

Site Analysis For The Design And Execution Of Urban Projects — Geographical Perspective —

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Abstract

Urban environment is undergoing change at a very rapid pace and in such circumstances the urban landscape is bound to face more complexities. The demand for better socio-economics infrastructure is logical and planning stratege has to be based on up-to-date information about the prevailing conditions of the geographical site, its environmental impact, physical suitability, infrastructural suitability and locational suitability. The only reliable source for related data is the utilization of aerial photography technique.

Creation of geographically referenced urban site information systems is making the planners more aware of the need for reliable and coherent data derived from the existing air-photos used to investigate the involved consideration in the selection of sites during various development periods the relationship between site and functions, the impact of site on morphology and the relevance of site analysis to planning of urban projects. It is obvious that photographs cannot be used directly to obtain data and therefore such figures have to be derived indirectly using other physical indicators.

Introduction

This paper presents the case of site analysis of towns in different regions of Jordan. The purpose is to investigate the involved consideration in the selection of sites during various development periods. The relationship between site and functions; the impact of site on morphology and relevance of site analysis to planning of Urban projects.

Practically all the towns that emerged during the last 35 years have occupied gap sites, where economic rather than physical attributes were considered crucial. Accessibility, local topography and water availability were dominant in the site selection of these towns. Climate, scenic beauty and defence were the main virtues of hill-top and spur towns (Fig. 1.1)

The morphology of the site was considered more important than the function. Social relief conformed to physical relief on all the hill-top, spur and gap towns. The social layout of towns conformed to what of most small feudal cities in that have to be found in the Asian towns. Further more, building construction was considered more important than land - use planning (Wahiba, A.M., 1973, 37-78.)

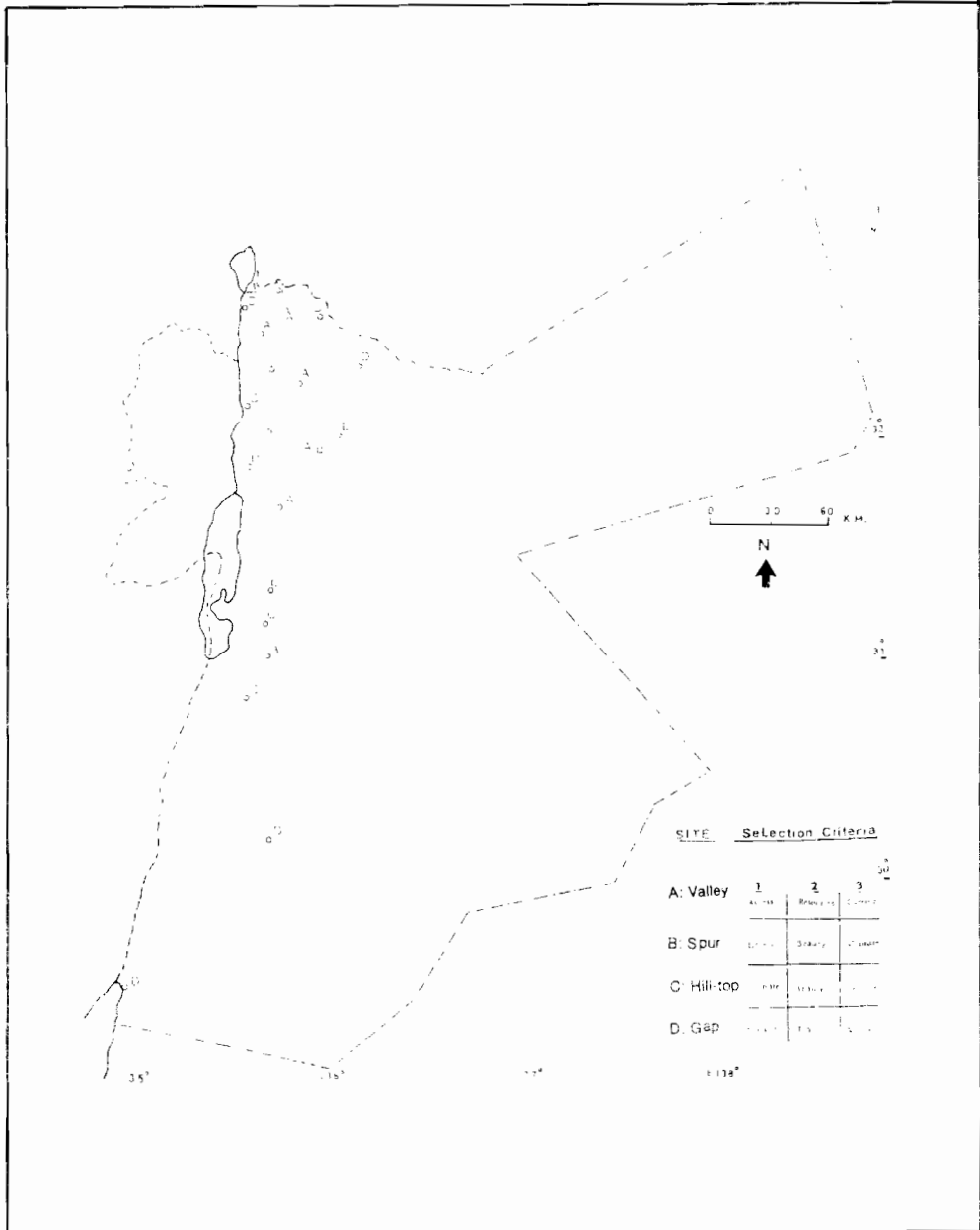
Jordanian towns make a bold appearance on the physical landscape. These towns are scattered over the whole country, with many of them lying in the north and the larger ones located along the Irbid-Aqaba highway. Altitude, terrain micro-climate, scenic beauty, accessibility, personal interest, political constraints, strategic importance and reputation of locality have been identified as the chief determinants of the locational pattern (Riyad, M., 1974, 311-361)

Methodology

An overview of the land use in terms of site capacity, present land use, planned land use, land tenure and environmental impact of the site on the surroundings is best given in map form. The aerial photography of an area was used to systematically interpret the visible indicators of geomorphological aspects of the site such as general topography, slope, soil, surface drainage, ground water level, Flood hazard and vegetation cover, site adaptation is incorporated in the photo interpretation process.

Site analysis for the design and execution of Urban projects meet relatively quickly the required completeness compared with the time needed to meet the same through field inventory only, and can be

Fig 1.1
Selection Criteria For Different Sites



accurate enough when air photos are more recent than inventories extracted from registration files. Comparison of airphotos of different years is an efficient tool for the task described above (Bruijn, C.A. Etal., 1976, 13-19). The new Urban areas can be detected, mapped and measured by trained interpreters about ten times faster than with field work alone. There are many methods for the delineation the study area:-

1. By photogrammetric methods:
The process is slow, expensive and inflexible, and not usually available at the Urban level.
2. Photogrammetric preprocessessing:
In flat areas, photos may be rectified, in hilly areas is to make "orthophotos." Which is an image obtained by differential rectification." Bringing the photo to the true scale by enlarging separately a number of very tiny parts of the photo. Difficult to obtain and rather expensive Method.
3. Using "intermediate" technologies to enable optical transfer between photo and map, more suitable for small local map updating than for thematic data collection. Its mostly used for flat areas.
4. Interpreting directly in the grid format:
Easily identifiable points of a topographic Km. grid are transfered from a map to the photo-using these points, an overlay with the grid cells of the information system in use is then adjusted on the photo. This method is inaccurate but cheap and fast and the result is satisfactory.
5. Digitally backed photo interpretation. "Photogrammetry without photogrammetric instruments."
It is a system consisting of digitizer an on-line computer with a specially designed entry console and a digital plotting coordinatograph. Relief displacement was not corrected as no stereo observation was possible.
6. The most common technique "to note the results from the photo interpretation on a seperate base map.
(Lindgren, D. 1973- 659-677). This method is less accurate in areas where no up-to-date base map is available or if the base map does not contain enough details to transfer correctly the various information on the photo.

Since 1978 a considerable progress has been made in land surveys and mapping in Jordan (Mitchell, C.W., J.A. Howard., 1978, 1-12). Maps was compiled by interpreting Landsat 1 imagery associated with reconnaissance field check. Landsat imagery was adequate enough for this broad reconnaissance scale of mapping. and no conventional air photos was used. Six hierarchical

classification levels, such as major climatic zone, land division, land province, land system, and land unit in descending order were utilized in land system mapping. Detailed mapping in the category of 1:10000 and larger supported by recent aerial photography are needed for the following applied purposes.

- Delineate study area on map.
- Select recent aerial photography covering delineated area in stereocoverage urban area, scale 1:10 000 - 1:5000.
- Interpret aerial photos under a stereoscope and delineate potential sites.

Towns - Combination

Urban population of Jordan were scattered in about twenty towns consist of Governorate centres and sub-centres, mostly small in size. Three of them have a population of more than 100,000, while Amman, the largest, consist of 800,000 or 29.7% of the total population of Jordan adjoining the fertile lands. Most of the town were characteristicall located on the main roads penetrating the country from south to north and from east to west. All of them were below 1500 meters in altitude. (table 1).

Services, more specifically administrative, and market functions defined the basic economy of many towns. Eight of them were governorate centres, and the other were district headquarters. Industrial component of population was small and that too was confined to Amman - Zarqa region. Interaction between towns and their rural environs was strong, Equally strong was the relationship among various towns.

To make an overall assessment of the site characteristics, aerial photography interpretation for different years is needed, complemented by field survey. The study result can form a basis for planning in the area. The first step towards the site selection is to define the local site criteria, which has it is own effect on the function of the site to be chosen. These criterias consist the main elements of suitability of the site. The second step is to delineate the study area on map and select recent areal photography, large scale, covering the delineated area. The third step is to interpret aerial photos under a stereoscope and delineate the potential sites. The final step is to study each delineated area in detail to decide the degree of suitability or non-suitability for the concerned purpose.

TABLE : 1
GROWTH PATTERN OF POPULETION IN DIFFERENT CITIES OF JORDAN
POPULATION

	Elevation meter (1)	1952 (2)	1961 (3)	1979 (4)	1985 (5)
Amman	900	108304	201904	653048	800 000
Zarqa	255	31496	96580	215687	274 300
Irbid	616	23157	44655	112954	144 650
Salt	1000	154078	23196	32866	41 200
Aqaba	24	5265	9908	27507	35 750
Madaba	785	8545	11224	29869	34 900
Ramtha	590	8779	11791	27292	34 210
Mafrq	700	6064	18124	25055	27 000
Tafila	1030	10337	6255	13923	15 550
Karak	1000	5539	11422	12195	15 150
M'aan	1100	6185	16643	12301	14 210
Jarash	590	2656	4225	11776	12 550
North Shuneh	-200	3230	3946	10836	9900
Deir Abu Said	300	1587	1927	4971	5960
Ajlun	900	4437	6850	14726	5635
Al Mazar	750	1195	1068	4899	5600
South Shuneh	-190	1907	4082	3327	2950
Al Qasr	900	1043	783	1724	1990
Samar	400	678	716	1449	1790
Deir Alla	-224	2420	5190	1799	1565

Source:

1. Maps, 1:50 000 / 1:100 000
2. Department of Statistics, 1985
3. Department of Statistics, 1983
4. Department of Statistics, 1964
5. Department of Statistics, 1952

The suitability standards should reflect the standards which encourage the maximum use of resources available. For each selected site a degree of suitability has been established:-

1. Marginally suitable: which imposes a constraint which can be dealt by heavy investments.
2. Moderately suitable: which imposes a constraint which can be dealt by moderate investments.
3. Highly suitable: which imposes no significant constraint on land - use.

Some non-suitable sites, should not be revised under any circumstances. For instance, insufficient water supply, or very high development costs will rule out the use of site for low-cost housing development.

The suitability standards should contain an element of subjectivity, and no absolute value should be attached to them. Accordingly, a rational selection of a site should be take care of these Dimentions:-

1. The land utilization dimention which refers to the site capacity, the land-use pattern, past and future, tenure system, and finaly the environmental impact.
2. The geomorphological dimention which refers to the general topography, slopes, soil, drainage pattern, flood hazards and vegetation cover.
3. The infrastructural dimention which refers to existing roads, water supply system, construction material sources, electricity supply, and sewage system.
4. The services dimention which refers to distance from the city centre, employment areas and the areas of services.

Fore the purpose of detailed analysis there were some other aspects which can add certain advantage in site suitability:

1. Geological Features.
2. Strategic Importance.
3. Climatic Factors.

After establishing the suitability standards, an inventory of potential sites can be made by scanning and interpreting a recent aerial photography coverage of the total area designated as search area (Mcloughlin, J.,1973,293.). For each site located, a site selection and assessment sheet can be filled out. Application of the suitability standards will indicate the most suitable sites. Assigning a non-suitable sites means that the site cannot be taken into further consideration (Table 2).

Classification of Towns by Site Conditions

Site stands for the ground on which a settlement is layed out. Certain physical features have been favoured, for varying reasons, for the siting of settlement. Towns in Jordan, as in many areas, were found occupying sites of varied nature (Fig. 1.2).

Population size of towns found some association with their site. Valley

towns are comparatively large, spur towns are medium size, hill-top and gap towns are small (Davis, Kingsley and Hilda Hertz 1951, 227-241). Ajloun was a glaring exception. This hill-top town enjoyed primacy because of its status as a tourist centre of international repute.

Valley sites were the most suited for siting of Urban settlements; their main advantages were centrality in relation to surrounding area, adequacy of space for physical expansion, easy access to water and convenience of laying out transport and utility networks. An occasional problem was flooding. Such sites also involved loss of fertile agricultural land, which is scarce in hilly and mountainous regions (Fryer, D.W., 1953, 474-494.).

By comparison, hill-top sites had the merits of a healthy climate, scenic beauty, strategic position and free drainage. Their demerits were virtual absence of flat land, lack of local water - supply and inconvenience of transportation.

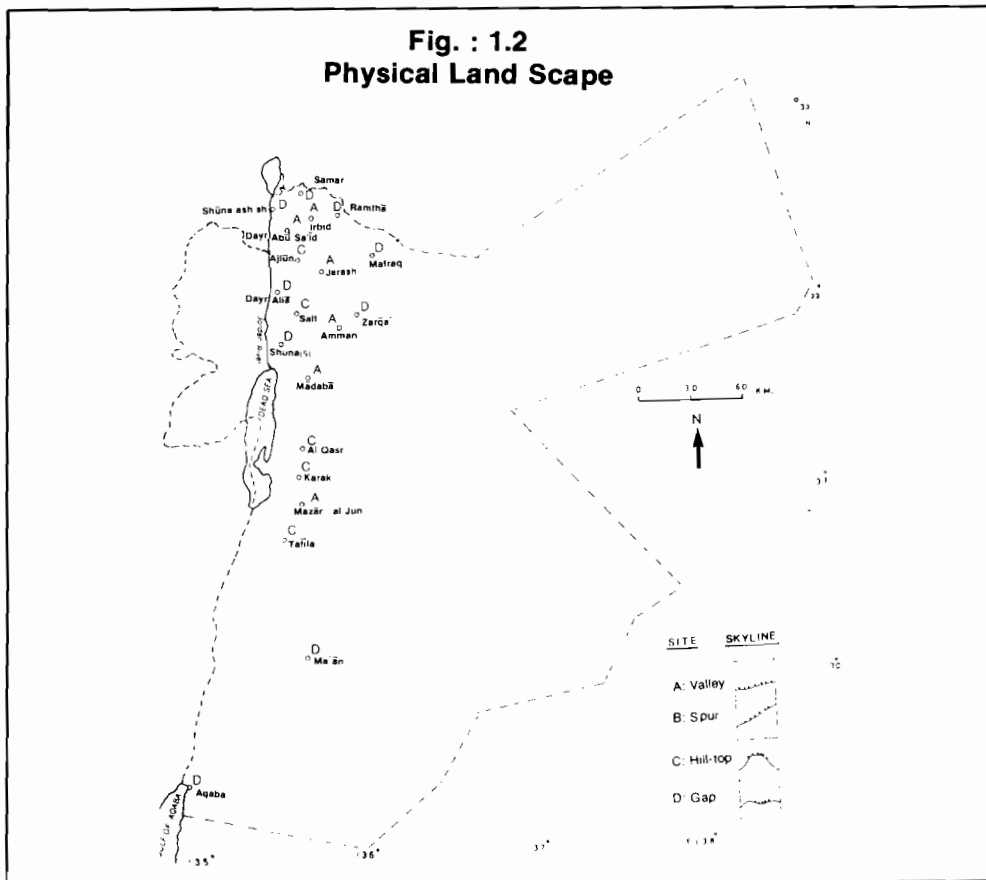


Table: 2
Site Selection Criteria & Standards

Suitability Dimensions	Site Characteristic	Highly Suitable	Moderately Suitable	Marginally Suitable	non Suitable
Geomorphology	general topography	flat	flat+ microrelief	undulating + micro-relief	considerable macro+ micro-relief
	Slopes soil	<5% sandy - loam, silt,	6-8% clay loam, silty loam, sandy clay-loam	9-10% silty clay, sandy clay	<10% no soil
	surface drainage	well drained	moderately drained	poorly drained	riverbeds marshed, swamps, tidal flats
	ground water	>500 cm below surface	500-200cm below surface	200-50cm below surface	<50cm below surface
	flood hazard vegetation	none grassland sparse	marginal barren	potential cultivated or dense tree cover	frequent intens. cult or dense forest
Land Utilization	site capacity	>20ha	5-20ha	1-5 ha	<1ha
	present land use	vacant	1-5 dw/ha	7-9 dw/ha	<10 dw/ha
	Planned land use	resident	no planned use	restrict.	non-resident.
	land control	developm authority	acquisition from one owner	small holdings	not for sale
Infrastructure	land costs	none	low	medium	high
	environmental impact	positive	temporarily negative	considerably negative	severe negative
	roads	primary on site	secondary >5km	tertiary 5-1km	no access <1km or insuff. supply
	water	>.5km	5-5km	5-10km	<10 km or inadequ. supply
Infrastructure	electricity	on site	>2km	<2km	inadequ. capacity
	sanitation/ sewage	no constraints	moderate constraints	severe constraints	only high cost solutions

Services	city center	>3km	3-6km	6-12km	<12km
	employment areas	>1km	1-4km	4-8km	<8km
	markets/shops	>.5km	.5-1km	1-2km	<2km
	clinics	>.5km	.5-1.5km	1.5-3km	<3km
	primary schools	>.5km	.5-1km	1-2km	<2km
Miscellaneous	Geological features	—	—	—	—
	Strategic importance	—	—	—	—
	Climatic factors	—	—	—	—

Data Source:

1. Oplique reial photographs.
2. Vertical stereo aerial photographs.
3. Maps.
4. Field check.

Between the vally floors and hill-top sites, spur, sites enjoyed the benefits of natural defence, panoramic landscape and moderate climate. They involved only a limited loss of agricultural land. Such sites, however, had restricted accessibility from their environs. Intra-site mobility was also difficult. Landslides were quite common and space for expansion was scarce.

Gap sites, by their very nature, enjoyed centrality. The convergence of routes in the gaps made them favoured transit points. Water supply was no problem. Physical expansion was, however, difficult since gaps generally provided limited sites.

The different sites, thus, presented comparative advantages and disadvantages. The choice of particular site was dictated, among other things by the original function that the town was supposed to perform, the technology available with the founders of the local in a wider regional context.

The above observations were amply validated by a historical survey of town sites. During the British period (before 1948) considerations of effective administrative control over the acquired territory, defence against invasion from outside, central position and regular water supply were paramount. The towns that evolved during this period occupied vally sites, conveniently accessible to environs and simultaneously enjoying a state of natural defence. Sites offering a healthy climate, panoramic view and strategic location were also favoured. Hill-tops complied with these requirements the best. Matters of

local water supply and problems relating to journey to hill-tops could be taken care of due to new modes of transport.

Economic considerations dominated during the post-Independence period. New urban sites were developed as tourist resorts to commercialise the natural beauty of sites. Zarqa grew in to a market place by virtue of nodal position of its site.

There is an evident contrast in site characteristics between town that originated during the British period and that which emerged during the post independence period. While the former were distinguished by their valley sites, the latter were prominently located on hill-tops or spurs. By comparison, economic rather than physical attributes of sites became crucial in case of post independence towns.

The spatial pattern in the distribution of urban centers in Jordan, their functional categories and general process indicates the importance of the occupational structure of the towns which reflect the main functions. In Amman there is a spatial unity between the economic and administrative organization. This is very clear from the analysis of the internal structure of Amman city under the British mandate in Palestine, Amman grew from a small village, and in 1946 it became the capital of independent Jordan. Amman has had large influxes of refugees following the Arab-Israel wars of 1948 and 1967 double seven times in population during the period 1952-1985.

Jerash is the bestpreserved example of a provincial Roman city is perhaps the entire Middle East. Major construction appears to have started in Jerash by the early part of century A,D Jerash is important not only for its individual monuments, but also for its strict and well preserved town plan, but also for its strict and well preserved town plan, built around the colonnaded main street and several intersecting side streets.

In this regard, Salt is best known as the seat of the Ottoman administration and the main commercial and cultural center of Jordan before Amman was chosen as the new Jordan's capital in 1922.

Ajlun is another example of Hill-Top town, climate scenic beauty were the main virtues of this town. The impact of its site was greater on its function as a tourist resort.

The location of Aqaba at the northern tip of the Gulf of Aqaba, Jutting north from the Red Sea, gives it a tropical climate that makes for perfect

weather for nine months in the reliable supply of fresh water only a few metres below the ground. The entry into use of the suez canal in 1869 deprived Aqaba of much of its former commercial importance. Aqaba flourished again by the mid 1950's as Jordan's only outlet to the sea.

During the past two decades. Aqaba has grown from a sleepy little fishing village into one of the mediterranean area's important new vacation and leisure centres, with a modern port and an industrial zone, carefully located for down the coast and well away from the touristic areas.

Town Sites and Functions

Irrespective of their origin during the pre-independence period, many of the towns in Jordan emerged as administrative centres. They were headquarters of districts and tahsils in the former British colony. Hence administrative towns predominated both in the valleys and on the hill-top.

In many cases relationships between the site and function of the town was totally overloaded. Other towns, however, displayed a discernible pattern. Practically all the cantonment and tourist towns were sited on the hill-top and spurs. The valley and gap towns were marked by more pronounced development of trade as one of their functions.

Transport cities in Jordan are likely to have an uneven distribution Ramthais a classical city that has prospered as a result of its strategic location at the crossing of important trade routes. There, the most important land route between Jordan, Syria Lebanon and Europe.

Ma' an development has been more closely associated with the Hijazi railroad than it has with the Haj land route crossing Jordan to Saudi Arabia.

Central places cities in Jordan are likely to be distribute rather widely and uniformly throughout the western zone of Jordan. They are the marketing and social centres for tributary areas of variable size. Such cities vary greatly in size and the extent of the tributary villages they serve.

Irbid in the North is the standard type of a retail and whole sale trade centre. This city combine political and social functions with those of marketing.

Zarqa city illustrate the type of manufacturing and mining city supported by specialized functions with a highly localized resources such as phosphate deposit the development of this city is so closely

associated with transport advantages, oil refinery and electric power in the suburb of Zarqa city.

Ajlune, Salt and Karak are resort cities which have benefited from their climatic advantages and they attract related industries.

Obviously, there is something very special about the site of Karak. No geographical area has played such a vital and inspiring role in the Jordan events that effected the course of history as the Karak.

Town Sites and Morphology

Far more than function, morphology of towns bore an imprint of their sites (Ahlmann, H. 1952,93-128). Although all hill-towns were linear in form yet they showed significant differences in their internal layout, intensity of development, building heights, skyline view, segregation of people by socio-economic status and circulation patterns. These differences were meaningfully related to site conditions (Fayid, Y.A., 1971, 105-130)

In conformity with their linear shape, the hill towns had their principal commercial lanes of bazars stretched along the main spinal road running through the core. Residential areas adjoined them at the back as well as on the first floor. Public and semi-public buildings occupied relatively higher parts of the sites. Friction of space was acute on all types of sites although valley sites were comparatively in a more comfortable position with regard to location of land uses, including residences, shops and open spaces. (Stamp, L.D., 1957,92-372).

Intensity of development did not differ significantly on various types of sites. The intensity was the greatest on the main terrace in case of the valley towns and was highest on the sunny slopes in towns of other types of sites (fig.1.3) Vertical expansion was more typical of the valley towns. Accordingly the nature of skyline differed with the site of a town (Bartholomew, H., 1959,17-28).

Residential segregation by socio-economic status was a common feature of all towns. Social conformed to physical relief in hill-top, spur and gap towns. Where the high class residences were distributed on the higher sunny slopes while the low class residences were concentrated on lower slopes. The residential pattern of the valley towns was in line with that of any typical Jordanian town. High class residences were more frequent in the proximity of the palace or in the vicinity of the main commercial land and low-class residences predominated on the periphery (Wahiba, A. 1972, 92-119) (fig 1.4).

Fig. : 1.3
Intensity of Development

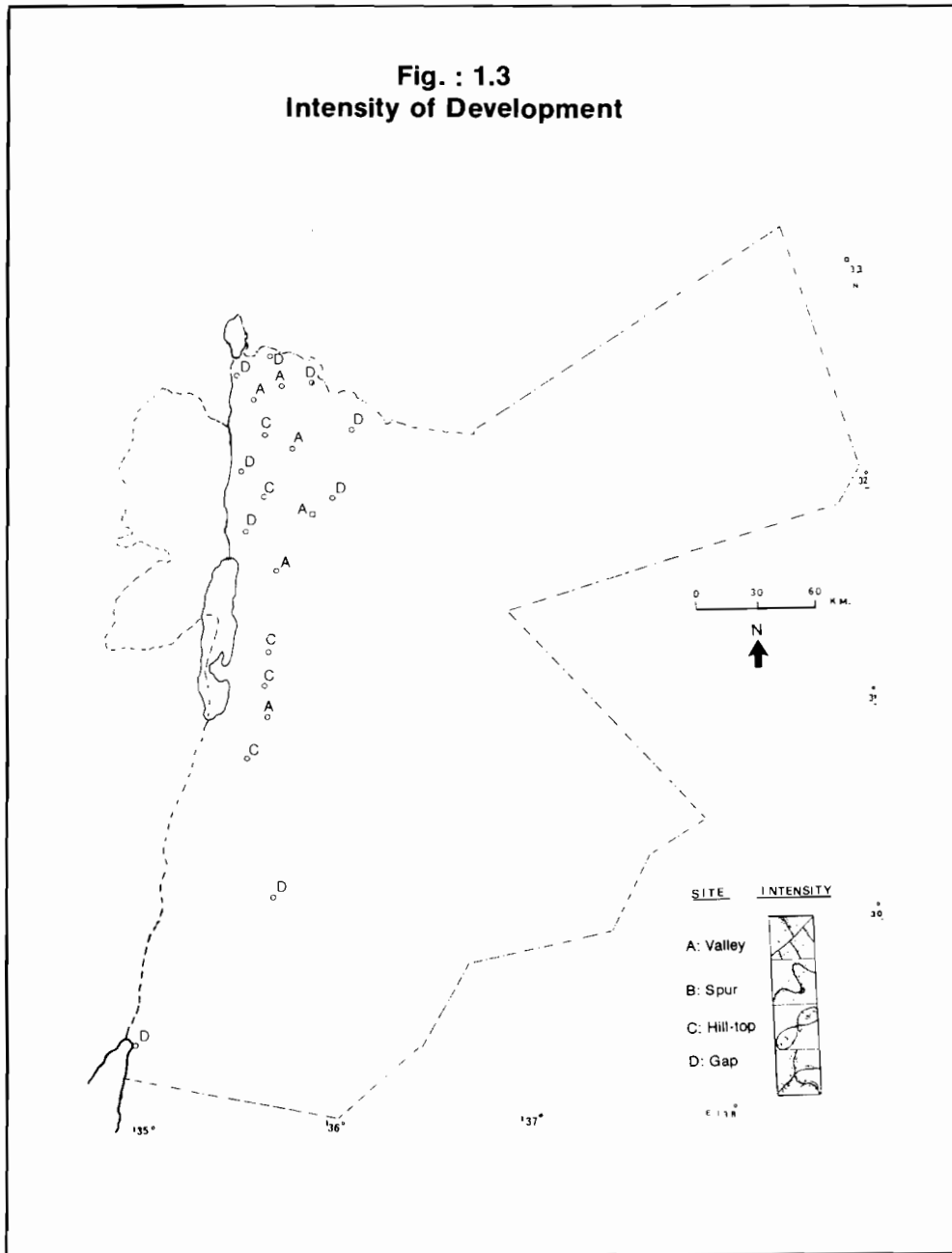
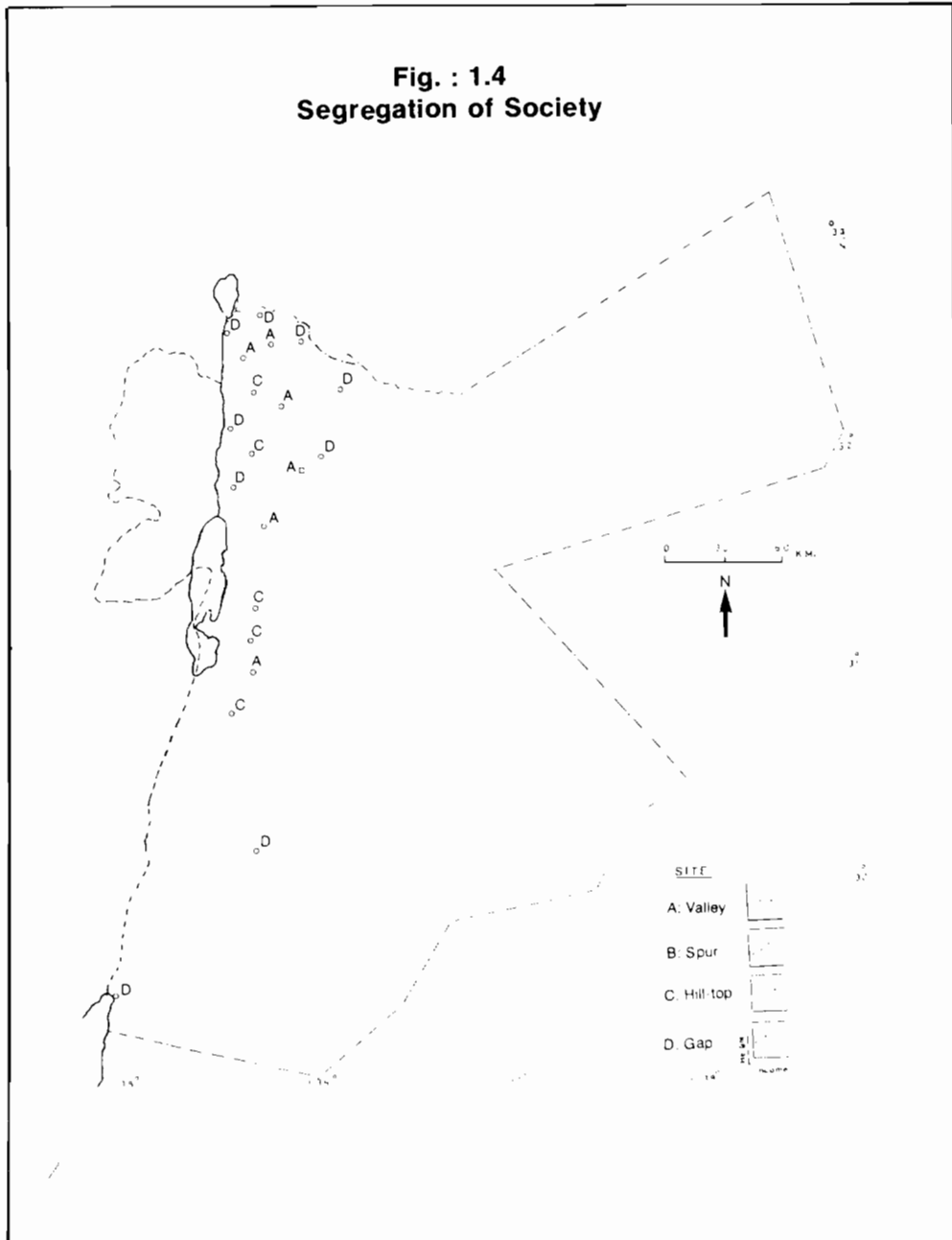
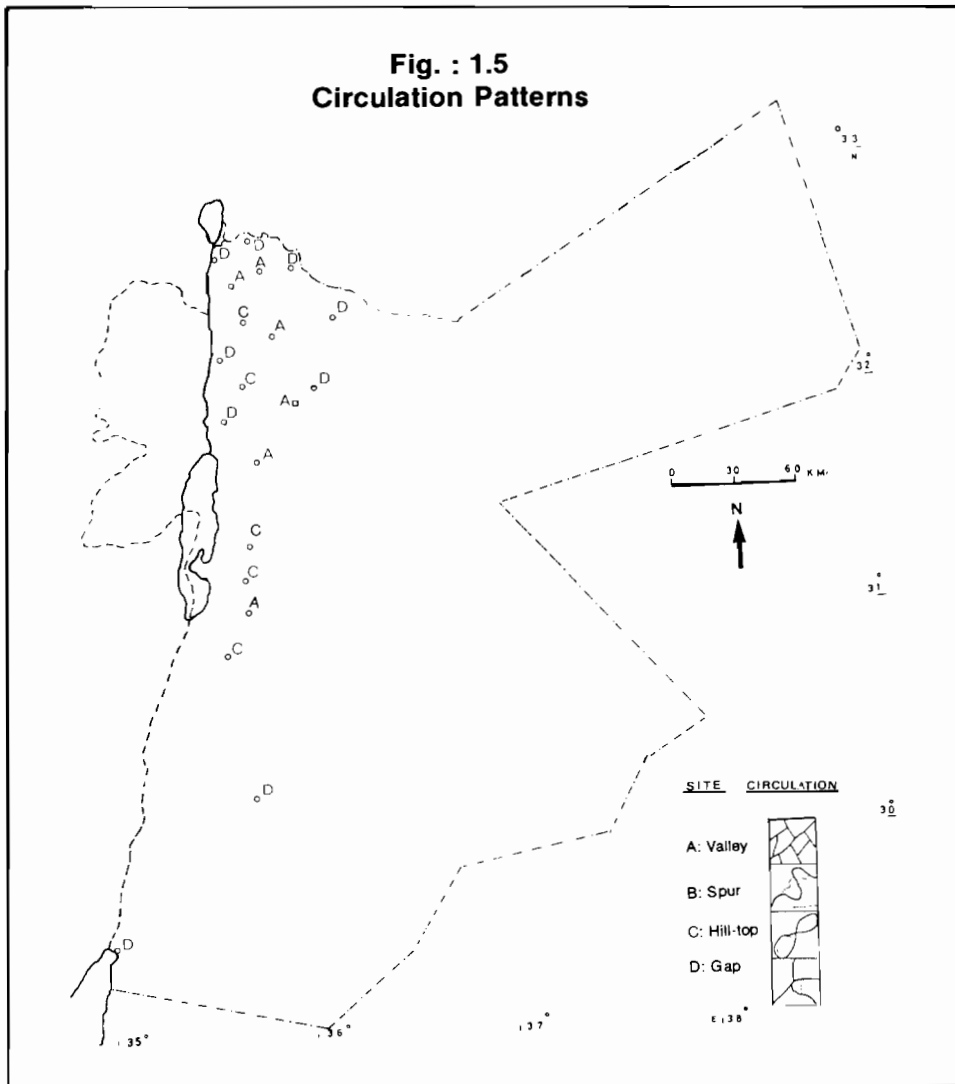


Fig. : 1.4
Segregation of Society



Differences in circulation patterns of towns on varying sites were the most glaring. Valley towns had generally straight roads and gridiron circulation networks. Spur towns usually had only one spinal road. Hill-top towns allowed a circulation in the form of concentric cities encircling the main ridge. Gap towns were marked by a radial circulation pattern. Tortousity index of the road network increased as one moved from the valley to hill-top towns. Hence the land-use systems, intensity of development, and circulation patterns of town were strongly influenced by the relief of their sites (Fig. 1.5).



The central area of Amman-Seil area is situated at the meeting point of a series of narrow wadis, and is surrounded by steep. "Jabals" in nearly every direction. Most of the main roads reaching the centre are located in the wadis. This has led to acute problems in the central area in terms of severe traffic congestion on all main roads, which are also major difficult servicing problems due to the lack of service roads which are in many cases ruled out for topographical reasons. Furthermore, it will be extremely difficult to widen the radial corridors that lead to the city centre in view of the intensity of buildings and the variety of mixed uses that are located adjacent to the routes.

Planning Implications

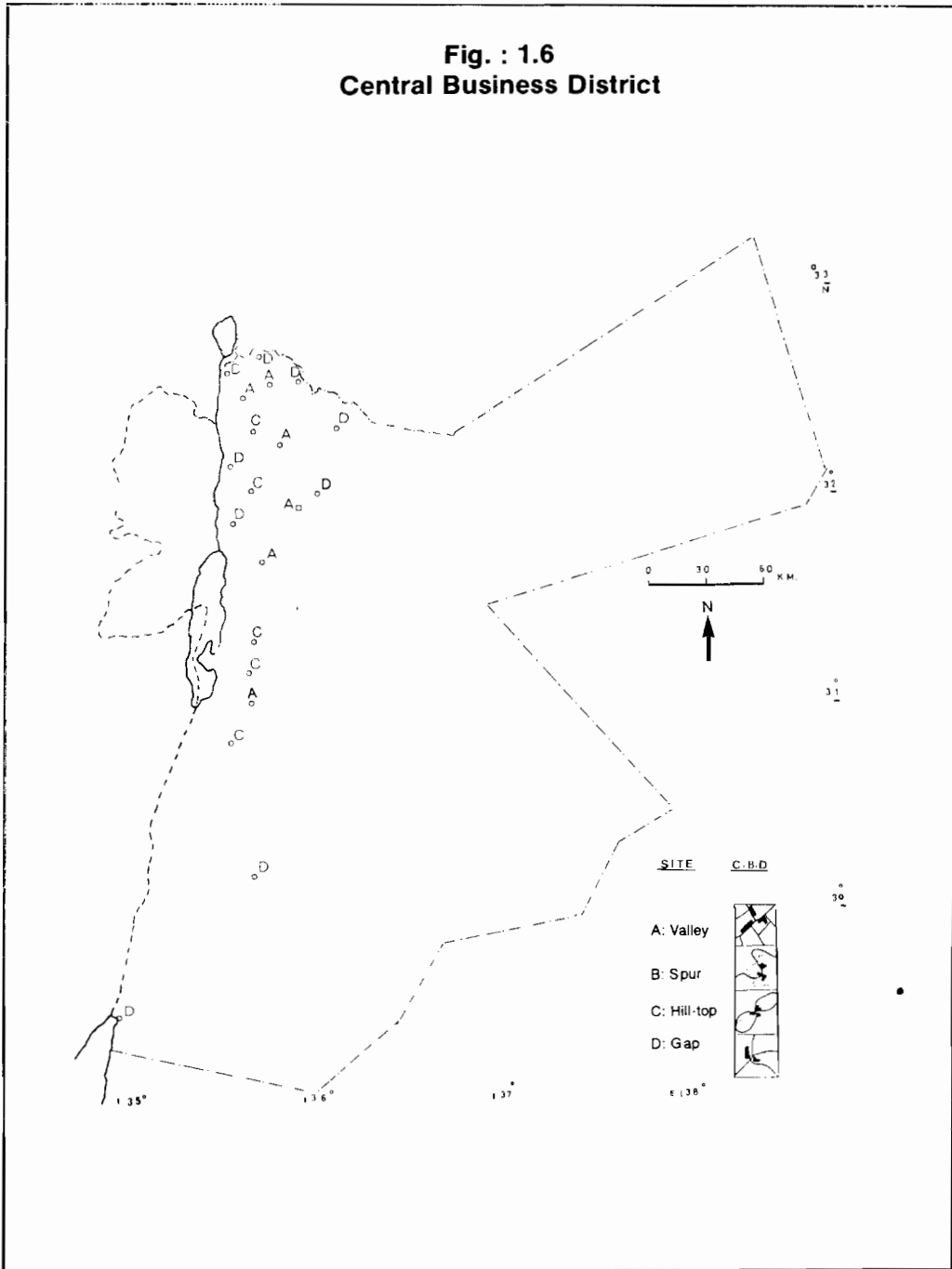
Two basic issues in the context of Jordanian towns are: how to improve their habitation quality through renewal and development; and how to enhance their functional vitality through input of new activities.

Considerations of site planning are involved in solution of the first problem. Despite their small size, Jordanian towns are getting overcrowded in terms of building use. Lack of space is their major handicap. The scarcity is acute in respect of land for new offices, bus stations and playgrounds.

Finding additional space for expansion and adjustment with local relief are the two primary concerns of town planning in Amman, Irbid and Zarqa. Factors of micro-climate, especially local insolation, direction and speed of wind, and amount and intensity of rainfall are to be borne in mind. Sunny slopes deserve priority in development (Calf, Wesley, 327-331). Land-use systems, circulation network and facility patterns are to be adjusted with all the physical elements mentioned above. Recreational areas on the top, residential areas along the sunny slopes, commercial lanes along the middle contour, primary activities, like dairy farming, at the foot and industry on flat parts of the site would be one of the possible designs (Fig.1.6).

Nonetheless, building use planning will always be predominant over land-use planning in all towns, and need to conserve forests and other points of scenic beauty within and around the urban sites needs no emphasis.

Fig. : 1.6
Central Business District



Answers to the second problem lie in intensification and commercialization of agriculture (especially in the field of horticulture) in rural tracts around the towns, in the stimulation of urban-rural interaction through new road links, in the establishment of a small - scale industries based on local raw materials and in harnessing of the tourism potential of each town. (Gibbs, J, 1961, 380-391).

In the context of what we have discussed before, would it be worthwhile to look into the future a bit and see what could be the planning strategy for the site?. The morphology, function, history and location are the main determinants of occurrence pattern and intensity of Urban development in different localities.

As Zerqa city is concerned, the highly growth rate is due to the Job opportunities in the large industrial enterprises. Although Zerqa's industry will expand and attract new employees, the Zerqa city less attractive for residential purposes. The growth of Zarqa is due mainly to the influx of refugees after 1967 and to migration from rural areas. It has grown from about 121 to 216 thousand, or by 80% during the same period. Otherwise, Zarqa site is less attractive for residential purposes; The harsh environment, absence of agricultural land, climatic constraints and the increasing salinity hazard of drinking water are the main reasons.

Further horizontal expansion of Zarqa city will be severely restricted by the combination of difficult topographic conditions to the west and south of the existing built up area, and the barriers to urban growth presented by the oil refinery and power station to the north, and military land to the east. Russeifa suburb is similarly constrained by unfavourable topography to the north, and open-cost phosphate mines to the south which will be extremely expensive to reclaim for Urban development. Both Zarqa and Ruseifa exhibit the most important Urban agglomeration outside Amman.

The future configuration of the settlement pattern in this town is ultimately determined by the resource potential represented by phosphate mining. Its physical characteristics and the nature of distribution of its economic activities along the wadi Zarqa.

Irbid city in the far north is another example. The reasons for a supposedly high population growth rate are as follows:

1. The opening of the Yarmouk University in the vicinity of Irbid in 1976.
 2. The opening of the University of Science and Technology in the suburb of Irbid in 1986.
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3. The improvement of water supply in the region through the new Yarmouk - Irbid water supply system.
4. The joint Jordanian - Syrian industrial free zone to be set up on the borders of the two countries.
5. The attractive effect of new Job opportunities in industry and the services sector which generate further influx of foreign laborer.

The overall pattern of residential development provide significant of indications of the way in which Irbid has been planned and developed during the past 30 years. Residential areas are planned long in advance of demand, and are rigidly zoned into exclusive categories of housing types. As a result they take an extremely long time to become fully developed the vast majority of residential areas have the capacity to absorb much higher populations. This includes some mature areas close to the central area. The most dangerous effects on life quality in Irbid city derive from human settlements and related activities caused by sinkholes and cesspools of houses and even hospitals, reverse wells used by factories to deliver toxic waste water into the underground, tank leakages of petrol stations, surface waste water infiltrating into the aquifer.

There have been plans since 1971 for the construction of a sanitary sewage system and storm water drainage in Irbid city. The design, based on a population of 130,000 inhabitants in the year 2000, seems to be outdated since the population in Irbid has already reached this limit, being about 261,000 in the year 1985. The municipality intends to update the design of the sewage system and the treatment works. In 1986, the work has been started in Irbid sewage system and the first phase has been completed.

Case Study

The result of 1979 census of Jordan indicate a marked acceleration in the pace of urbanization during 1961-1976 period. It is apparent that the increase in urban population has taken place in the context of the existing stable settlement structure, and very little in the emergence of new settlements.

The allocation of land between different activities within the country is a long-established feature of government involvement in land matters. Subsequently, the extension of controls at this level has led to more comprehensive town plans and environmental management schemes, while at the same time the intensification of spatial interaction has prompted the widening of the scale perspective adopted in land-use planning to take in metroplitan and regional considerations. It is these

essentially strategic considerations which appear to have dominated planning thought in Amman metropolitan region.

Issues about the distribution of land-using activities within national space cover a range of themes comprising inter-regional and intra-regional considerations (Green, F1958, 210,216). The former encompass policies designed to secure some degree of balance in the distribution of population, while intra-regional planning relates to the internal structure of individual localities.

At the same time, the site has been treated as a complex system consist of important features such as dynamics, interia, hierarchy, efficiency, mutual complementary, regularity of communications, and manageability (Issawi, C, 1969, 113-114). A study of each of these features permits the peculiarities and trends in the development of the site to be revealed.

As a socio-economic process, urbanisation is characterised by the concentration, intensification and differentiation of urban activities in most towns of Jordan (Beheiry S.A., 1973, 203-247.).

The growth of Amman during the last 35 years has been attributed to the influx of displaced persons from the West Bank after 1967 and to the development of Amman as demanding labour market. However, Amman surely will remain to be an attractive labour market. Therefore, its growth will remain higher than that of almost every other place in Jordan. With an annual growth rate as shown in table No. 1, Amman city would double in size within 10-15 years. If Amman really would develop in this dimation, then, two thirds of the total population of Jordan would be concentrated in Amman and nearly 80-85% in the Amman-Zerqa region. Such a development has to be stopped in time for its unrepairable concequences. As an argument in favour of very high future growth, the supposedly increasing re-migration of Jordanians from the Gulf Area is brought up. Re-migration is said to rise because of the increasing number of job opportunities in Amman.

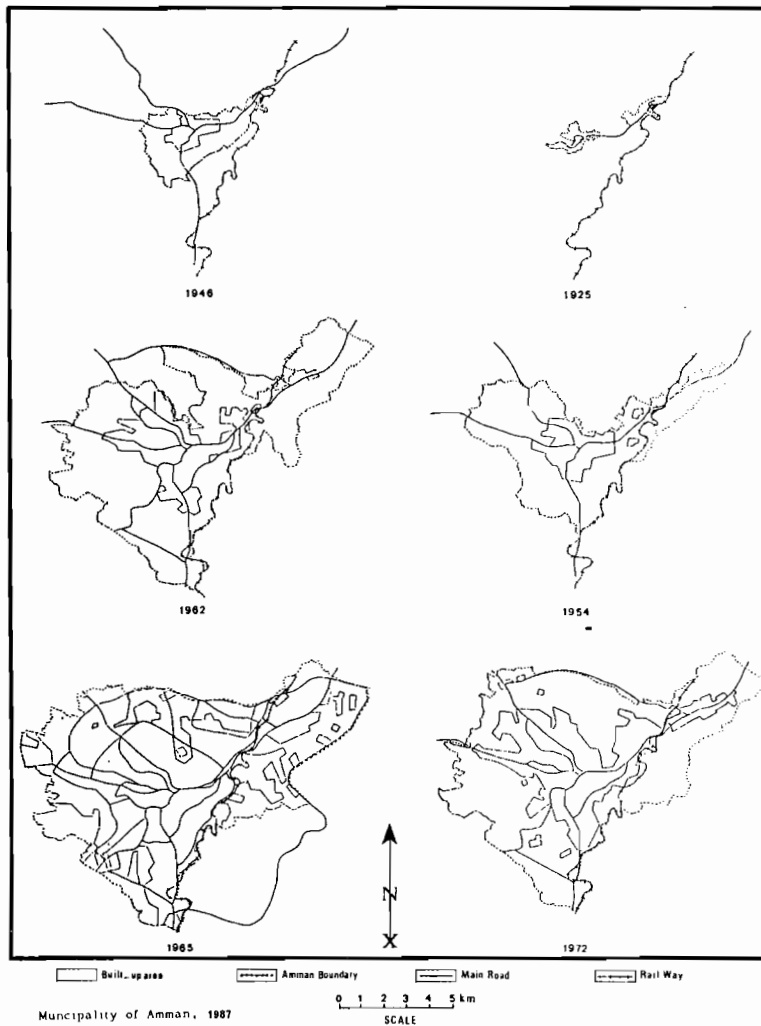
The history of Urbanisation of Amman goes as far as 1925 when the municipality of Amman had demarcated the boundary of Amman within 3s.q. km. The impact of the site was at least two fold. Firstly the extension of the agriculutral land along the seil area. Secondly, the migration of people from Salt area to settle in Amman as traders, the town multibled rapidly when this site has chosen as the capital of Jordan in 1925 (Fig. 2).

Three main phases were considered in the history of development of Amman;

1. 1921-1948

This phase show a slow development, which started in an area of 3s.q. km. round Seil area with a population of 5000 extended to about 16 sq. km. with a population of 45,000 (Municipality of Amman, 1974, 3-35).

**Fig. : 2
Growth Pattern of Amman Metropolitan**



2. 1948-1972

This phase witnessed a very rapid growth in terms of area and population. The site had the capacity of 550,000 people within an area of 85 sq.km. The migration of Palestinian had contributed sharply in this high rate of growth. Absence of all types of regulations and rules, and the random growth of the city are the main characteristics of the first phase. This situation continued even in the early of the Second phase until a comprehensive development plan for Amman has been put for execution in 1956. Upon this, the function, characteristics and land use map were decided. Another attempts were made in 1959 by the experts of the United Nations. They had put a detailed planning for every block with Amman in 1961, the first planning department in Amman Municipality had been created.

In these two phases. Amman distinguished by three characteristics. (Municipality of Amman, 1986, 4-26).

1. Planning at local level.

There were creation of back ward localities in different parts of Amman especially in the east and south beside, interaction of different types of land uses and the absence of recreation facilities within the category of land-uses.

2. At regional level.

Amman has been converted to a regional centre attract all the activities of surroundings and the concentration of all industrial, economic administration and cultural institution. This situation had created a new job opportunities.

3. Migration.

This sector consist of natural migration from different towns and villages of Jordan to Amman, of the outer migration from the west bank in 1967.

3. 1972 - 1985

In this phase, the supposedly increasing remigration of Jordanians from the Gulf Area is brought up. Remigration is said to rise because of the increasing number of Job opportunities in Amman.

Reference to what has been classified under the suitability dimensions (Table, 2), following an overall assessment of site characteristics of Amman.

Topography:

In the western portion, the elevation drops from Suweileh, at over 1000m. above sea level to the western limits of Marj Al Hamam and Na'urat 300m elevation. In the north there is a relatively little change in overall elevation. The central portion, most of the natural drainage channels meet in a series of wadis, which are tributaries to Seil Zarqa the south and east is relatively flat and gently undulating land.

Slope:

Slopes with Amman confirms the general pattern of topography the most severe slopes in excess of 50% are concentrated in the sides of Seil Zarqa. The majority of land to the north and the south of central Amman has slopes of 8% or less, landslides in rocky areas are usually associated with a combination of steep natural slopes and a rock structure dipping out of the slope.

Soil:

The weathering has resulted in the production of the typical "Terra Rossa" Soils. These are calcareous clay soils. The other principal soil type is the alluvium found in all wadis the deposits are generally poorly sorted, ranging from silt to boulder size.

Surface drainage:

Amman from the upper reaches of four major hydrologic units namely wadis Zarqa, Shueib, Kafrein and Wala. The wadis are relatively young, in the north-west are relatively older. The system consist of roughly parallel minor wadis crossing the basin-the existing stormwater drainage network consists of about 70 km of mains, sub-mains and secondary drains. The same water sources supplying Amman are being shared by different water users in various localities in Northern Jordan.

Present Land Use:

The appraisal of the historical development of Amman and existing major land uses, provide the basis for analysing urbanization structure. The basic structure evolved into a Combination of concentric and radial development. All new residential areas are developing along the main movement corridors, lower income households are tending to concentrate in east and south Amman and middle and upper income household in western, and north-west Amman. Industrial development is located in a series of fragmented zones associated with the main southern and north-east corridors. There is no significant industries to the north and west of the centre of Amman. Commercial, services and major institutions are concentrated in the main movement corridors

radiating from the city centre. The central area of Amman contains the largest concentration of retail and service establishments, providing a comprehensive range of goods and services.

Planned Land-Use:

Long term population projections, indicate that the population of Greater Amman will increase by 83% between 1985-2005. This situation has generated the need to formulate new residential zoning arises not only for purposes of density control but also to address the issues created by critical imbalances in the land allocations for residential purposes.

Land Control:

The vast majority of land within Amman is in private ownership. As a result virtually all sites for schools and other facilities, must be purchased by the relevant authority where land is available. It is difficult for the planners to acquire sites of sufficient size and in appropriate locations to provide the services required to serve local communities.

Land Cost:

Current Values (1985) of parcelled land within Amman vary between 35-80 J. D/Sqm for A and B type. Outside Amman, the values vary between 15-50 J.D/sq.m for the same type. For C and D type, the cost vary between 15-50 J. D/s.q. m. The variations depending upon accessibility to the centre of Amman.

Water:

The current water sources supplying Amman are in majority located outside the boundary of Amman. Similarly the envisaged future water resources are located outside Amman.

Construction material:

The limestone reserves in the area have resulted in extensive quarrying, which has provided most of the local building stone. Sand is also exploited extensively in the area surrounding Amman for use in construction.

Electricity:

The existing network is an efficient one, and there will be no problems in this regard, but the demand for more electric supply to urban activities is expected to exceed identified sources of supply.

Sanitation Sewage:

The collection network is completely available. Two treatment plants

are associated with this system. They are Ain Ghazal and Khirbat El Samra treatment plants. The west Amman zone has a very steep slopes with steep water courses. The construction of a sewage collection system will involve additional costs North Amman and south-east are a mixture of steep of gentle slopes, the construction of sewage networks will be moderate to expensive in the north and low to moderate in the south-eastern zone.

Ground Water:

The total available ground water resources is 263 MCM year. This volume is based on the estimated safe yield of the aquifers. If the advocated policy of allocating ground water resources is applied, it becomes clear that the ground water resources will fall short of water demand.

Flood Hazard:

Which is mainly related to storm water, in steep areas with steep water courses. The storm water drainage system tend to be larger and requiring special construction effort and large capital cost. The existing storm water drainage network consists of about 70 km of mains, submains and secondary drains.

Vegetation:

The vegetation in Amman region consist mainly of shrubs and can be treated as degraded forest. A forestation effort have been undertaken in the last two decades. It is essential to preserve forest reserves from the encroachment of urban development, Seppe vegetation is confined to the eastern Amman characterised by the absence of trees.

Site Capacity:

As a capital city, Amman is the main centre of business community. In this context, site capacity will investigate the option of creating mixed land uses where high density residential, office buildings and commercial uses can co-exist allowable densities would be better linked to the capacity of plots and roads for car parking and gardens, plot size, minimum frontage, sideset backs and plot coverage all contribute in determining the maximum capacity for parking in a certain districts and this varies greatly between eastern Amman and western Amman and the new residential settlement at Abu Nusair.

City Centre:

The central Amman contains the largest concentration of retail and service establishments. The city centre situated at the meeting point of

a series of narrow, wadis and is surrounded by steep "Jabals" in nearly every direction. Most of the main radial roads reaching the centre are located in the Wadis. The physical pattern associated with the central area explain to a large extent the pattern of commercial developments outside it.

Employment Areas, And Markets:

Employment areas for retail and other commercial services are concentrated in the central area of Amman the commercial corridors, local centres to the south and east are more basic and cater for essential everyday goods and services, while local centres in the west and northwest incorporate a wide variety of clothing and luxury goods. major institutions within Amman are owned by Government, which are widely dispersed throughout residential areas of west Amman. The western fringes of Amman represents an employment exporting area, the rest is the area of employment attraction.

Community Services:

Consist of education and health services. There are some constraints in the range and distribution of these services because of the severe shortage of government owned land.

Conclusion:

In the broadest sense, planning is the allocation of scarce resources to achieve certain specified objectives, which are defined in response to identified problems, issues and aspirations. The degree of success or failure provides a measure of performance of both the plans and the planning process. In the light of detailed investigation reported in this study, the utility of aerial remote sensing data in the design and execution of urban projects has been tested. By making an overall survey, we find that aerial photography is a realable source of information for site selection and site analysis. In theoritical terms, the planning for an urban project must respond to general national and regional objectives, as well as to more specific metropolitan and local interactions. The future configuration of the settlement pattern is ultimately determined by four groups of factors, namely;

- Geomorphological factors, factors inherent to the physical endownments of the site, its general topography, slopes, soil, surface drainage, ground water, flood hazard and vegetation cover.
 - Land utilization factor, which can be either policy measures ranging from land control and regional develoment plans to programes and projects affecting specific localities, or present land use and it is environmental impact.
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- Infrastructural factors, factor that deployed in the site.
- Services factor, which relevant to distance from the city centre, employment centre, central buisness district, clinics and schools.

The site analysis is a key concept in the town planning profession. A major objective of site analysis is to determine how much space and what kind of facilities a community will need in order to perform its functions. Also an inventory of site analysis will show the kind and amount of space used by the urban activities in different sites.

The determinats of site selection can arranged in order of importance for different sites. Accessibility is the main determinant of valley site, while defence for spur sites, climatic factors in the hill-top sites and nodolity for the gap sites. Natural Resources, scenic beauty and transit positions are the second in the heirarchy of ranking of determinants.

The functional morphology of sites can be illustrated by the circulation pattern of the site, the intensity of develoment for residential and other activities, the location of public buildings, the segregation of classes in terms of income and reputation of a locality and finally the physical land scape. These factors differ widely from one site to another and they have been identified as the chief determinants of the locational pattern.

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