



**The Aga Khan Program for Islamic Architecture**

at Harvard University and the  
Massachusetts Institute of Technology

*Room 10-390, M.I.T.  
Cambridge, Massachusetts 02139  
Telephone: (617) 253-1400  
Telex: 921473 Cable: MITCAM*

**ALGERIA, National Context**

**Background Paper Update, by Assia Kellaf**

**ECH-CHELIFF, Urban Context**

**By Assia Kellaf**

**ECH-CHELIFF: THE RECONSTRUCTION OF THE CITY OF AL ASNAM, ALGERIA**

**Project Summary Paper, by Nacim Zeghlache**

**Prepared for**

**The Aga Khan Program for Islamic Architecture**

## **ALGERIA**

### **Primary Information**

Country:	Democratic and Popular Republic of Algeria
Capital:	Algiers
Population:	20.3 million (1982)
Growth Rate:	3.2%
Density:	8.28 persons per square kilometer
Urban:	48%
Urban Growth Rate:	5.7% (Algiers)
Area:	2,382,000 square kilometers
Geography:	Northern region, containing a fertile coastal plain, a chain of mountains, the Tell Atlas, a range of high plateaus, and a second chain of mountains, the Saharian Atlas. Southern Saharian region characterized by two sand-covered depressions separated by a higher area.
Climate:	Temperate in the north, hot and dry in the southern Saharian zone.
Languages:	Arabic is the official language Berber (18%) French
Religion:	Sunni Islam (99%)
Currency:	Algerian Dinar (DA). 4.79 DA = US\$ 1.00 (1983)
GNP per Capita:	US\$ 2,140
Major Cities:	Algiers, Oran, Constantine
Production:	Industry 58% Services 35% Agriculture 7%

## **ALGERIA**

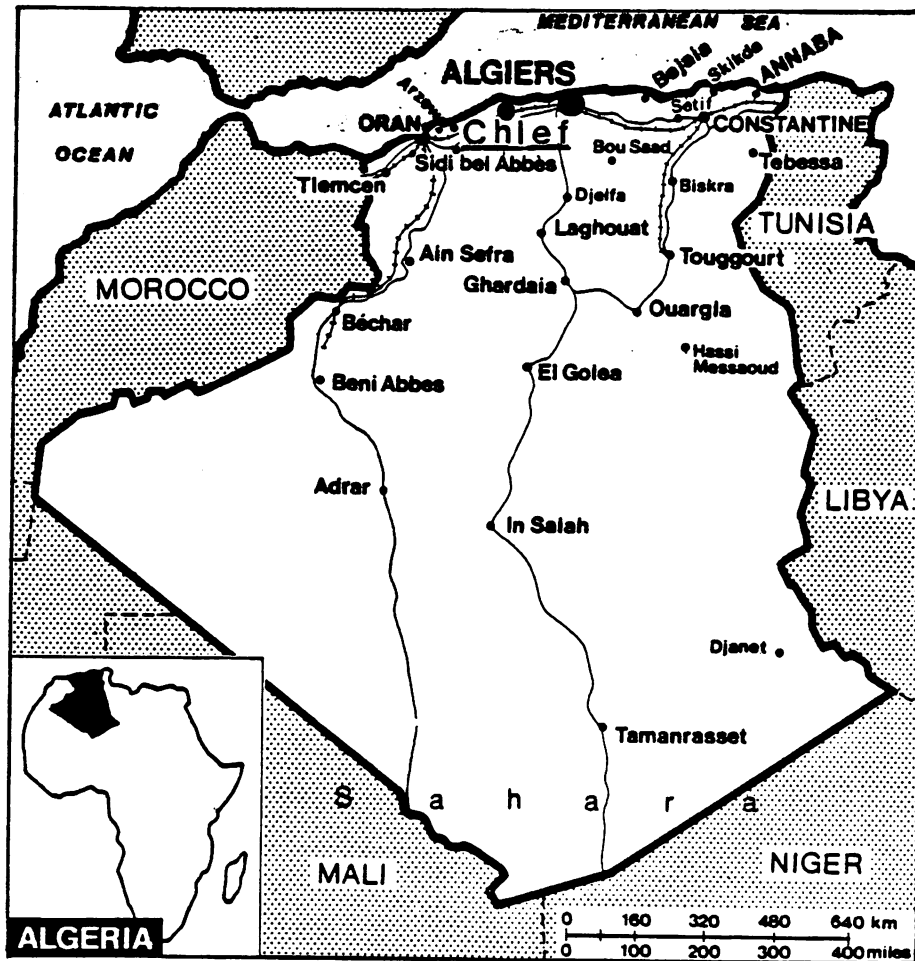
### **National Context**

The Democratic and Popular Republic of Algeria is, after Sudan, the largest African country. 80% of its 2,332,164 square kilometers is desert. The country is bounded to the east by Tunisia and Libya, to the south by Niger, Mali and Mauritania, to the west by Morocco and the Sahraoui Republic, and to the north by the Mediterranean. Algeria is named for its capital city, Algiers (El Djezair in Arabic, meaning "islands"; the city's harbor contains many small rocky islands).

The land area is divided into two dissimilar regions. The northern temperate region (20% of the country) contains four different zones running roughly parallel to the Mediterranean coast: a fertile coastal plain approximately 300 kilometers wide; a chain of mountains, the Tell Atlas; a range of high plateaus; and a second chain of mountains, the Saharian Atlas, separating the coastal north from the southern Saharian zone. The Saharian region (80% of the country) is characterized by two depressions separated by a higher area. The depressions are covered by sand dunes ("erg") and extend from the Hoggar Mountains in the southeast of the country to the Ames Mountains in the Saharian Atlas.

The coastal region enjoys a temperate, Mediterranean climate, cool in winter and relatively warm in summer. In the mountains and high plains immediately to the south, the climate becomes increasingly dry. The Saharian region is very hot and dry, with a significant drop in temperature at night. The greatest rainfall occurs in the northeast, decreasing gradually to the west and more sharply to the south. The annual rainy season lasts from November to March. Total rainfall varies considerably from one year to another, sometimes differing by 800%.

The well-watered coastal region is under cultivation, mainly citrus fruit, raisins, and cereals. Natural vegetation consists of small Mediterranean bushes ("maquis") and a few forests in the eastern region. On the high plateaus, grains are the primary crop. Natural vegetation in this region has been considerably impacted by clearance. In the Saharian region, agriculture is limited to oases of palm trees.





## HISTORY

The native Berber population was converted to Islam following the Arab conquest of North Africa at the end of the 7th century. A rich cultural and intellectual life flourished in Algeria throughout the medieval period, encouraged by the agricultural productivity of its maritime plain and extensive commercial links with both Europe and the eastern Mediterranean. An Ottoman province of the late 16th century, Algeria was conquered by France in 1830 and remained under French colonial rule for 130 years.

A protracted seven-year struggle for independence led by the Front for National Liberation (FLN) started in 1954, and was accompanied by massive population movements. Algeria became a democratic and popular republic in 1962 and adopted a socialist orientation. Development program was launched by an agrarian reform, the nationalization of foreign assets (mainly the petroleum resources in the Sahara), and a major industrialization effort. A series of four-year plans were adopted, aimed at developing the country's resources, reducing its economic dependence on the West, and improving the standard of living of its rapidly growing population.

## ADMINISTRATION

The government is based on a one-party system, the Front for National Liberation (FLN), and on a socialist ideology. Executive powers are vested in the FLN, headed by the President of the Republic, who is Chief of State and General Secretary of the party. The President is elected to a five-year term by popular vote. The legislative body is the National Popular Assembly, with 261 members elected for a five-year term by popular vote.

Territorial administration is based on a policy of decentralization. The country is divided into 31 "wilayas," with two lower levels of administrative units: 160 "dairates" and 704 "communes." Each wilaya is administered by an executive council and an elected popular assembly of 35 to 55 members. The executive council is headed by a Wali, who is responsible for the implementation of the investment programs of individual ministries as well as the administration of the wilaya as a whole. Each wilaya is divided into administrative dairates comprised of communes--territorial units administered by a communal executive and a local popular assembly.

## DEMOGRAPHY

The population of Algeria was estimated at 18.25 million in the 1977 census, and at about 20.3 million in 1982. The annual growth rate (3.2%) is still very high. In 1977 about 57% of the population was under 20 years old, and only 36.7% was of working age (20 to 59 years old).

Almost the entire population lives on one-fifth of the country's land area, in the northern section. The Saharian region is very sparsely inhabited and contains only 5% of the population.

Unemployment and underemployment are high in Algeria, in spite of the large number of jobs created during the last two decades. The average annual growth rate of employment is 7.8%, but it has failed to keep up with the growth rate of the labor force. One result of this is a major out-migration of workers to France and other EEC countries. About one million Algerians are employed abroad today. The government is trying to encourage workers, especially skilled workers, to return home to help develop the domestic economy.

## URBANIZATION

At present, approximately half the population lives in urban areas. The remainder lives either in small rural agglomerations (13%) or scattered about the countryside (39%). However, rural-urban migration is considerable; the 1977 census showed 140,000 people leaving the countryside annually to migrate to the cities. From 1970 to 1979, 1.7 million peasants settled in the cities of Algiers, Oran, Constantine, and Annaba, putting a tremendous burden on the urban areas to provide the necessary employment and infrastructure. Algiers is the city most affected; with an annual growth rate of 5.7%, it is outstripping other cities in size, despite the government's decentralization policy. The urban population is expected to increase from 48% of the total population in 1980 to 60% in 1990.

## ECONOMY AND DEVELOPMENT PROGRAMS

Algeria's strategies for development are tied to its socialist and egalitarian political ideology. A principal goal is to move toward economic independence and self-sufficiency. The National Charter proclaims "the concept of development to be indivisible from economic liberation." The long-term strategy is to create an efficient system of production to meet

the country's material needs, to raise disposable income, and increase the capital accumulation necessary for investment in large development projects. The state controls the overall production process to ensure equitable and rapid development, as well as the development of indigenous natural resources--phosphate, petroleum, and natural gas; Algeria's natural gas resources are estimated at nearly three billion cubic meters, among the world's largest.

The development strategy stresses two sectors: industry and education. The creation of an industrial base adequate to generate further economic growth is a high priority. Education is recognized as a means of developing human resources, and is the only social program to receive major allocations under the national budget.

Four plans have been implemented to date. The First Plan (1967-1969) called for an investment of 11 billion DA, of which 45% was allocated to industry. The Second Plan (1970-1973) totalled 27 billion DA, with 36.5% allocated to industry and 5.5% allocated to housing. The Third Plan (1974-1977) totalled 110 billion DA, with 43.5% allocated to industry and 13.3% to the social sector, including housing. The Fourth Plan (1980-1984) has a budget of 420 billion DA. 15% is allocated to the oil industry, 23.5% to other industries, 12% to water resources and agriculture, 15% to housing construction, 10.5% to education, and 6.5% to social institutions.

The first three plans concentrated on developing heavy industries for the transformation of raw materials. This industrial development has been concentrated mainly in the northern part of the country, and emphasis has been on such capital-intensive projects as the gas treatment plants of Arzew and Skikda and the steel complex of El Hadjar in Annaba. The goal for the future is to attain self-sufficiency in cement, iron and steel, plastics, chemicals and fertilizers.

Other sectors have generally received less support. Agriculture was allocated only 15% of investment in 1974-1977, although this sector supports over half the population. An agrarian reform was implemented under the 1974-1977 plan which led to the establishment of large cooperatives and grouping of scattered rural populations in "agrarian villages," which were intended to provide an "urban quality of life" in the countryside. In spite of this reform, however, agricultural production has declined and today large quantities of food have to be imported. Inadequate investment

has also adversely affected all sectors concerned with social services, excepting education, with a particularly severe impact on urban living standards because of the lag in building housing and its infrastructure.

The Fourth Plan aims to complete the massive capital-intensive industrial program and to strive to correct the deficiencies in other sectors, by such means as increased investment in agriculture (particularly irrigation) and in housing and services.

Algeria's intensive investment program is spurring a rapid growth of production. From 1960 to 1970, the average annual growth rate of the gross domestic product was 6.3%. Between 1970 and 1980, it rose to 7%, largely as a result of increases in output from the industrial sector and increased gas and oil production.

#### HOUSING

National housing programs are implemented by specialized agencies. The Ministry of Housing, with the cooperation of the wilayas, allots programs to different areas and sets up a schedule for implementation. The Ministry of Finance allocates funds to local administrative agencies of the National Office for Promotion and Management of Housing (OPGI). The OPGI agencies handle actual payments and administer contracts during the production process. Under contract with the OPGI, the Office of Planning for Construction and Housing (DUCH) handles all activities relating to implementation of projects in its jurisdiction. This may range from master planning to construction of individual dwelling units. New construction by the public sector relies heavily on industrialized methods, including prefabrication.

Land for housing construction is purchased from municipalities, which control its development. Urban land is regulated by a master plan and is added by the municipality whenever demand occurs. The municipality is in charge of servicing the land, and in most cases all servicing costs are borne by the government. For private development, municipalities undertake subdivisions which are sold to individuals or cooperatives.

In 1974, the municipalities were designated as managers of all urban land, including reserves for future development. However, municipalities have generally lacked the ability to run a complex land-banking system, and their failure to create a land reserve has slowed private development.

Algeria, like many other developing countries, suffers from an acute shortage of housing in urban areas. The deficit has been gradually increasing over the years as a result of a high urban growth rate coupled with a national development strategy that stressed capital investment. Low budgetary allocations for housing and underestimation of the housing deficit between 1967 and 1977 have resulted in a large backlog.

In 1963 the deficit in housing was estimated at 1,073,000 units (387,000 in urban areas and 686,000 in rural areas), attributable in part to the economic disruptions, population movements, and destruction that accompanied the protracted struggle for independence. Fewer than 6,000 dwellings were constructed annually in the post-war period, and by 1966 the average occupancy rate was 6.1 persons per three-room dwelling, and an estimated 48% of dwelling units were overpopulated. From 1967 to 1977, an increase in population of 43.7% was accompanied by an increase of only 11.5% in the housing stock. Over this period, not only did construction fall short of projected goals, but an underestimation of actual housing needs resulted in a more severe deficit by the end of the Second Plan than in 1966. In addition, the overcrowding of individual units has accelerated the physical deterioration of the housing stock, while little maintenance is provided by its occupants--in urban areas, 57% are renters, rising to 80% in the largest cities.

The development of the construction sector has been constrained by insufficient production of construction materials, machinery, and tools. Moreover, inefficient distribution limits the availability of construction materials in different areas of the country. This affects construction costs, which are very high and extremely variable from one region to another. The low rate of housing production is also influenced by the largely unskilled labor pool available in construction. This limits the choice of technology for housing production.

Algeria's housing policy is predicated on its National Charter's statement that "A decent dwelling, meeting minimal standards of modern comfort, is fundamental to the improvement of the standard of living of the population." The government is theoretically responsible for the financing, production, and allocation of finished units to provide decent housing for all. However, a new orientation in housing policies was developed at the Fourth Congress of the FLN party, held in 1979, with an emphasis on

increasing housing production and setting up an institutional framework to regulate housing construction. The new policy seeks to decentralize and rationalize institutions, by reorganizing existing firms and creating new ones to increase production capacity, and by training skilled construction laborers. The Fourth Plan calls for the construction of an average of 100,000 dwellings a year for the plan period to absorb the present growth rate and begin to reduce the existing deficit. The plan envisages a total production of 450,000 dwellings, 300,000 in urban areas and 150,000 in rural areas. A production figure of 200,000 per year by the end of the decade is proposed.

Another component of the new housing policy is to encourage involvement of the private sector in housing finance and production. Rent and sales policies for public housing have been redefined. After two decades of high rent subsidies and considerable problems in management and maintenance, the government aims to recover part of its investments by increasing rental rates and offering for sale 60 percent of the public housing stock. Private ownership of family dwellings is being encouraged by several programs, including the provision of housing cooperatives and serviced lots. A last element in the government's new housing policy is to take advantage of international cooperation for transfers of technology and approaches in the provision of housing.

During the first four-year plan, Algeria attempted to speed housing production by importing industrialized building processes. The results fell far short of expectations and were deemed particularly unsatisfactory in the case of heavy prefabricated systems; the country lacked the skilled manpower and support industry necessary for their proper functioning. The current Plan heralded a major reassessment of construction technology. The experience of Ech-Cheliff was a catalyst in bringing about this reevaluation. It focused attention on the light prefabricated systems successfully used to rebuild Al Asnam in record time. However, the long-term implications of lower densities of settlement, high infrastructure cost, limited economic life of structures, and high maintenance costs have yet to be resolved. The search continues for efficient construction technologies suited for wider application in a variety of situations other than emergency crises, that would yield a better return on investment in the overall housing sector.

## **ECH-CHELIFF**

### **Urban Context**

Ech-Cheliff is the principal town of its wilaya and ranks eleventh among Algerian cities. It is located about 50 kilometers inland from the Mediterranean coast, at the intersection of the major east-west and north-south roads--roughly halfway between Algiers and Oran. It is situated in the valley of Oued-Cheliff at less than 200 meters altitude, and is separated from the Mediterranean by hills 200 to 700 meters high; buffered from the maritime influence, its climate is therefor slightly more arid than a typical Mediterranean climate.

Ech-Cheliff Wilaya has an area of 112,000 square kilometers and its population of nearly 890,000 inhabitants places it among the densest wilayas in the country, with 102 inhabitants per square kilometer. Its economy is largely agrarian: orange trees are grown on irrigated land and cereals and sugar beets are also cultivated. The wilaya was becoming an important contributor to the national economy, due to its agricultural resources and its textile and fruit-processing industries, when a major earthquake in 1980 brought utter destruction to the area.

### **HISTORY**

The city of Orleansville was founded by the French in the mid-1800s on the site of the old Roman settlement of Castellum Turgitanum. It remained a relatively small agrarian city until the middle of the century, growing from 18,500 before World War II to 35,000 in 1954. Orleansville was partially destroyed by the earthquake of September 9, 1954, which killed 1,243 and wounded thousands, as well as demolishing 20,000 houses. The city was subsequently partially rebuilt and it became known for its modern architecture.

Orleansville was renamed El Asnam after Independence in 1962. The city developed rapidly, its population tripling in 20 years from 40,000 in the early 1960s to 120,000 in 1980. But on October 10, 1980 (26 years after the first earthquake), a second quake of even higher intensity destroyed 80 percent of the city. The new city that was built on the site under emergency plans was named Ech-Cheliff.

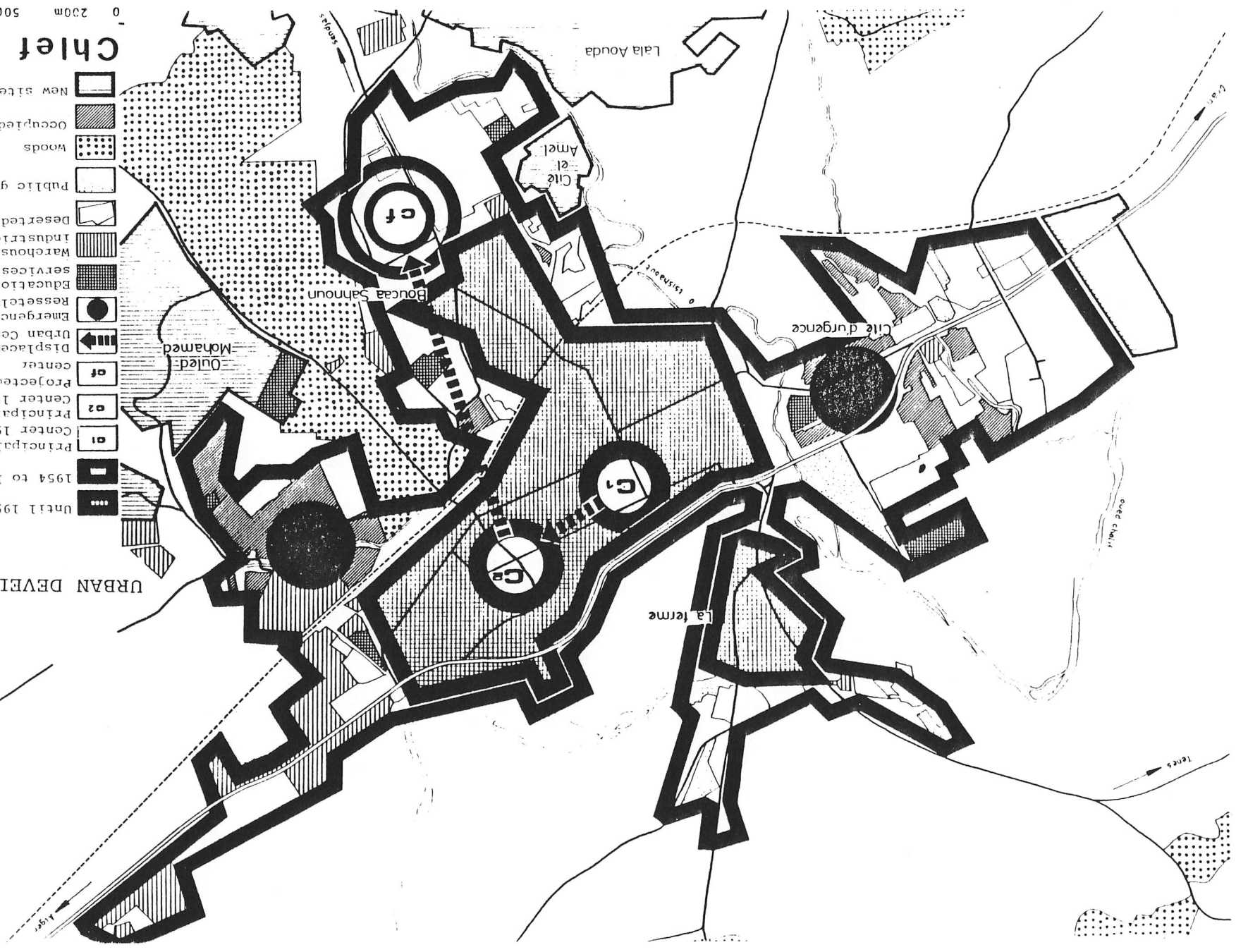


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# Chief

- New sites
- ▨ Occupied housing
- ▤ Woods
- Public gardens
- Deserted areas
- ▨ Warehouses and industries in operation
- ▨ Services in operation
- ▨ Education and health
- Resettlement 1954
- Emergency
- ▨ Urban Centers
- ▨ Displacement of center
- ▨ Projected Urban Center 1980
- ▨ Principal Urban Center 1954
- ▨ Principal Urban Center 1954 to 1980
- ▨ Until 1954

## URBAN DEVELOPMENT





The October 1980 earthquake was 15 times more powerful than the previous one. It occurred along a fault line oriented northeast to southwest. The earth was distorted, cracked, and lifted (sometimes more than a meter) along a 40-kilometer band about 500 meters wide. Two tremors occurred that afternoon, the first of a magnitude of 7.3 on the Richter scale, followed a few hours later by a second, of a magnitude of 6.3. The first was one of the most violent tremors recorded in North Africa.

Eighty percent of the city was destroyed, with most of the destruction occurring along the northern part of the fault. The center of El Asnam was particularly badly hit. Most of the public buildings, the city hall, the courthouse, the great mosque, the party headquarters, the high school for girls, the post office, and the market were all largely destroyed. The city's only hospital was partially destroyed and was rendered unusable. The largest hotel and at least three neighborhoods were totally destroyed. The El Nasr quarter, where three thousand people lived, collapsed entirely.

The extent of the damage was due to two causes. First, the city's buildings had been constructed following various standards: some buildings antedated the 1954 earthquake, others had been built according to the 1955 regulations or following norms developed in France in 1962, while still others were constructed according to 1969 earthquake-resistant norms. Second, the large increase in El Asnam's population during the intervening 20 years had caused a quantity of informal housing to be built, to no particular technical specifications. In any case, among the great variety of structural norms found in El Asnam, few buildings were able to withstand the 1980 earthquake.

Construction which conformed to the strictest regulations was designed to withstand a tremor of intensity 8; but the earthquake reached 10. The increase in cost for construction capable of resisting an earthquake at 8 is approximately three to four percent; however, since the violence of the tremor doubles from one degree to the next on the Richter scale, the cost increase for construction secure against a 9 or 10 tremor jumps to 20 to 30 percent. Protection against higher intensities than 10 is virtually impossible.

In the aftermath of the tragedy, the relief effort was mounted by teams from all over the country as well as from overseas. The first actions taken were to try to rehouse the population in tents provided by the army and foreign assistance and to take necessary measures to prevent epidemics. Only two weeks after the earthquake, economic activities resumed: agricultural workers returned to their fields and industrial workers to their plants.

Although thousands of tents were supplied, they were insufficient, and the search for a housing solution began. The idea of quickly erected temporary accommodation was rejected in favor of light prefabricated structures with a lifetime of 10 to 15 years. Firms from various countries including Canada, Italy, and France submitted proposals. The construction process was directed by the contracting firms. A nearby harbor was reserved for the import operation, and local laborers were hired to ease the unemployment problem and stabilize the population.

One objective of this import program was to avoid adding to the burden on the country's already overstressed construction capacity, and to limit the impact of the earthquake on the current four-year plan. It was estimated that the reconstruction of El Asnam alone would correspond to housing production nationwide for one year under the plan.

#### THE EMERGENCY PLAN

After less than four years, the 478,950 victims in the wilaya who survived the catastrophe can begin to see some prospect of living in decent conditions. Great progress has been made in the three areas earmarked as priority needs for the first reconstruction efforts--housing, education, and infrastructure. No victims of the earthquake live today in temporary housing. Most of the new development has occurred along the main highways and in the plain, despite the fact that the foothills would have been more advisable, both economically and from the standpoint of safety, as these areas are less sensitive to earthquakes. Developments along the highway polarize investment and promote migration from poor rural areas towards these new foci of activity. Moreover, although the wilaya's economic base is largely agricultural, the emphasis on redevelopment of the urban center following the earthquake contributed to the trend of abandoning the countryside. Plans for the future will concentrate on reducing the density of

the center, which today contains 80 percent of the wilaya's socio-economic activities, by promoting the rural and piedmont development; and on scientific study of seismic phenomena and the characteristics of the land.

#### THE URBAN CONTEXT

Natural Constraints: Four natural characteristics have to be taken into account when planning the urban development of Ech-Cheliff:

- Earthquake risks, which are relatively uniform throughout the Ech-Cheliff area
- Climate and topography: the continental climate exhibits typical extreme variations, with cold winters and very hot summers whose temperatures often reach 40°C
- Soil conditions: with the exception of the river banks of Wadi Ech-Cheliff, the best sites are found in the southern part of the city and on the hills where the settlements of Ouled Mohammed, Lalla Aoudaj, and Chorfa are located
- High quality agricultural land and wooded areas to be preserved

Economy: Twenty percent of the total population of the county is economically active. The sectorial distribution of the labor force is as follows:

Agriculture	5%	
Industry	15%	40%
Construction and Public Works	10%	
Services and Transportation	20%	
Commerce	15%	60%
Administration and Public Services	25%	
Other	10%	

Current forecasts do not anticipate any major change in the regional economic structure, where services, commerce, and transportation will remain the dominant sectors. It is anticipated that the city of Ech-Cheliff will attract both private and public investments.

**Current Development Patterns:** The city of Ech-Cheliff is characterized by heterogeneity. It consists of adjacent subareas with markedly different character, shaped by the destruction and rebuilding activities associated with the past two earthquakes. Before the 1954 earthquake, the Hay-al-Houria quarter (formerly La Ferme) and the Hay-Salem quarter (formerly Bocca Sahnoun) were urban areas of traditional semi-rural character relatively independent from the center of the city. After the earthquake, the "cite d'urgence," a zone of emergency shelters built to rehouse the victims, evolved into a marginal area containing the worst pockets of poverty in the city.

Following the 1980 earthquake, new districts of prefabricated houses and community facilities were erected outside the built-up area; the center of the city was the area most affected by the earthquake. Consequently, the older sub-centers of La Ferme, Bocca Sahnoun, and the cite d'urgence are experiencing new growth in response to their increased importance as the city's functional service centers. Simultaneously, there has been a proliferation of informal areas at the urban periphery. The large parcels of land formerly occupied by public facilities separate the various quarters.

**Population Growth:** Between 1966 and 1977, the population of Cheliff county ("commune") grew at a rate of four to five percent per year. Assuming a continuation of this rate of growth, the 1983 population would be on the order of 130,000 to 140,000 inhabitants, of which 100,000 would be living in the city proper. Recent forecasts project a rate of natural increase of three percent and a rate of immigration of one percent, which would lead to a doubling of the population by the year 2000.

The total urbanized area covers 1,500 hectares. The addition of the new quarters has lowered the overall density by a factor of 10, from 400 to 500 persons per hectare before the earthquake to about 50 to 60 today.

#### REDEVELOPMENT PLAN

The redevelopment of the city had to be planned in accordance with regional development objectives spelled out in the plan prepared by the Agence Nationale de l'Amenagement du Territoire (ANAT):

- Limit urban development in areas where earthquake risks are high.
- Promote the development of new urban centers in the southern foothill zone.
- Reorganize the transportation network, taking into account the highway projects planned for the year 2000.
- Ensure a balanced distribution of infrastructure and social services.
- Emphasize the development of agricultural activities and small- and medium-sized enterprise.

### Project Reference Sheet

Project Name: Ech-Cheliff: The Reconstruction of Al Asnam, Algeria  
Location: Ech-Cheliff, Algeria  
Consultants: 18 Algerian firms and 24 foreign firms from nine countries  
Contractor/Builder: Algerian government and foreign contractors  
Client: Algerian government  
Implementing Agency: Ministère de la Plannification et de l'Aménagement du  
Territoire; and Ministère de l'Urbanisme de la Construction et de  
l'Habitat  
Date of Commission: 1980  
Implementing Status: Ongoing  
Estimated Cost: NA

Summary Description: In October 1980 a major earthquake struck the city of Al Asnam, destroying most of its buildings and killing 4,500 of its inhabitants. The Ministry of Urban Development and Housing undertook to rebuild the city on the same site before the winter of 1981. The reconstruction effort started by providing temporary housing for homeless the survivors, and repairing the basic infrastructure. Technical and economic feasibility studies determined that a large number of damaged buildings could be repaired and brought into conformity with current standards for earthquake resistance. 1,200 prefabricated houses were erected to accommodate residents while their dwellings were repaired. Most of the old urban fabric in the city center was thus salvaged at moderate cost. The rest of the city was divided into sectors assigned to various foreign contractors for reconstruction; the projects relied extensively on prefabricated systems for new housing and community facilities. By the end of 1981, most of the affected population had been rehoused.

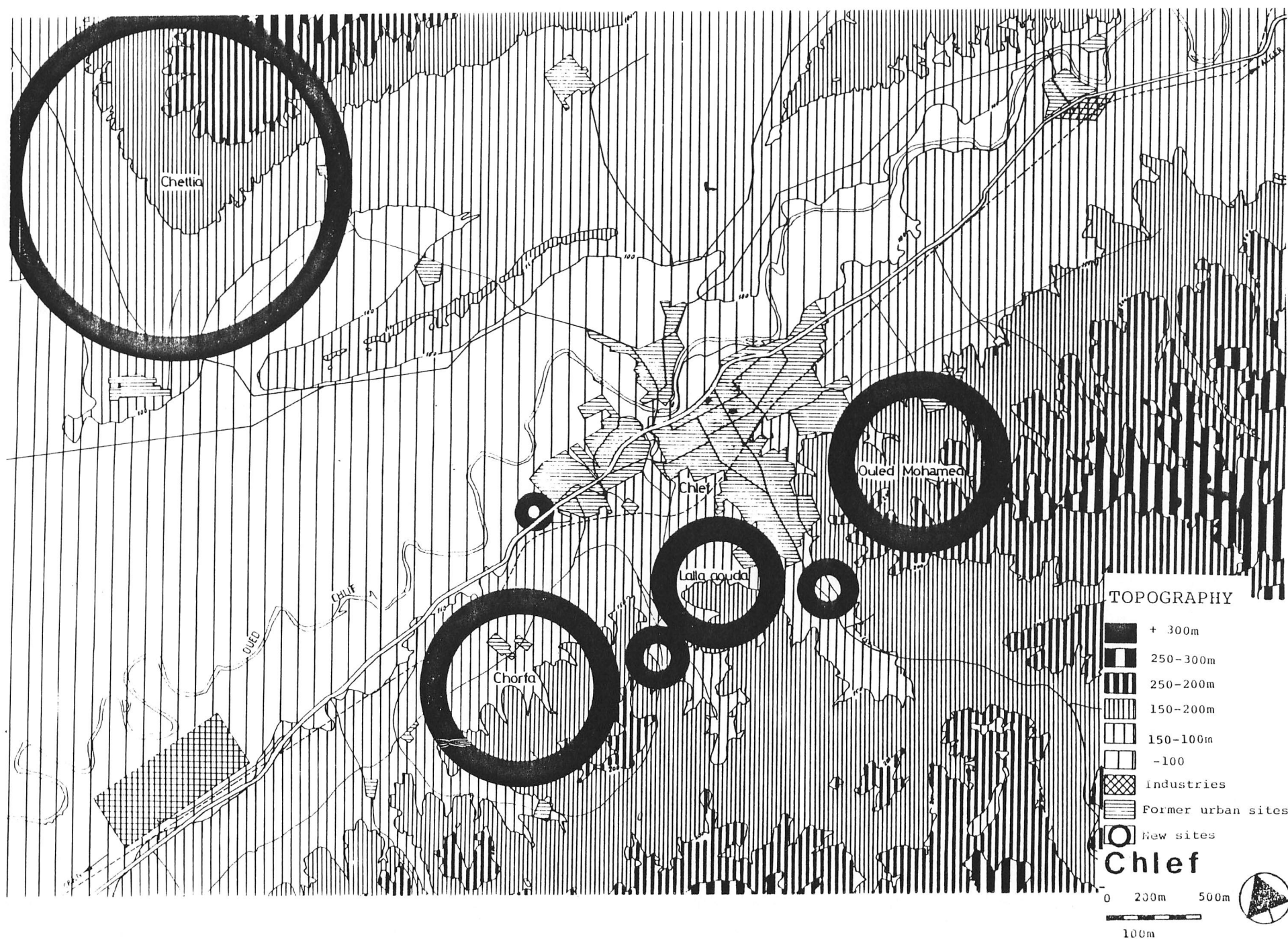
**ECH-CHELIFF: THE RECONSTRUCTION OF THE CITY OF  
AL ASNAM, ALGERIA**

**Project Summary Paper**

At the time of the 1980 earthquake, the housing stock of Ech-Cheliff was composed of five categories of dwellings:

- Traditional one- and two-story dwellings built on rectangular plots of various dimensions within the old city.
- Prefabricated dwellings of emergency housing built after the 1954 earthquake--the "cite d'urgence." Most of these dwellings were altered and expanded over the years to meet cultural requirements and additional family needs. The 1980 earthquake demonstrated the adequacy of their resistance to earthquake damage.
- Apartment buildings, generally three or four stories high, on the European model. Ongoing construction at the time of the earthquake consisted mostly of apartment buildings with reinforced concrete structural frame and infill masonry walls which suffered heavy damage.
- Semi-rural dwellings existed as remnants in the old parts of town and on the farms beyond the edge of the urbanized area.
- Informal spontaneous housing in squatter settlements.

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## THE EMERGENCY PLAN

## Schedule of Priorities:

- 1981: Provision of housing
- 1982: Education projects
- 1983: Other community facilities and services

## Program for the Development of New Housing Sites:

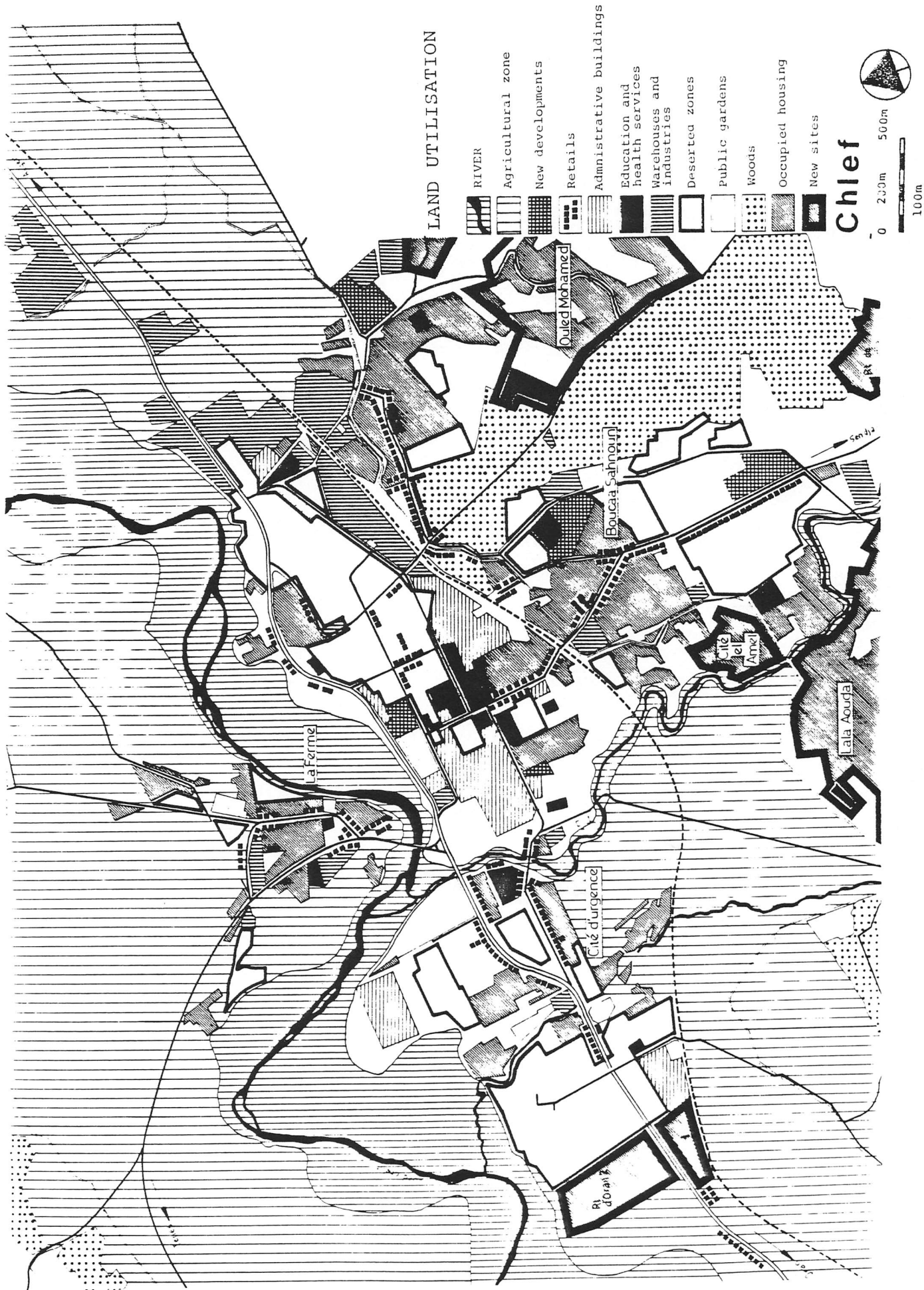
Total area	1,800 hectares
Improved area	1,150 hectares
Road network	320 kilometers
Sewerage network	450 kilometers
Storm drainage	200 kilometers
Water supply network	450 kilometers
Electricity and street lighting	320 kilometers
Public gardens and spaces	200 hectares

## Housing Construction Schedule:

- December 1980: Selection of sites was completed
- January 1981: The first reconstruction activities were started
- May 1981: Completion of working drawings for the dwellings
- May 1981: Seven months after the disaster the first houses were ready for occupancy
- June 1981: Completion of infrastructure networks
- August 1981: 11,000 dwellings ready for occupancy
- October 1981: Completion of prefabricated housing assembly
- January 1982: 18,500 dwellings ready for occupancy
- In addition, the rural housing emergency program provided 21,670 dwellings.

## School Construction Schedule:

- October 1981: First primary school completed
- February 1982: Seven high schools completed
- May 1982: Completion of three high schools and seven primary schools
- July 1982: Completion of eight high schools and 24 primary schools



### Construction Schedule for Other Community Facilities:

March 1984: 17 health centers, 18 clinics, eight hospitals

June 1984: 18 vocational training centers

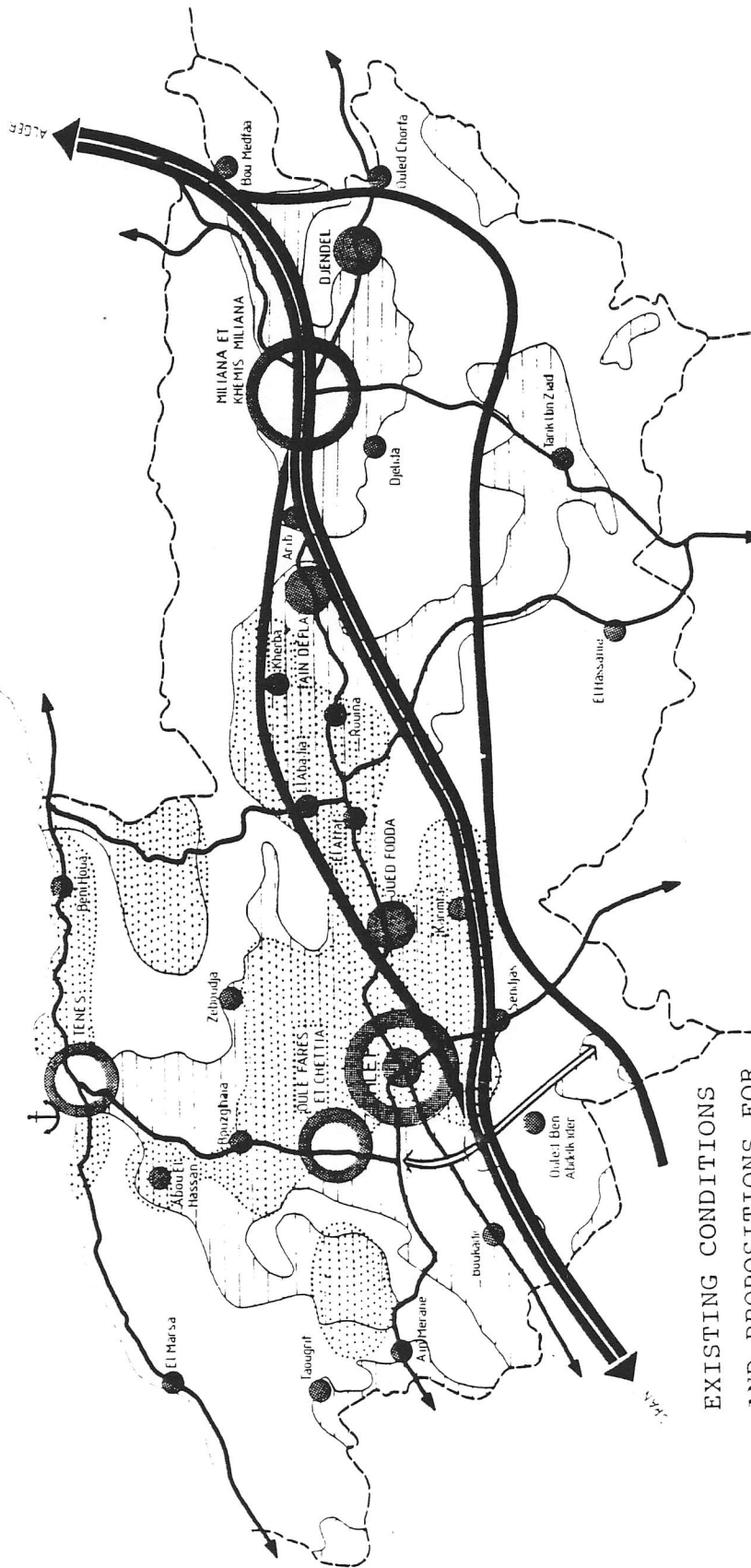
By January 1982, all of the earthquake victims had been rehoused in prefabricated dwellings within large housing complexes built on the periphery of the city. In addition, a compensation program assisted victims to rebuild their homes and businesses. Roads had been constructed, and water and sewer lines laid out. Numerous community facilities were built and enrollment was guaranteed for every student for the school year 1982-83. The quality of public services had been improved to a level higher than the national average.

Emergency housing: Speed of execution, lightweight materials, and resistance to earthquakes were the main criteria in the choice of industrialized building systems. Eighteen Algerian firms and 24 foreign firms from nine different countries participated in the reconstruction:

Italy	6 firms	4,682 dwellings
Belgium	4 firms	2,042 dwellings
Denmark	4 firms	3,100 dwellings
France	4 firms	5,000 dwellings
Great Britain	2 firms	800 dwellings
Portugal	1 firm	628 dwellings
Spain	1 firm	420 dwellings
Switzerland	1 firm	400 dwellings
Canada	1 firm	1,774 dwellings

The various post and panel structural systems offered a limited number of prototypical house plans. The Algerian authorities asked for special modifications in the interior design in order to adapt it somewhat to local socio-cultural traditions. Finally, two prototypes were selected:

- One-story detached units with a floor area of 78 square meters
- Two-story semi-detached units with a floor area of 65 square meters



# EXISTING CONDITIONS AND PROPOSITIONS FOR

## THE WILAYA

- Controlled-urbanisation zones  
(A N A T proposition )
- Primary seismic epicentre
- Existing national roads
- Projected national roads
- Wilaya boundaries

## EXISTING URBAN AREAS

- More than 5000 people
- From 10,000 to 30,000 people
- From 30,000 to 60,000 people
- From 60,000 to 120,000 people

## ROAD NETWORK PROJECTION

- preferential alternative
- Secondary alternative

Chlef



Lot sizes of 200 sq. meters allowed for individual yards and gardens.

With proper maintenance, the houses should last approximately 20 to 25 years. These systems offered expeditious solutions for an emergency situation, but in the longer run problems of maintenance and durability have to be resolved.

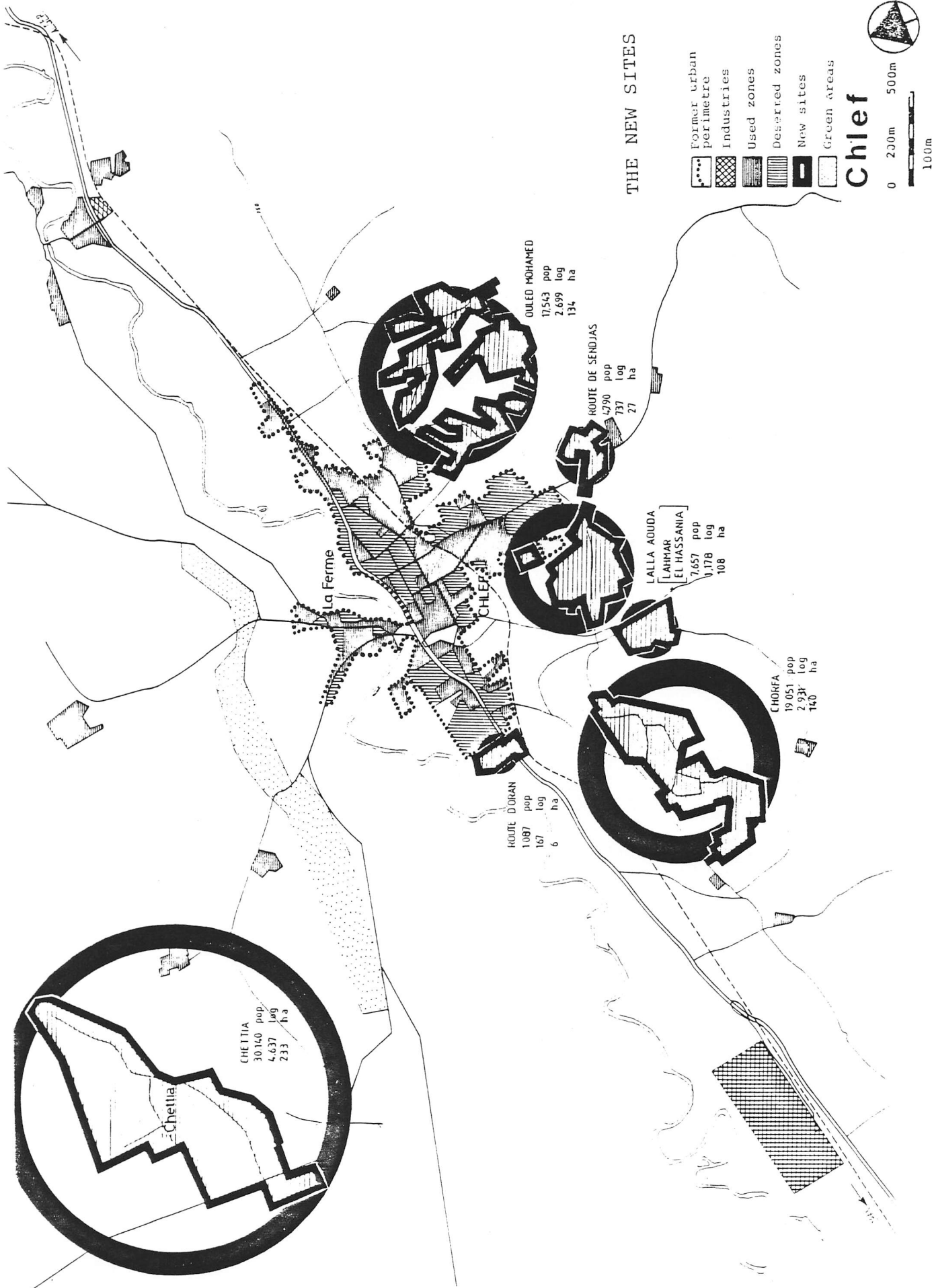
In spite of its vulnerability to earthquakes, the old central area of the city is being redeveloped and will certainly attract back a very large portion of the population. This will recreate the form that existed prior to the earthquake, encouraging development on alluvial soils along the Wadi Cheliff to the north of the city--an area which is highly prone to earthquake damage and which contains, moreover, the richest agricultural land. It will also impose hardships on the residents of outlying sites, forcing them to commute using a transportation network still in an embryonic stage. Thus, unless services are rapidly introduced in the new quarters, they will tend to lose the more affluent segment of their population.

The authorities will have to decide soon on the status of the new housing. Residents are anxious to know whether the prefabricated units they occupy are going to be rented, sold, or given to them. Those who own an older house that is still habitable or repairable will have to decide whether to stay and improve their new house or return and rehabilitate their old one. The poorest inhabitants are worried about the prospect of having to pay rent in addition to costs for the prefabricated houses.

#### FUTURE DEVELOPMENT PLANS

To rationalize the process of future development, a planning strategy was adopted with the following objectives:

- To integrate the various areas of the city by maximizing contacts between their inhabitants and by improving both pedestrian and vehicular circulation.
- To redirect urban expansion towards the south, in light of problems of earthquake vulnerability and soil stability.
- To create a new city center at a more appropriate location.
- To rebuild the existing city in accordance with acceptable earthquake resistance standards.
- To give priority to the adequate development and servicing of new areas

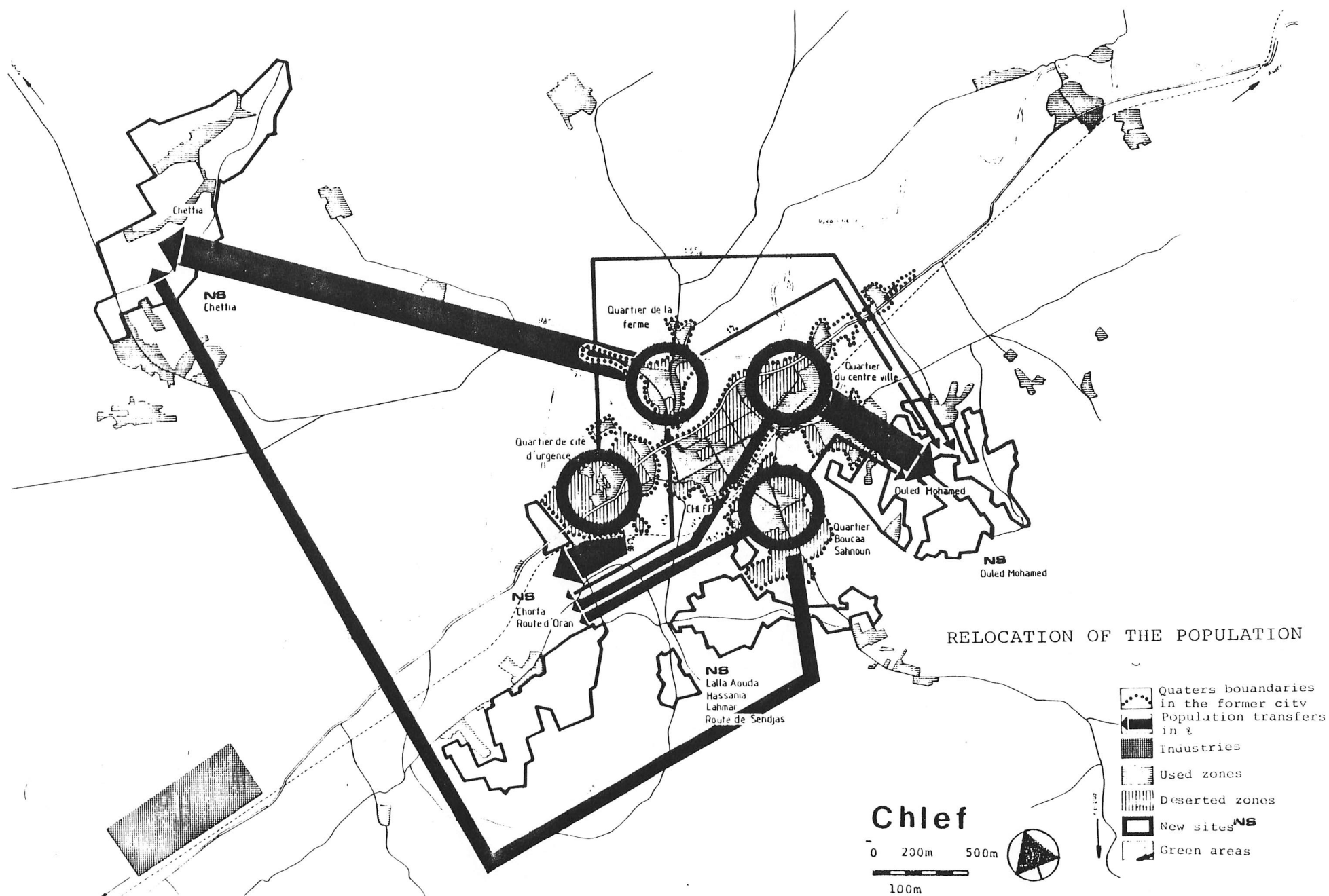


The difficulties encountered (in terms of time, technical problems, and costs) in the rebuilding of older areas to the desired standards led to a decision to defer, for the time being, the revitalization of the existing city and concentrate public investment on the development of new sites located to the south. Even if it were entirely rehabilitated, the existing city would have a holding capacity of only 160,000 to 180,000 inhabitants, which would be exceeded in the next decade--making it necessary to concentrate on the provision of zones for future expansion. The cornerstone of the new development scheme rests on the ability to successfully establish a new city center and create an efficient circulation system linking together the various subareas of the city, old and new.

**The New City Center:** Located south of the existing city, the site selected for the new center is bounded to the north by the old quarter of Bocca Sahnoun, to the east by a housing complex already under construction in 1980 prior to the earthquake, and to the west by a stadium and a new housing complex. The stadium is an existing structure on the edge of the new city center, and will be kept for sports, ceremonial meetings, and other functions.

The design concept for the new center seeks to fulfill the following objectives:

- To create a focal point for the city, integrating the new areas with the older developments.
- To concentrate civic functions and commercial activities in a node that includes commerce, public facilities, government center, offices, banks, and housing.
- To reinforce the symbolic character of the new center by the incorporation of prestigious elements.
- To provide a spine of landscaped open space, including public parks and playgrounds. Land speculation and the heavy concentration of activities had led to the virtual disappearance of public open space in the existing city.
- To allow for incremental planned development with enough flexibility to adapt to unanticipated future requirements.





The city of Ech-Cheliff is the seat of the regional government of the province. The Wilaya building and the law courts are considered to be the main symbolic elements of the city center. Administrative buildings of lesser importance would be located in the subcenters. The mosque is proposed as the articulating element between the government center and the commercial area. It is clearly visible from the green spine. The mosque will encourage the growth of businesses in its immediate surroundings. The various commercial activities are located at the intersection of main arteries and are integrated by a network of pedestrian streets. Other facilities include a cultural center, a movie theater, a post office, a hammam (Turkish bath), a library, and a hotel.

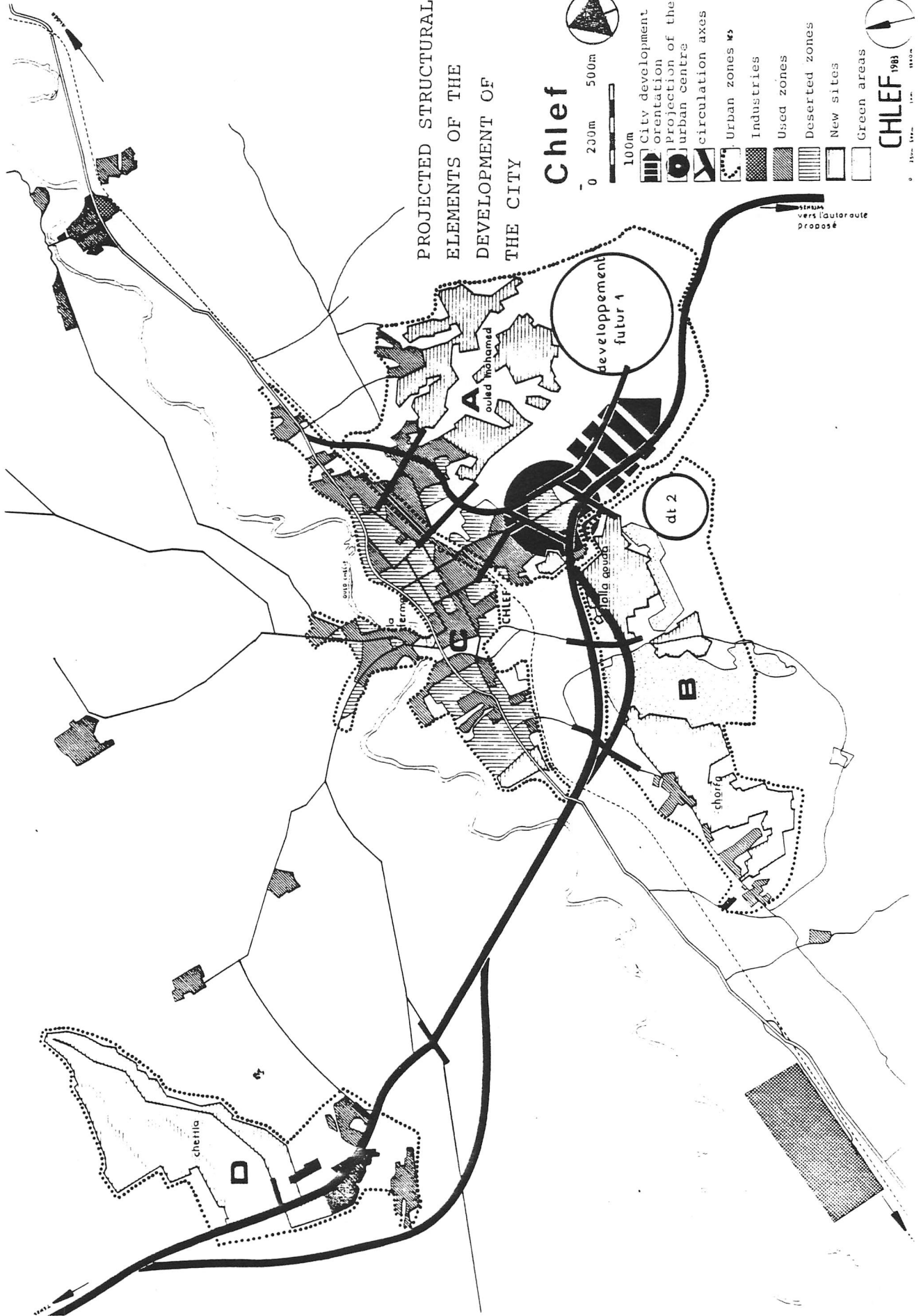
The vehicular circulation system has been designed to maximize accessibility in the occurrence of earthquakes. Thus, the grid system features three-road intersections instead of cross-roads, to minimize traffic congestion at peak volume. The regional bus terminal is located in the heart of the city center to ensure adequate linkages to the regional transportation network.

#### Infrastructure:

**The Road Network:** Roads built to accepted earthquake resistance standards will link the new sites to the new city center, relieving the pressure on the older areas, particularly the denser quarters such as Hay-al-Houriya, and helping to discourage further urban sprawl to the north. A drawback of this scheme, however, is that urbanization of the villages along the highway connecting Ech-Cheliff to the major port of Tenes may be stimulated, causing encroachment on valuable agricultural land.

**Water Supply:** Existing aquifers are estimated to have reserves of approximately 35 million cubic meters per year. Current use is on the order of 31 million cubic meters per year (200 liters per person per day). By the year 2000, the city will have a population of approximately 250,000, implying an annual water consumption of 33 million cubic meters. The total capacity of reservoirs and water towers is 25,400 cubic meters, the equivalent of one day's consumption. Planned projects aim at doubling the storage capacity for safety purposes.

# Chief

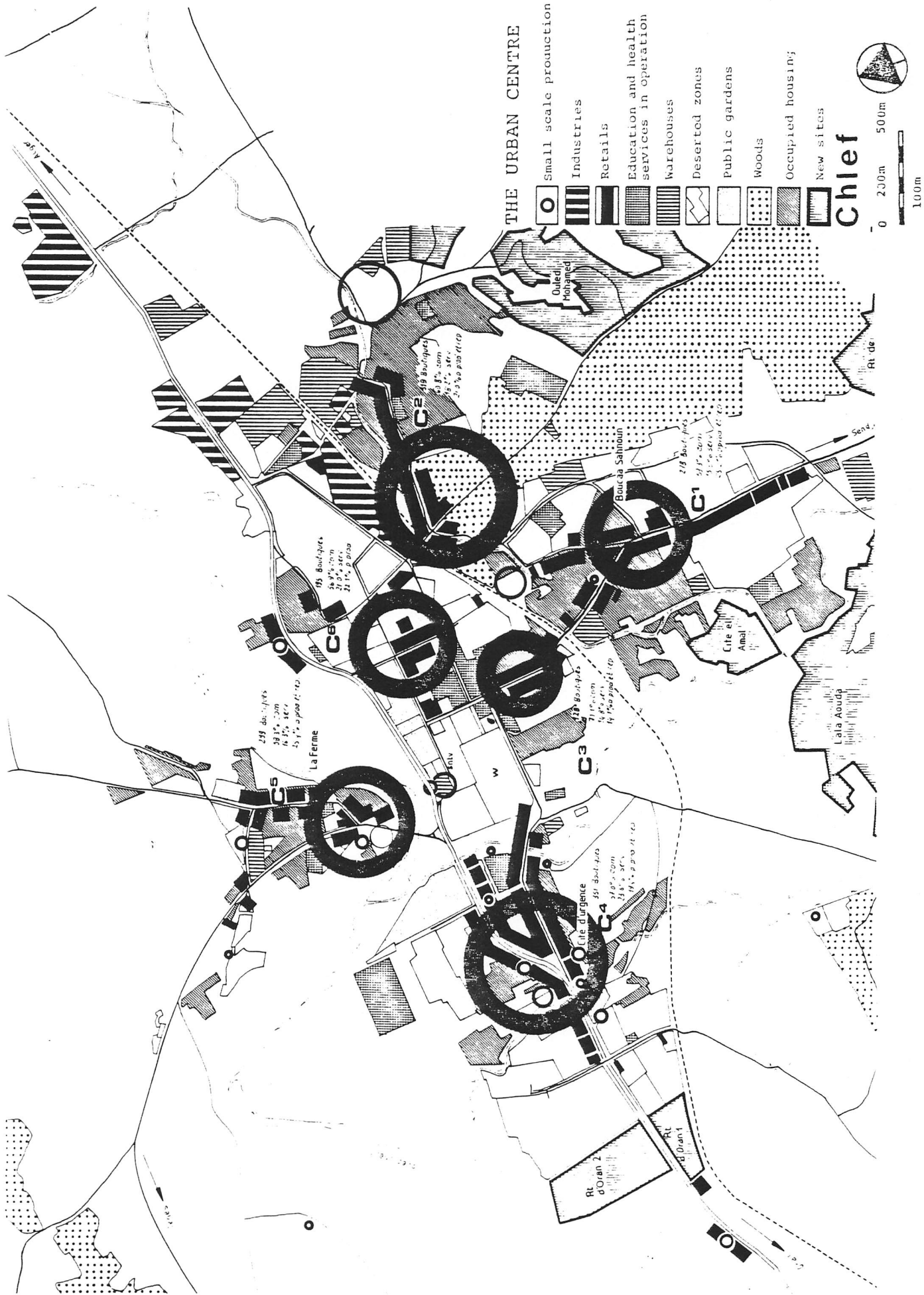


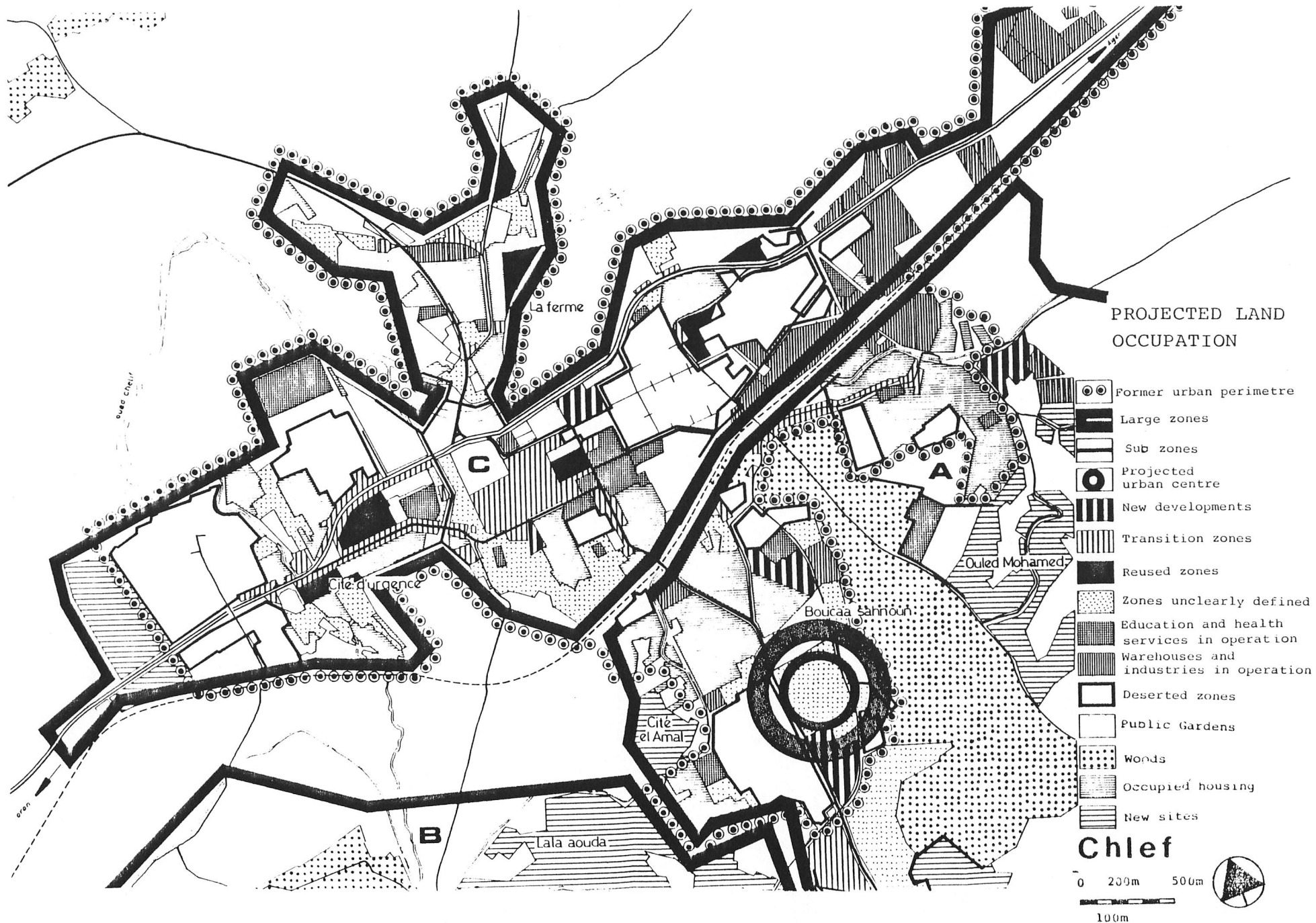
Sewerage: Untreated sewage is dumped into the Wadi Cheliff, polluting the aquifers and occasioning outbreaks of diseases. To treat the effluent, four primary treatment plants are required which, in view of the existing network, are to be located at Chorfa, Lalla Aouda, Ouled Mohammed, and Chettia. The construction of a main collector would reduce the number of treatment facilities required; furthermore, the use of oxidation ponds could lead to important savings in construction and maintenance.

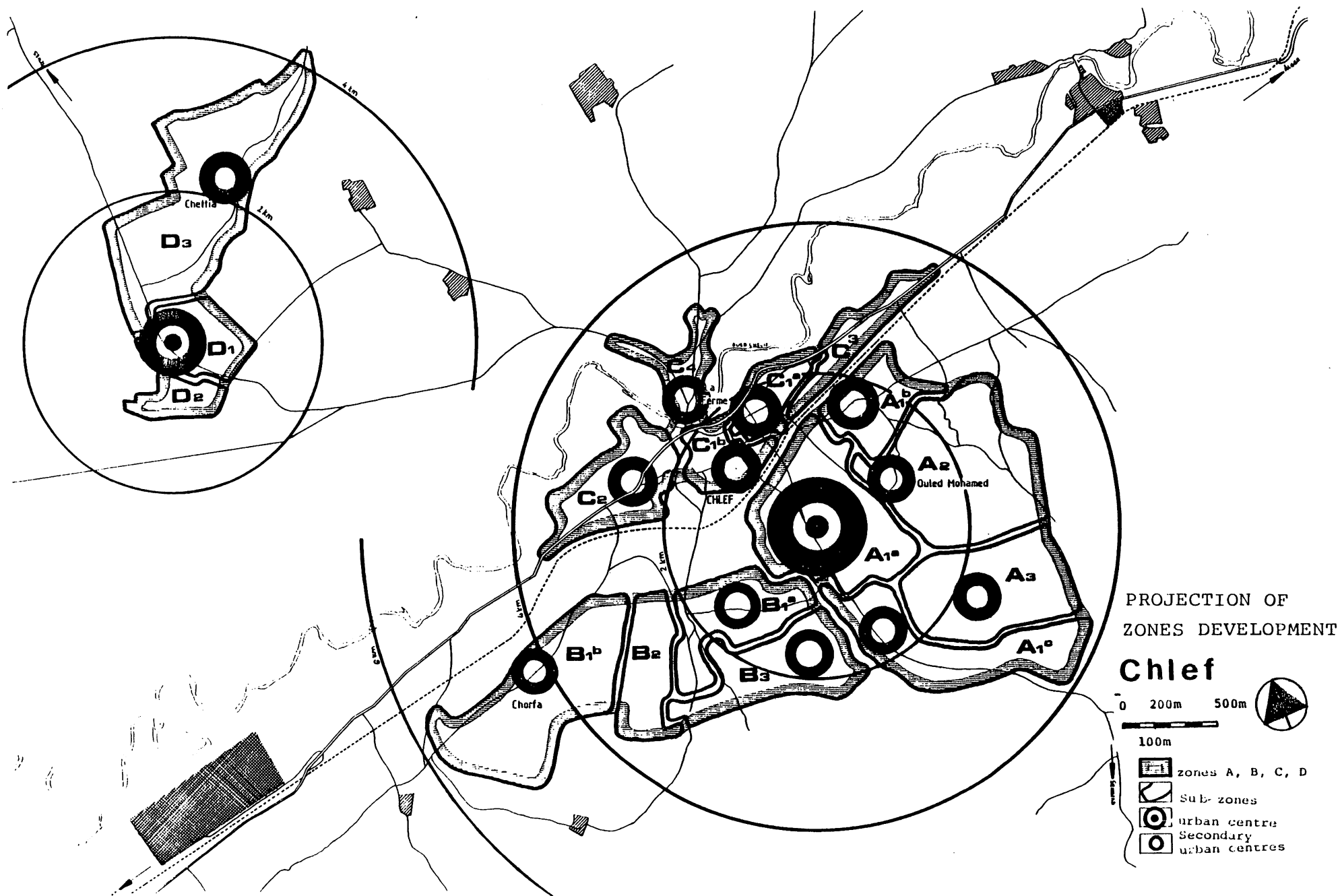
New Housing: The major issue to be addressed concerns the provision for an additional population of 120,000 over a 20-year period. The policy selected combined provision of new housing with rehabilitation of the existing stock. To minimize infrastructure problems, the plan has explored alternative strategies for the densification of the new housing complexes through:

- Vertical and horizontal expansion of the prefabricated dwellings in a manner similar to what residents have already done to adapt the dwellings to their lifestyle and needs.
- Removal of some prefabricated houses and their replacement by denser housing. The prefabricated houses could be reassembled at other locations.

A detailed analysis of different housing designs was undertaken to arrive at solutions well adapted to the harsh climate, and flexible enough to accommodate subsequent incremental expansion, yet structurally resistant to earthquake damage. Eight basic prototypes, each offering six alternative interior layouts, were made available to municipal authorities for the use of private construction. Issuance of building permits to individuals is contingent upon their selecting an approved model. The alternative is to develop detailed plans independently and submit them for approval. The prototypes are one and two story reinforced concrete frame houses. The built up area ranges from 80 to 200 square meters, and ancillary amenities include garages and enclosed private gardens.



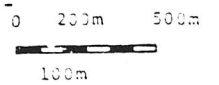




PRINCIPAL URBAN CENTRE:  
STREET NETWORK

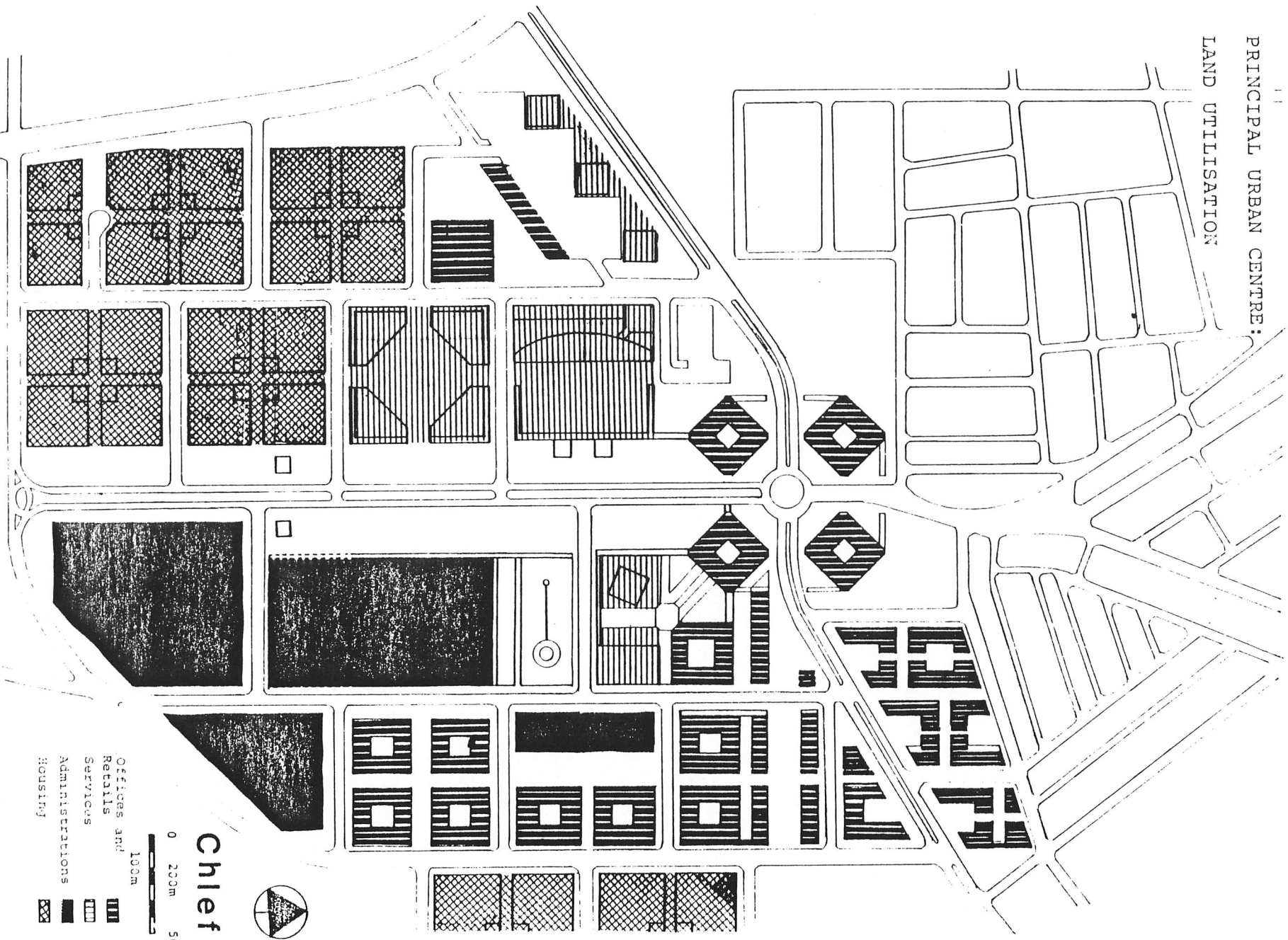


Chlef





PRINCIPAL URBAN CENTRE:  
LAND UTILISATION



Chief

0 250m 500m

100m

- Offices and Retail
- Services
- Administrations
- Housing





PRINCIPAL URBAN CENTRE:

PHASING

