCY OF ALTERNATIVE SUBDIVISION PATTERNS

ZONE	PLOT SIZE m^2	SECONDARY STREET WIDTHS m	PRIMARY STREET WIDTHS m	RATIO OF PLOT WIDTHS TO LENGTH	BLOCK LENGTH m	PERCENT CIRCULATION %	UNIT INFRASTRUCTURE COSTS PER GROSS AREA JD/m^2	DENSITY INCLUDING 5% OPEN SPACE (Persons/Hectare)	TOTAL COSTS OF INFRASTR. PER PLOT JD/Plot	TOTAL LAND REQUIREMENT PER PLOT INCLUDING CIRCULATION AND OPEN SPACE m^2
GRID LAYOUT										
Popular	150	6	8	2	130 1/	19.7	5.16	336	1028	199
	75	6	6	2	122 2/	23.4	6.23	639	653	105
CUL DE SAC										
Popular	150	6	8	2	134 1/	16.4	4.40	351	840	191
	75	6	6	2	125 2/	20.6	5.60	664	564	101
LOOP										
Popular	150	6	8	2	157 1/	17.8	4.74	345	920	194
	75	6	6	2	144 2/	22.2	5.97	650	614	103

1. Blocks contain 15 plots on a side
2. Blocks contain 20 plots on a side

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