

MUNICIPAL RURAL AFFAIRS,
Ministry of 1978

Southern Region Project Study.
Physical Plan report (of)
Southern Region.

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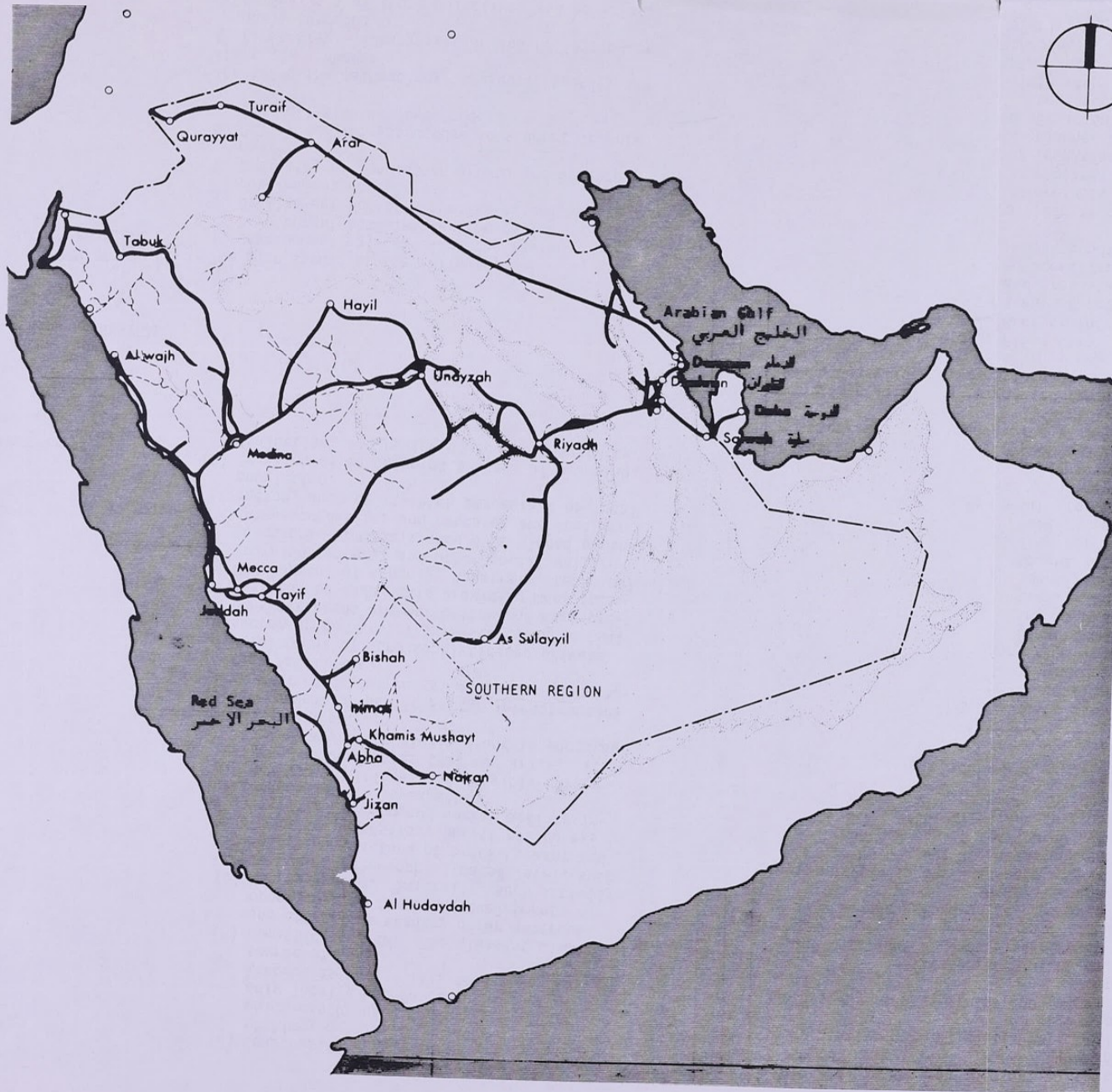


FIGURE 1-1-1
 KINGDOM AND
 SOUTHERN REGION
 PROJECT AREA

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- (a) Construction. The Region has an abundance of lime, gypsum, clay, sand, and stone which can be used for construction not only locally but in other regions of the kingdom as well. This is also a potential source of jobs.
 - (b) Domestic Tourism. The pleasant climate and attractive scenery offer numerous opportunities for such development.
 - (c) Manufacturing. Initially, such activity may be at an unsophisticated level, such as the manufacture of brick, cement and household utensils. But it can be expanded as demand and worker ability increase, which is expected.
 - (d) Seizing additional and possibly unforeseen opportunities that may arise. It is necessary to be flexible and to encourage innovation.
- (4) Development of public sector infrastructure such as roads, airports, and water distribution facilities.
 - (5) Development of more sophisticated private sector or commercial infrastructure so that consumer needs are met better and more profits can be made, this providing more jobs.
 - (6) Development of schools, hospitals, technical training centers, and other social welfare functions. Emphasis should be placed on the unique conditions and needs of the southern region, such as its high percentage of rural population.
 - (7) Creation of an on-going process of planning, evaluation, and review of economic activity.

- of the national development plan by which a regional plan should be defined.
- b. Outline analysis of the regional resource potentials and existing problems and opportunities of the region to synthesize a framework for the development objectives. (It is noted that this is a general and preliminary analysis, and the detailed and specific analysis is done at a later step.)
2. Second step: Creation of the general development location policies for the region through:
 - a. Analysis of subregional characteristics and possibilities for identifying locations appropriate to those types of development listed in step 1. This is to be done on a subregional basis and, as before, is still in general terms.
 - b. Itemization of key policies for each subregion based upon the analysis described in a.
 3. Third step: Determination of development policies and project programs in each of the development categories (i.e., primary, secondary, and tertiary industries), through:
 - a. Identification and evaluation of the existing conditions, problems, and opportunities.
 - b. Identification and evaluation of the development potential.
 - c. Itemization of policies for each development category.
 4. Fourth step: Estimation of future population and employment through:
 - a. Projections based only on the existing population and employment conditions and not reflecting any of the proposals contained within this report.
 - b. Projections reflecting adjustments made in accord with the proposals and policies of this report.
 5. Fifth step: Decisions concerning the development of infrastructure, particularly in the areas of regional transportation, housing, and urban facilities and services, through:
 - a. Identification and evaluation of the existing conditions, problems, and opportunities.
 - b. Identification of national policies and projects which will have an effect on the regional plan.
 - c. Identification of future demand caused by planned and projected development.
 - d. Creation of the policy and plan for the region.
 6. Sixth step: Establishment of the development plan and programs for its accomplishment through:
 - a. Listing of potential development projects

1-2 PROCESS OF THE REGIONAL PHYSICAL PLAN

1-2-1 THE FORM OF THE REGIONAL PHYSICAL PLAN

- The plan specifies the following:
1. Development objectives of the region
 2. Development policies for the region
 3. Development policies for the establishment of development categories
 4. Estimates of population growth and development
 5. Policy for infrastructure to support orderly and well-planned development

- The following methodology is used to specify the items given above:
1. First step: Identification and definition of goals through:
 - a. Analysis of those objectives and policies



DEPUTY MINISTRY FOR TOWN PLANNING AFFAIRS
MINISTRY OF MUNICIPAL AND RURAL AFFAIRS
KINGDOM OF SAUDI ARABIA

SOUTHERN REGION PROJECT STUDY

PHYSICAL PLAN REPORT

SOUTHERN REGION



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1. introduction: the regional physical plan

The concept of the Southern Region has been developed for the purpose of establishing a logical planning area and while an effort has been made to respect the traditional outlines of the provinces and other administrative units, the boundaries do not follow them exactly. The region lies in the southwestern corner of the Arabian peninsula and contains approximately 140,000 km², which is 5.9% of the land area of the Kingdom. It has a population of 1.05 M., or about 27.8% of that of the Kingdom.

The Region is bounded on the north by the mountain of Al Hijaz, on the east by the desert of Najd, on the south by the nation of Yemen, and on the west by the Red Sea. It is known to have been inhabited since prehistoric times, and its accessibility and strategic location have drawn people to it from many parts of Africa and Asia. In many ways, however, it has been more of a corridor or a "Gateway" a place that pilgrims and travelers passed through rather than an area which has been extensively developed on its own merit. Even today, it has no cities of a size or importance to compare with certain others in the kingdom. Similarly, there has been no unifying or centralizing force within the region, so that the figure of 92% of the population being rural or migratory is by far the highest in the kingdom. (The northern region follows with 22%, and in the heavily developed central, eastern and western regions as few as 3% are rural or migratory.

There are no substantial hydrocarbon resources in the southern region, which has had a generally negative impact on its development in recent times. A major issue in planning will be the balancing and countering of this effect, through efforts to establish wage parity for example. However the region possesses nearly half of the kingdom's agricultural workers and 79% of its arable land, so that with a proper development policy, the prospects for growth in agriculture and agro-industry are bright.

In summary, the central features of the southern region are as follows:

1. Predominantly rural, which is significant on the national level, in having the highest percentage of rural and migratory population, and on the regional level by having a generally randomly dispersed development pattern with no major city.

2. Lacking hydrocarbon resources, and suffering at the present time relative to those areas of the kingdom where they exist, not only in having a slower rate of growth but in having its skilled labor siphoned off due to the wage differential.
3. Being outside the major development belt running from Jeddah through Riyadh to Dharan.
4. Having the highest quality land and the best water resources in the kingdom.
5. Having a relatively large percentage of the kingdom's population including a particularly large segment of those skilled in agricultural and related trades.

The National objectives, stated in the five year development plan, that have the greatest significance for the southern region include the following:

1. Use of funds obtained from the sale of hydrocarbon products for re-investment in critical sectors of the kingdom. The most significant is in agriculture so that the dependance on imported foodstuffs can be decreased.
2. Similarly, investment in agro-industry and other sectors which relate directly to food production.
3. Investment in secondary facilities, such as commercial infrastructure and transport facilities so that the agricultural products can be distributed in the most effective manner and the system can be made to be economically profitable and self-supporting.
4. Planning and evaluation on an on-going basis to ensure balanced and comprehensive growth and development. This will assure that economic demands are met as quickly, flexibly, and with as high a quality standard as possible.
5. Development and maintenance as high a standard of living for the people of the kingdom. This element includes the development of jobs, provision of health, education, and other social welfare services, and the creation of opportunities for recreation, domestic tourism, and related amenities.

The particular way that these objectives may be met with regard to the southern region include the following:

1. Development of agricultural potential, which is the greatest of any region in the kingdom.
2. Development of agro-industry, both drawing from and supporting basic agriculture.
3. Development of other appropriate sectors of the economy, among the most obvious examples are:

SOUTHERN REGION PROJECT STUDY

PHYSICAL PLAN REPORT

SOUTHERN REGION

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PREFACE

It is our great honor and pleasure to have had the opportunity to participate in the preparation of the Regional Master Plan for the Southern Region and the Master Plans for the main cities of the Southern Region of the Kingdom of Saudi Arabia.

This report summarizes the results of our study leading to the Physical Master Plan for the Region. During the course of this study, the data that was compiled through the Existing Conditions Study was analyzed and evaluated, producing the basic framework for the plan. The detailed evaluation of the elements for each of the five cities and the village cluster are presented in two separate reports, "Alternative Strategy Study" and "Preliminary Master Plans for the Cities." These, together with the Preliminary Regional Master Plan Study, created a basis for the Ministry's final evaluation of the Plans. Upon receiving the comments and directions from the Ministry, necessary modifications were made and the final plan is concluded here.

1978

Kenzo Tange

Project Principal

ACKNOWLEDGEMENT

In the process of the preparation of this report, valuable assistance has been given to us by numerous governmental organizations and officials. In this regard, we would like to express our particular and sincere gratitude to those listed hereunder for their kind suggestions and guidance on our progress of the study.

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The Minister of Municipal and Rural Affairs

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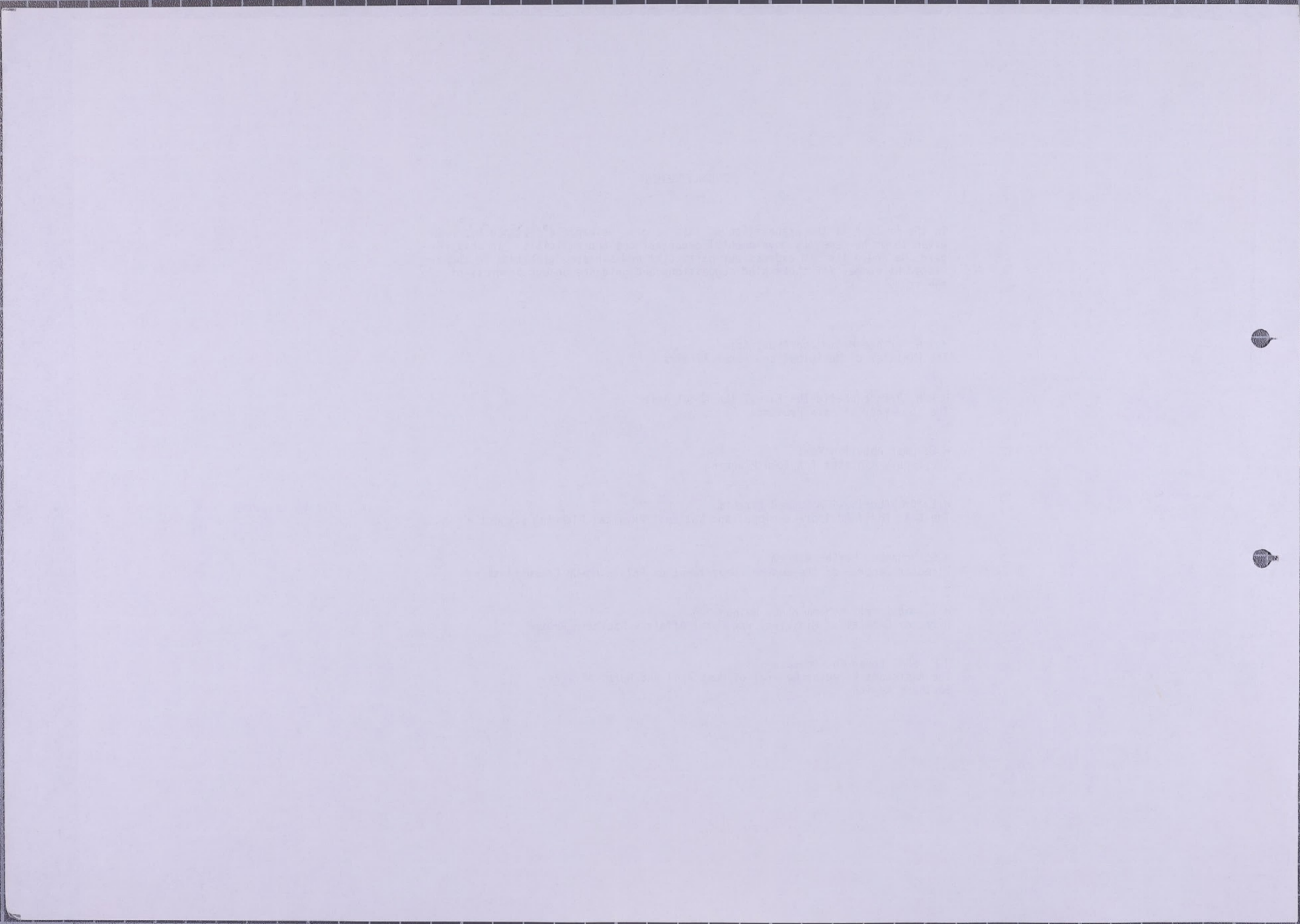
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- and locations based on the policies set during the second and third steps.
- b. Estimation of timing, scheduling, and phasing parameters to establish a base for the implementation program.

7. Seventh step: Determination of policies for the administration, organization, and planning framework for the five major cities and the village cluster through:

- a. Recommendations to the government administration to achieve the implementation of the plan in the most effective and expeditious manner.
- b. Identification of and recommendations for the implementation mechanism via legislation, regulations, and so on.
- c. Restatement of the development objectives, policies, and projects for each of the five cities and village cluster to create an appropriate planning framework for each of them.

The actions proposed in these steps are contained in the following elements of the report:

1. The first step is contained in Chapter 2, "Development Objectives of the Southern Region."
2. The second step is contained in Chapter 3, "Sub-regions and Development Potential"
3. The third step is contained in Chapter 4, "Water Resources and Development Potential," Chapter 5, "Development Policy for Agriculture," Chapter 6, "Development Policy for Livestock Raising and Fishing," Chapter 7, "Development Policy for Industry," and Chapter 8, "Development Policy for Commerce and Service Industry."
4. The fourth step is contained in Chapter 9, "Population Projections and Demography."
5. The fifth step is contained in Chapter 10, "Policy for Manpower and Social Development" and Chapter 11, "Development of Infrastructure."
6. The sixth step is contained in Chapter 12, "Development Plan."
7. The seventh step is contained in Chapter 13, "Development Administration."

1-3 THE ROLE OF THE REGIONAL PHYSICAL PLAN

1-3-1 THE REGIONAL PLAN AS LINKAGE BETWEEN THE NATIONAL PLAN AND CITY PLANS

The regional master plan (not necessarily the "physical" master plan) has a major role as a link between national development and local development. The development framework derives from a balance between national development objectives on the one hand and local opportunities and desires on the other. The regional plan thus serves to communicate national policies to the local areas and to reflect local development preferences back to the larger-scale development policies.

1-3-2 THE REGIONAL "PHYSICAL" MASTER PLAN AS AN INDICATOR OF INTRAREGIONAL DISTRIBUTION OF FACILITIES AND RESOURCES

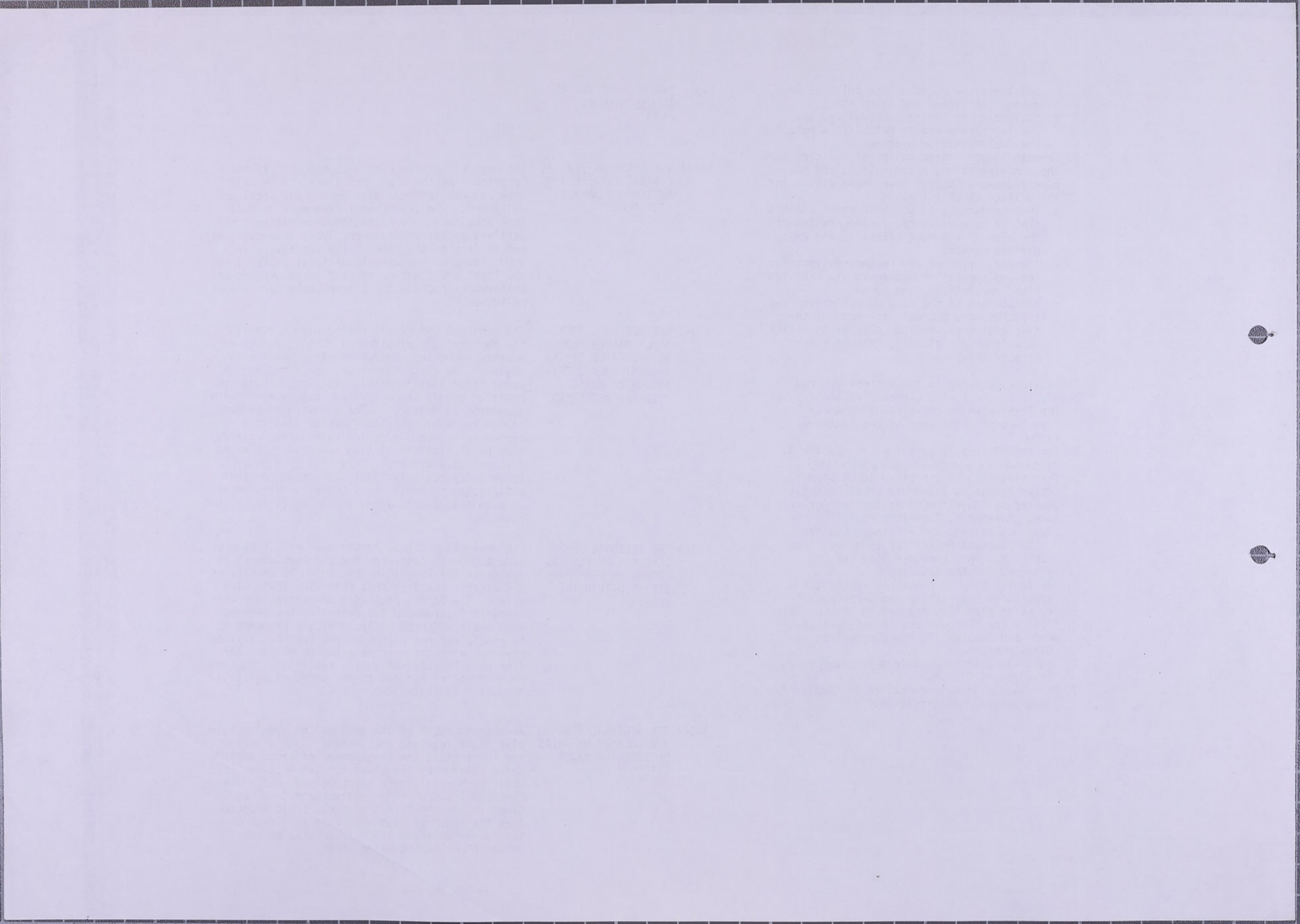
The regional "physical" master plan specifies the physical distribution of facilities and resources among the various locations within the region. The distribution process requires the creation of administrative districts, whose composition should be determined largely by physical geographical features. The anticipated product of the regional "physical" master plan is a series of regional maps indicating the distribution of physical facilities and resources among the various districts. This will provide an opportunity for inter-district comparison that will assist in providing a better understanding of both the districts and the major cities within each one.

1-3-3 THE REGIONAL PHYSICAL MASTER PLAN AS FRAMEWORK FOR MAJOR CITIES WITHIN THE REGION

The regional physical master plan will thus provide a general framework for the development of the major cities within the region by specifying the central features that determine their character. The master plans for the cities are more specific instruments for achieving the development goals. Consequently, they are prepared to be consistent not only with the regional physical plan but with the more detailed objectives for land use, location of public facilities, housing development of various kinds, commercial facilities, and civic centers as well.

1-3-4 THE REGIONAL PLAN AS A REGULATOR OF AREAS OUTSIDE THE MAJOR CITIES

Another function of the regional physical master plan is to regulate and control, both directly and indirectly, the development of areas outside those covered by the plans for the major cities. While such regulations are provided mostly via the establishment of incentives and disincentives rather than overt control, it is expected that the regional plan will have an effect on the non-urban areas as great as that of the master plans on the major cities.



2. development objectives of the southern region

2-1 NATIONAL DEVELOPMENT OBJECTIVES AND THE SOUTHERN REGION

2-1-1 NATIONAL DEVELOPMENT OBJECTIVES AND THE REGIONAL FRAMEWORK

Since a major function of the regional plan is to serve as a link between national and local development, the first step to be taken toward formation of a regional framework should be an assessment of their regional implications. This section outlines the national development objectives and policies as stated in the current five-year national development plan and spotlights their relationship to planning for the southern region.

2-1-2 SUMMARY OF NATIONAL DEVELOPMENT OBJECTIVES

The development goals listed in the current national development plan, as prepared by the Ministry of Planning, are [1] :

1. A high rate of economic growth with progress toward national economic self-sufficiency.
2. Development of human resources.
3. A system of social welfare that ensures social well-being and economic freedom for all citizens.
4. Development of infrastructure.

The key development strategies for the accomplishment of these goals are as follows:

1. Diversification of the economic base with particular emphasis on increasing agricultural and industrial production. Self-sufficiency in these areas is a high priority as a precaution for the time when oil reserves will be depleted and foreign exchange revenue from oil will decline. A further emphasis is on widespread development of the various regions, with attention given to the distinctive physical and human resources of each region.
2. Rapid development of the Kingdom's manpower resources through education, training, and the utilization of certain foreign manpower resources. This development includes:
 - a. Raising the productivity of the labor force by education, training, and the creation of a productive work environment, and
 - b. Shifting manpower out of the labor-intensive agricultural sector to other sectors with a higher level of productivity and income.
3. Social programs which are designed to extend the benefits of national development to all elements of the population in need of them, but without removing the incentives for individual effort and achievement. The ex-

pansion and upgrading of educational and health services, together with the widening of social transfer programs and comprehensive housing programs comprises the central elements of the social development strategy.

4. Nationwide development of the telecommunications and transportation networks; extension of electrification; continued development of the commercial infrastructure.

2-1-3 NATIONAL DEVELOPMENT OBJECTIVES AND THE FRAMEWORK FOR THE SOUTHERN REGION

The plan for the southern region should be based on the following principles, as derived from the aforementioned national goals:

1. The southern region shall undertake its fair share of the effort toward meeting the national goal of diversified economic development by the use of the natural and human resources available in the region. While lacking the hydrocarbon resources found in other parts of the Kingdom, the southern region is relatively well endowed with water resources, favorable climatic conditions, attractive natural areas, good potential for agriculture, manpower, and access to marine resources and water transportation. Therefore, in accord with the national plan, the southern region will concentrate on the development of (a) agriculture, (b) domestic tourism, (c) industry as feasible, and (d) mineral extraction.
2. The southern region shall undertake its fair share of the effort toward meeting the national goal in the area of human resource development by establishing and improving educational and training facilities and by developing those industries in which skills are learned by actual experience. In light of the rural and agricultural nature of the region, the educational and training program should emphasize the following:
 - a. Establishment, improvement, and expansion of technical schools related to livestock raising, fishing, and other elements of agriculture and agro-industry.
 - b. Experimental and test farming activities, with emphasis on practical results, training, and distribution of technology. In addition to these special concerns, it is important that regular educational facilities and institutions be improved to meet the national standard.
3. The southern region shall undertake its fair share of the effort in the area of meeting national social development goals by ensuring an appropriate level of social welfare and well-being in the region. Since the region is characterized by patterns of isolated

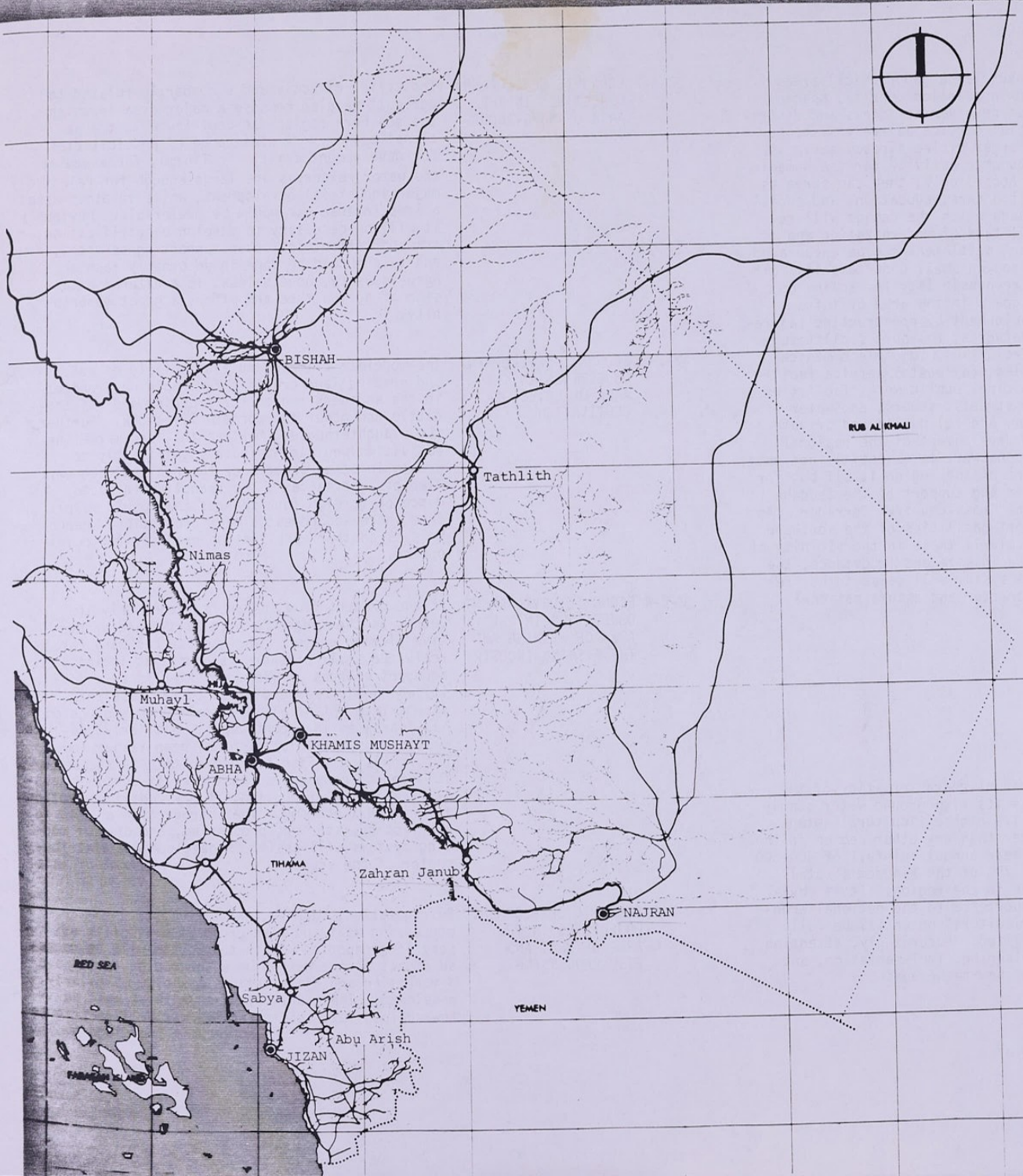


FIGURE 2-1-1
SOUTHERN REGION
GENERAL MAP
scale 1:2,000,000

Bio

settlements over large geographical areas, and thus a low population density, special attention must be given to access and distribution of social service delivery systems. Some of the larger cities already serve as centers of economic activity for the nomadic population. Accordingly, they can serve as bases for health care, education, and social services through which the nomads will receive the advantage of modernization and their permanent settlement may be encouraged.

4. The southern region shall undertake its fair share of the responsibility for achieving the national goals in the area of infrastructure development by constructing (a) regional road networks, (b) port facilities, (c) airport facilities, (d) telecommunications facilities, (e) postal service facilities, (f) municipal public works facilities such as local streets, sewers, and water supply systems, and (g) public and private housing. The development of the regional infrastructure network is essential, not only for improvement of the region itself but for its merger into and support of the Jeddah-Riyadh-Daharan "Cross-Country" Corridor. As the Red Sea port facilities of the southern region, particularly those in the vicinity of Jizan, increase in size and importance, the infrastructure system will cease to be "regional" in character and assume national importance.

2-2 ECONOMIC DEVELOPMENT OBJECTIVES OF THE SOUTHERN REGION

2-2-1 ECONOMIC DEVELOPMENT OBJECTIVES IN THE AREA OF GENERAL IMPORTANCE

One of the predominant characteristics of the southern region is its rich ground water supply and consequently its high agricultural potential; it is greater than any other region in the Kingdom. With a mean annual rainfall of 400-500 mm, approximately 79% of the Kingdom's total cultivated area is in the region. It is obviously of great importance to the national economy that this agricultural potential be fully developed and utilized. Accordingly, attention must be paid to planning, implementation, and the development of new techniques.

2-2-2 ECONOMIC DEVELOPMENT OBJECTIVES IN THE AREA OF AGRO-INDUSTRY

Industries directly and secondarily related to agriculture also compose a major area in which the southern region can contribute to the national economy. A wide range of possibilities for development exist: in Tihama, for example, the water resources are large enough for relatively major industrial development, while in other areas a less intense use would be preferable. Obviously it will be necessary to develop electrification, transportation, and other supporting services, and this should be done in an orderly fashion. Agro-industry, nonetheless, is a natural extension of agriculture and offers a great opportunity.

2-2-3 ECONOMIC DEVELOPMENT OBJECTIVES IN THE AREA OF LIVESTOCK CULTIVATION

The moderate climate and availability of water and grazing land create a favorable environment in the southern region for breeding and raising cattle and other appropriate livestock. Further, the slaughterhouses, meatpacking, and marketing activities would contribute significantly to growth in other sectors of the regional economy. Also of importance is the reduction in dependence on foreign food sources that would result from increased domestic meat production. Hence this is another excellent opportunity for development.

2-2-4 ECONOMIC DEVELOPMENT OBJECTIVES IN THE AREA OF FISHING AND THE FISHING INDUSTRY

At the present time, Jizan is second only to Jeddah as the Kingdom's most active and productive fishing center. The Red Sea has many coral reefs and small offshore islands that indicate abundant sources of fish. Fishing is an activity which has been exploited to far less than its maximum potential level, although production has increased in recent years. Similarly, domestic consumption of fish has been rather low but is rising. Fish has proven to be a successful export, however, so that even if consumption is exceeded by production, it may contribute to the national economy. The introduction of modern fishing, storing, processing, and distributing systems will assist in development of this sector of the economy.

2-2-5 ECONOMIC DEVELOPMENT OBJECTIVES IN THE AREA OF MEAT AND FISH PROCESSING

Refrigeration, canning, and other aspects of processing meat and fish products will be necessary if production within the region is to have an impact on the nation as a whole. Similarly, a marketing and distribution network must be developed. These activities will all contribute toward food self-sufficiency in the Kingdom.

2-2-6 ECONOMIC DEVELOPMENT OBJECTIVES IN THE AREA OF MANUFACTURING AND CONSTRUCTION

Two primary industrial activities lend themselves to development on a large scale. They are: (a) agriculture, and (b) cement and construction material production. Both of these will create demands that can be used to develop secondary industries. Agriculture will require the production of fertilizer, farm implements, and so on, and efforts should be made to develop local sources for them. Plans already call for such sophisticated activities in the Tihama area as salt water desalinization, electricity generation, and modern port facilities; at the same time an effort should be made to construct industrial facilities that will support agricultural activities and utilize their products.

It is anticipated that the current high level of construction activity can be maintained and even accelerated over the coming decade. The Ministry of Planning expects a ten-fold increase in the national consumption of cement within the next five years. The southern region will not be an exception to these figures; and since it has a plentiful supply of clay, lime, gypsum, sand, and stone, it may benefit from the demand for cement. Obviously this will require increased availability of water and electricity. Opportunities exist for the development and expansion of small industries producing concrete blocks, doors, and other items used for construction.

2-2-7 ECONOMIC DEVELOPMENT OBJECTIVES IN THE AREA OF DOMESTIC TOURISM

With a pleasantly cool climate, the beauty of the mountain villages, and the spectacular views of the Asir Range, the highland region of the southern region has a huge potential for tourist and recreational activities. Traditionally these activities have not occurred in the Kingdom on a wide scale, and it is unlikely that there would be a rapid increase in them within the near future. The increasing standard of living may change this, however. It would be possible to begin development on the basis of serving regional recreational needs and make a transition later to the serving of national tourism opportunities. Among the necessary actions are improvement of the transportation system and establishment of quality hotels around Abha; these will obviously assist other sectors of the economy as well.

Several areas within the Asir Region have already been identified for their potential or actual development as tourist centers; these include Sawdaw, Qara-ah, and Mohalah. For different reasons, the Farasan Islands and the Tihama area offer opportunities for tourists

seeking to visit the coast and enjoy water sports. (these possibilities are discussed in detail in section 8.3) It should be remembered, however, that development of such tourist features is as much a national objective as a regional one. These facilities are likely to be visited as much or more by people from outside the southern region as those within it. Further, any policy for domestic tourism should be applied uniformly and fairly to all regions.

2-3 HUMAN RESOURCE DEVELOPMENT OBJECTIVES OF THE SOUTHERN REGION

2-3-1 HUMAN RESOURCE DEVELOPMENT OBJECTIVES IN THE AREA OF BASIC EDUCATION

The recent increases in the per capita gross national product provide an opportunity to continue the long-standing objective of improving the educational system and raising the educational level of the people; this applies to all areas of the Kingdom including the southern region. The level of academic achievement in the past has been quite high - practically the whole world uses "arabic numerals" due to early advances in arithmetic by Arab peoples - but the style of life common in recent years has not required or promoted the use of reading writing, or arithmetic skills. A basic understanding in this area will be necessary for all persons who contribute to and take advantage of modernization.

2-3-2 HUMAN RESOURCE DEVELOPMENT OBJECTIVES IN THE AREA OF TECHNICAL TRAINING

The most effective means of distributing the advantage of the Kingdom's economic activity to all people is to provide training programs for them that will increase their ability to earn, to support their families, and to contribute to society. Much experimentation will be required to develop the most effective means of training; it must consist not only of vocational programs for younger people but also in-service training for experienced workers.

2-3-3 HUMAN RESOURCE DEVELOPMENT OBJECTIVES IN THE AREA OF PROGRAMS FOR NOMADS

It is difficult to provide health, education and other social services to people who range over wide areas in an irregular fashion. It is similarly difficult to make use of their labor resources. An objective in this regard must be to provide a system of encouraging nomads to settle in permanent locations, while respecting their customs and preferences as much as possible.

2-3-4 HUMAN RESOURCE DEVELOPMENT OBJECTIVES IN THE AREA OF ATTRACTING HIGH-SKILL LABOR

Asir, Najran, and Tihana form a "gateway", since they are in the corridor formed by the Red Sea and the Rub Al Khali Desert through which travelers between Saudi Arabia and the adjacent countries to the south must pass. This can be used to advantage due to the number of people who must pass through and the high levels of skill possessed by some of them. Already 12.7% of the urban population of the southern region is of Yemeni nationality. Attracting and using the skills of persons presently living outside the region will accelerate accomplishing other development objectives.

2-4 SOCIAL DEVELOPMENT OBJECTIVES OF THE SOUTHERN REGION

2-4-1 SOCIAL DEVELOPMENT OBJECTIVES IN THE AREA OF NOMAD WELFARE AND SETTLEMENT

By way of the "King Faisal Project," the Kingdom has undertaken to encourage the permanent settlement of nomadic peoples. The southern region has been actively involved in this, since it is near the areas over which the nomads roam and because the agriculture and livestock activities within it are closely related to the nomadic style of living. It is thus a more natural place for their settlement than other regions of the Kingdom might be, and should continue to provide this opportunity.

2-4-2 SOCIAL DEVELOPMENT OBJECTIVES IN THE AREA OF HEALTH, EDUCATION, AND WELFARE

Traditionally health and welfare has been handled by the extended family - tradition places great importance on caring for one's neighbors and relatives. The objective in this instance should be to support the traditional system and to supplement it in areas or functions where it falls short. In particular, a system and to supplement it in areas or functions where it falls short. In particular, a system of training teachers and health professionals should be established, with incentives to go or return to the rural areas where the greatest needs exist.

2-4-3 SOCIAL DEVELOPMENT OBJECTIVES IN THE AREA OF ESTABLISHING A SERVICE DELIVERY SYSTEM

The idea of a service delivery system refers to the establishment of a clearly defined, effective, and uniform mechanism for meeting the needs of the population in such areas as health, education, and other aspects of life. Many elements can be included, depending on the particular situation. In some cases, the needs may be long-term, such as educating children over a period of years. In other cases, they may be short-term and very urgent, such as providing medical assistance to someone injured in an accident or finding a temporary home for a family whose residence was lost in a fire or flood. In some instances, the delivery of such services is not difficult. If someone lives in an urban area, they can probably walk to school, walk or be carried to an infirmary if hurt, or stay with relatives if left homeless. But since 92% of the population of the southern region is rural or nomadic, it is generally a problem to provide modern education, health, and other services to them because they are so far removed from the facilities. It is obviously important that all people be given the right to receive such assistance, but even with a high rate of general development, it will likely be many years before a majority can conveniently be served by a fixed system of service delivery. Consequently, it will be necessary to establish a system of providing these services where the people are. This should be done in a manner that interferes as little as possible with tradition and customs. The system of providing health, educational, and other services must be flexible and mobile, at least until a greater degree of permanent settlement is achieved.

2-5 INFRASTRUCTURE DEVELOPMENT OBJECTIVES OF THE SOUTHERN REGION

2-5-1 INFRASTRUCTURE DEVELOPMENT OBJECTIVES IN THE AREA OF MERGING WITH THE NATIONAL SYSTEM

It must be remembered constantly that the system of infrastructure, particularly transportation and communication, must not only serve the southern region's needs, but fit in with and complement the national system. This is particularly important in light of the aforementioned role of the southern region as "gatekeeper," and its probably future connection with the Jeddah-Riyadh-Daharan "Cross-Country" Corridor.

2-5-2 INFRASTRUCTURE DEVELOPMENT OBJECTIVES IN THE AREA OF PORT FACILITIES

As the Kingdom's commercial transactions with other nations increase, the role of the Red Sea ports, particularly those around Jizan, will increase correspondingly. The facilities there

are presently overcrowded and backlogged, and expansion and improvement of them is a high priority in supporting both regional and national goals.

2-5-3 INFRASTRUCTURE DEVELOPMENT OBJECTIVES FOR CITIES AND VILLAGES IN THE REGION

It is clear that existing urban areas will be expanding rapidly, both in response to economic conditions and in accord with national and regional plans and objectives. It is important that this growth occur in an orderly and planned manner. Much attention must be paid to the proper implementation of the plans for the cities.

2-5-4 INFRASTRUCTURE DEVELOPMENT OBJECTIVES IN THE BROADER AREA OF URBAN DEVELOPMENT

At present there are no cities in the southern region larger than about 50,000 inhabitants, and they are scattered in a largely random manner. There are thus many problems in providing administration, delivery of social services, and so on. A system of grouping cities and villages in a useful and meaningful way must be established, and networks for the efficient and effective provision of governmental services must be developed. This is one of the most important functions of the regional plan. (Further discussion refer to Chapter 11-3)

CHAPTER 2 : NOTES

1. Ministry of Planning, Second Development Plan, 1395-1400 A.H., Section I.

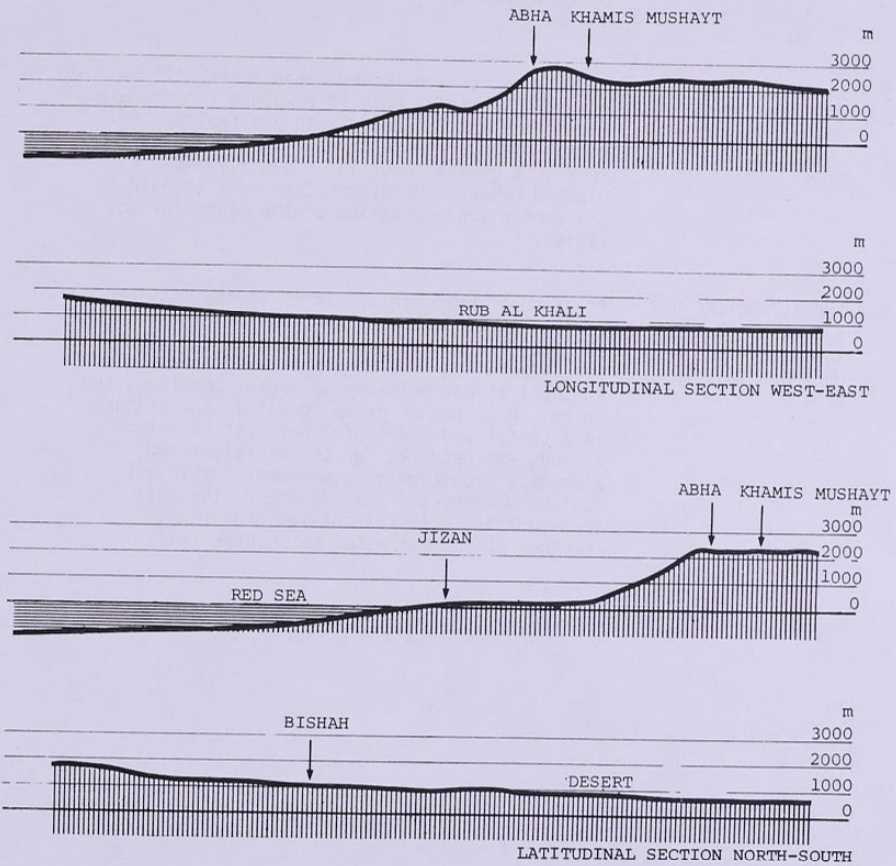
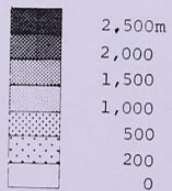
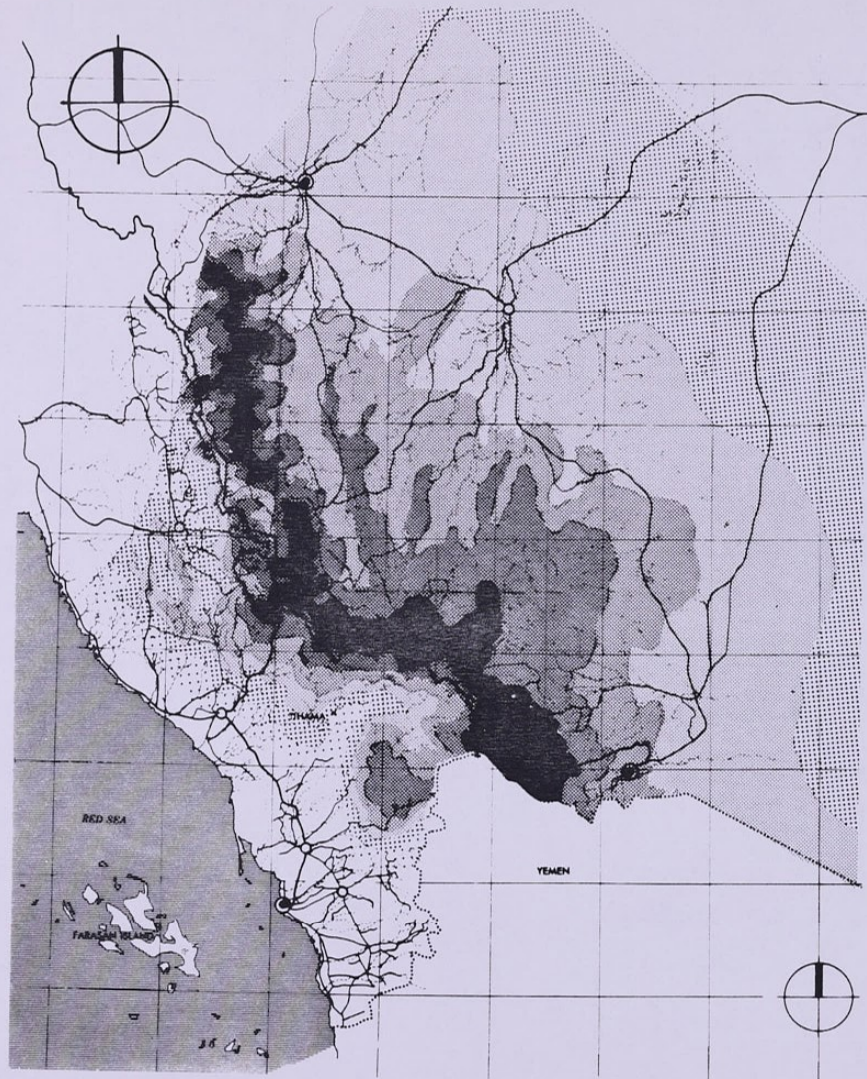


FIGURE 2-1-2
SOUTHERN REGION
CONTOUR MAP

scale 1:2,500,000

3. sub-regions and development potential

3-1 SUB-REGIONS AND RESOURCES

3-1-1 SUB-REGIONS

The southern region covers an area of about 140,000 km² within which topographical, hydrological, and climatological conditions vary widely. Social and cultural distinctions exist as well. It is thus necessary to divide the region into sub-regions based upon the presence of certain common characteristics. Four sub-regions have been outlined:

1. Asir sub-region
2. Wadi Quadrangle sub-region
3. Najran sub-region
4. Tihama sub-region

Sub-regional boundaries are initially defined by meteorological conditions and result in a division of the region into three ranges, the Asir, Tihama, and Wadi Rectangle ranges. The second step was an adjustment of the boundaries to correspond as closely as possible with administrative and tribal boundaries; obviously it is desirable to maintain villages with strong relationships and mutual interests in the same sub-region rather than separate them into different sub-regions. Boundary lines were also adjusted to correspond with Wadi basins, watersheds, and other topographical features; this was not difficult since they are inherently related to the meteorological conditions that established the initial lines.

Figures 3-1-1 through 3-1-4 indicate the basic characteristics of the region which determine the sub-regional boundaries. Figure 3-1-5 indicates the actual lines.

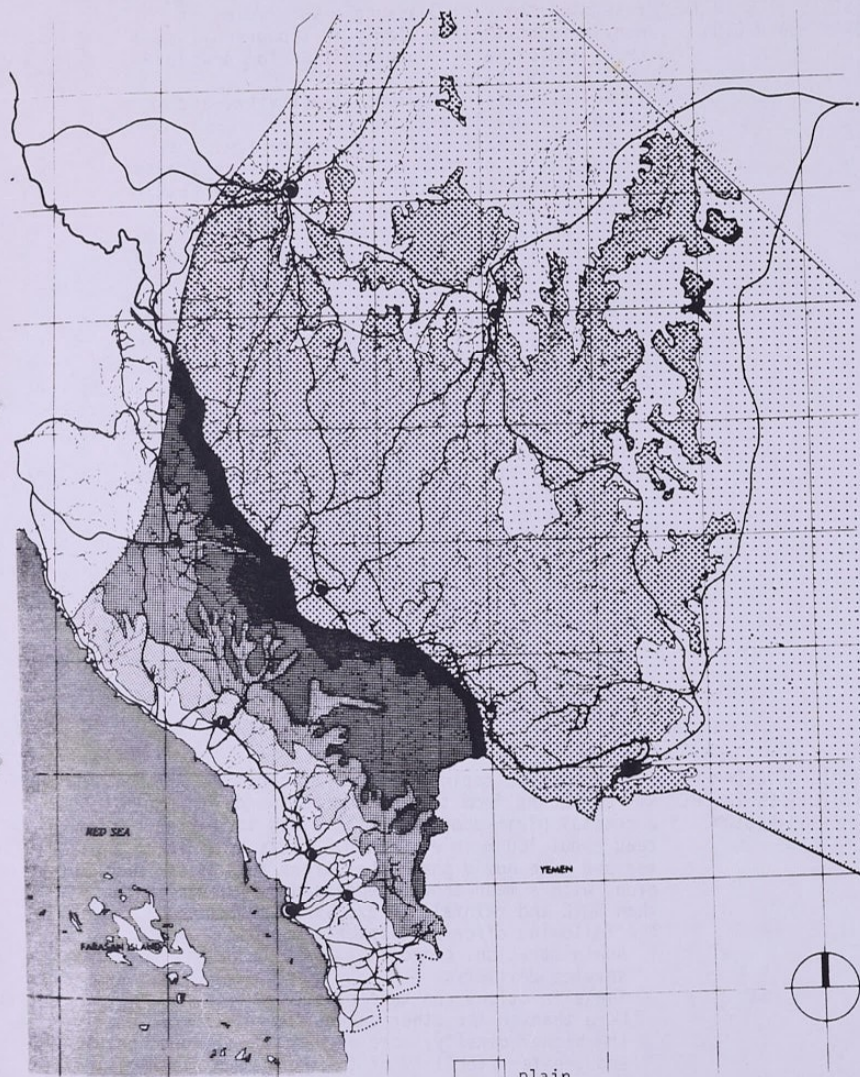
3-2 ECONOMIC DEVELOPMENT POSSIBILITIES

3-2-1 ECONOMIC DEVELOPMENT POSSIBILITIES IN THE ASIR SUB-REGION

The Asir sub-region contains approximately 20,000 km². It is relatively cool and pleasant with an annual mean temperature of 16.8°C and a mean rainfall of 200 mm, and up to nearly 600 mm in some areas of the sub-region. The topography is rugged and reaches an elevation of

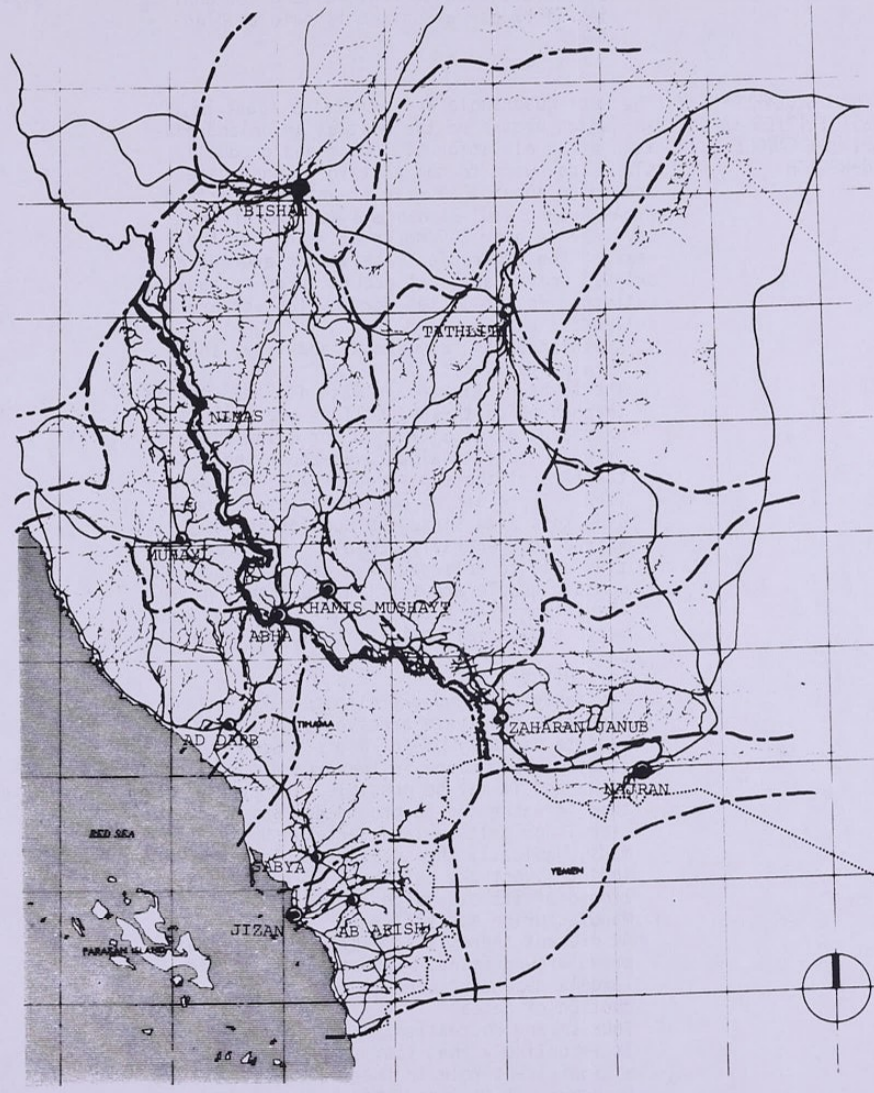
3000 m. This is the most heavily forested sub-region in the entire nation. These conditions indicate that the following areas offer good possibilities for economic development:

1. Administration, commercial activity, and service delivery:
The Asir sub-region is located at the center of the southern region. It contains the cities of Abha and Khamis-Mushayt, which are already relatively large and rapidly growing. It is likely that they will continue their pre-eminence in the sub-region and are thus logical centers for governmental administration, a wide variety of both local and regional commercial activity, delivery of social services such as health, education, and welfare, and other urban activities. Attention must be paid to the implementation of the plans for these cities to ensure that the continued growth and expansion will take place in an orderly fashion.
2. Production of high-value agricultural products:
The favorable conditions in the Asir sub-region should be exploited by engaging in high-intensity agricultural activity. Dairy farming and labor-intensive horticulture are the types of uses best able to take advantage of the climatological conditions, the relatively small fields, and the availability of labor. They are most likely to produce the greatest return and will assist in meeting the needs of the population centers nearby. Attention must be paid to preparing for this type of agricultural activity, particularly in the provision of water. It may also be possible to make commercial use of the forests.
3. Manufacturing activities:
The rapid growth now taking place in the region, and likely to continue, provides an opportunity for developing a building materials industry. Raw materials are available for the manufacturing of concrete blocks, doors, and other construction items.
4. Tourism and recreation:
The attractiveness of the region offers an opportunity for providing tourist and recreational services to meet the needs of both the region and the entire Kingdom. The climate and the spectacular scenery are among the best in the nation. Although transportation difficulties and a lack of hotels and similar facilities have restricted the opportunities for tourism thus far, these conditions are changing for the better. It will be possible to develop certain types of facilities initially for local use, with a



- plain
- coastal plain
- foothill
- escarp slopes
- mountains
- plateau
- desert

FIGURE 3-1-1
TOPOGRAPHICAL
FEATURES
scale 1:2,500,000



wadi basin
FIGURE 3-1-2
WADI BASIN
scale 1:2,500,000

later transition to regional and national use, if proper attention is paid to planning.

3-2-2 ECONOMIC DEVELOPMENT POSSIBILITIES IN THE WADI QUADRANGLE SUB-REGION

The Wadi Quadrangle area contains about 85,000 km² which begins on the west as an upland plateau at an elevation of 1500 m and gradually slopes downward to the east to a sandy desert averaging about 1000 m in elevation. Certain areas around Wadi Bishah and Wadi Tathlith may receive over 200 mm/yr of rain, but the rest of the sub-region receives an average of only 70 mm/yr, and that occurs in an irregular pattern. Possibilities for development are as follows:

1. Administration, commercial activity, and service delivery:
The towns of Bishah and Tathlith are centers through which these functions are now being provided, particularly so for Bisha since it is on a traditional caravan route and since the airport there has recently been modernized. There are no major settlements outside this area since the population is sparse and generally nomadic. These activities will be enlarged on a gradual basis as nomadic people are settled and make the transition from a traditional system of commerce and social activity to a more modern one.
2. Agriculture:
The sandy soil and dry climate make it difficult to cultivate areas outside the immediate vicinity of the Wadis. Some date growing takes place in the area around Bisha and it may be possible to increase this if water can be provided. Some traditional agriculture is undertaken by the nomads, basically the subsistence level raising of livestock, but there is little likelihood of its expansion.
3. Manufacturing activities:
At present there is some processing of dates grown around Bisha. Expansion of this is largely dependent upon increasing the production of dates.
4. Tourism and recreation:
It is unlikely that tourism will ever play a significant role in the sub-region's economy. It is important, however, that as the nomadic people are gradually settled, they be provided with attractions and amenities to assist in their adoption of the new way of living. Sports and recreation opportunities may assist in this.

3-2-3 ECONOMIC DEVELOPMENT POSSIBILITIES IN THE NAJRAN SUB-REGION

This sub-region contains about 15,000 km² and resembles the Wadi Quadrangle sub-region in many respects, particularly in topography, soil type, and climate. Opportunities for development are as follows:

1. Administration, commercial activity, and service delivery:
As in the Wadi Quadrangle sub-region, the population of this sub-region is very sparse and generally nomadic. There are few settlements other than Najran and its vicinity. The degree of activity here is likely to increase as more of the people are permanently settled and provided with services.
2. Agriculture:
The agriculture now in existence is largely of a traditional kind. No change is expected in the foreseeable future.
3. Manufacturing activities:
Some manufacturing of building materials in a traditional system takes place and may be enlarged to meet construction needs. It is possible that a market for such materials may be developed in Yemen which is adjacent to the region and 10 km from the town of Najran.
4. Tourism and recreation:
Local recreational facilities would assist in the settlement of nomads, as discussed for the Wadi Quadrangle sub-region. Another opportunity is for relatively low-level hostels and similar services for pilgrims making the trip from Yemen and other nations to the south to Mecca and Medina. Large-scale tourism appears unlikely.

3-2-4 ECONOMIC DEVELOPMENT POSSIBILITIES IN THE TIHAMA SUB-REGION

The Tihama sub-region consists of about 20,000 km² extending from the Red Sea eastward through a coastal plain about 30 km in width to a plateau about 100 m in elevation. It is both hotter and more humid than other areas in the region, with a mean annual temperature of more than 30°C and rainfall in excess of 500 mm. The following offer development possibilities:

1. Administration, commercial activity, and service delivery:
These functions can take place more easily here than in the other sub-regions because of the higher density, more even distribution, and greater stability of the population. The road system is more highly developed, and there are port and airport facilities at Jizan, all of which assist in this function.
2. Agriculture:
Tihama is presently the most advanced sub-region in this function, with more agricultural activity taking place and the greatest opportunities for advancement into large-

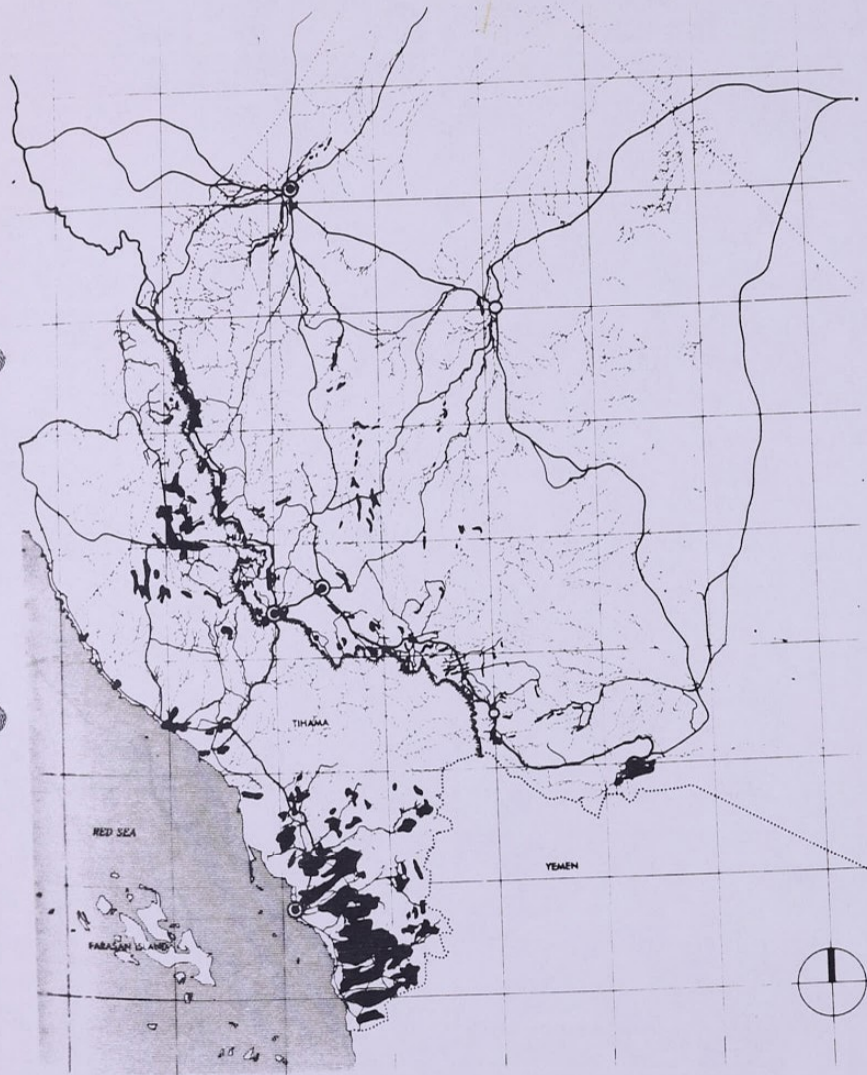
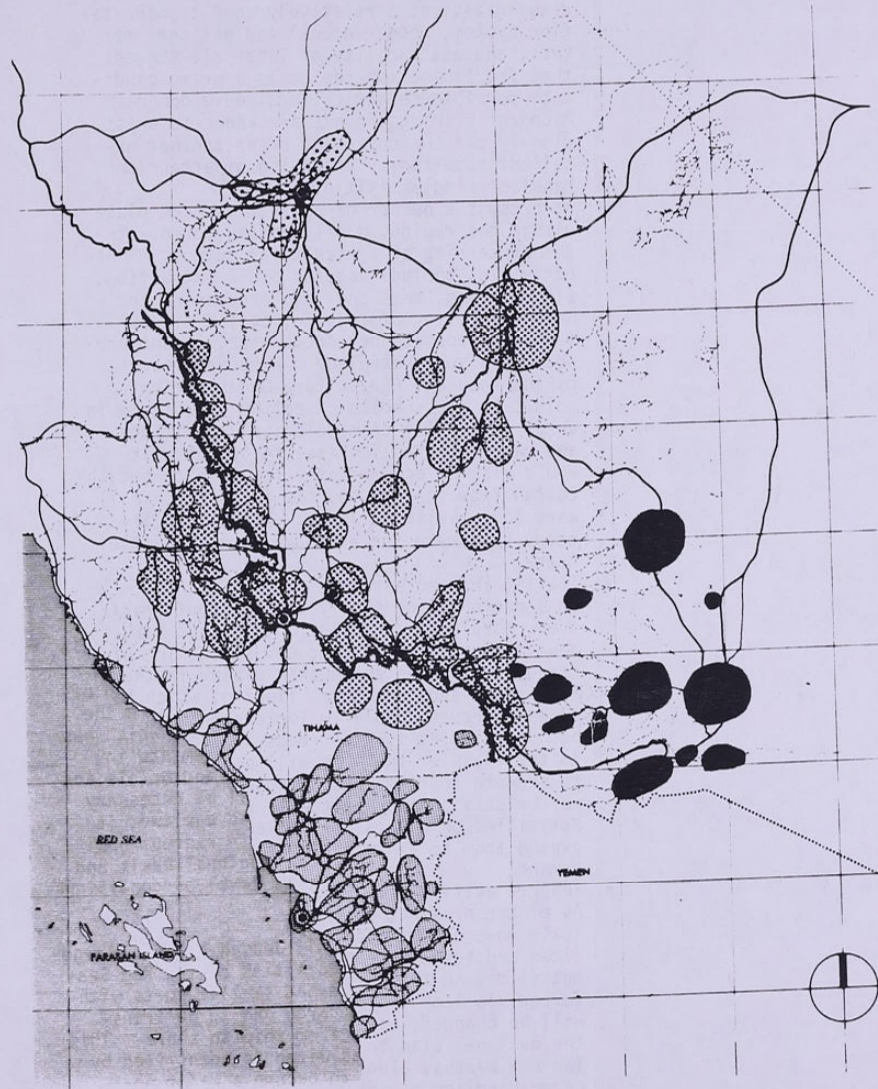


FIGURE 3-1-3
CULTIVATED LAND
scale 1:2,500,00







-  asir admi.
-  jizan admi.
-  najran admi.
-  bishah admi.

FIGURE 3-1-4
VILLAGE DISTRIBUTION
BY ADMINISTRATIVE
ORGANIZATION
scale 1:2,500,00

scale production. The possibility of large volumes of water being made available through desalinization, a relatively good transportation system, good regional and national markets, and availability of labor all suggest that the Tihama sub-region is a prime candidate for intense agricultural development. Abundant fishing grounds are known to exist closely off the coast and offer another excellent opportunity deserving of attention.

3. Manufacturing activities:

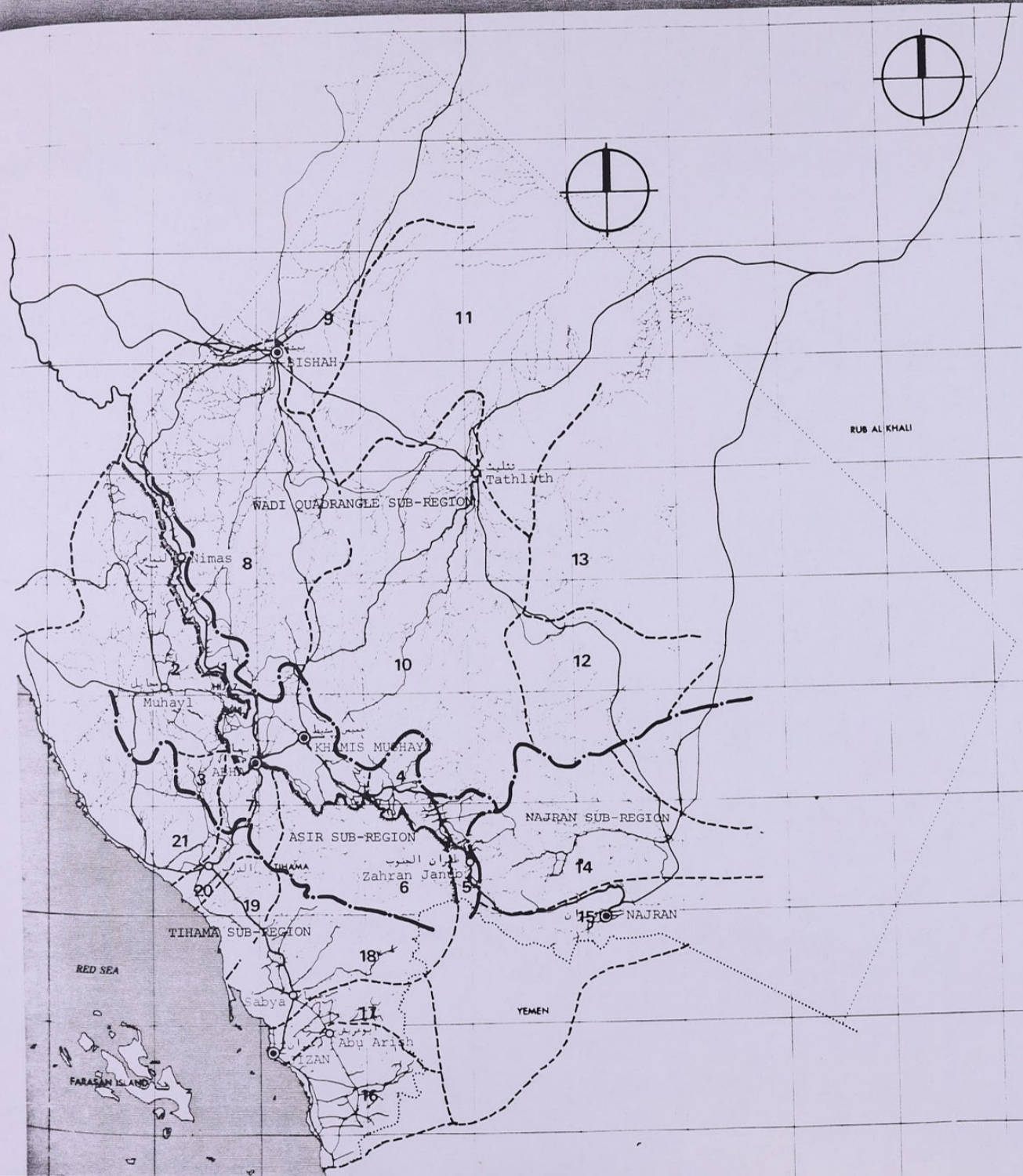
At present a number of activities take place within the region, mostly having to do with the processing of agricultural output. These activities include vegetable oil extraction, slaughtering, meat and fish processing and packing, cotton processing, cotton oil extraction, and leather production; cement production also takes place. A recent report by the Food and Agriculture Organization points to the success of cotton production in areas of similar climatological conditions and recommends an increase in output. It would also be economically feasible to obtain cotton from foreign sources if a cotton mill were to be built in Jizan. Plans have already been made for expanded port facilities there.

4. Tourism and recreation:

In a nation as generally dry as Saudi Arabia, there should be a considerable market for aquatic sports. Swimming and sunbathing offer opportunities as do skin diving in the Farasan Islands and shark fishing, which has already proven popular. Improvements in both facilities such as roads and hotels and in the image of the area will be necessary to promote tourism. As noted earlier, it may be possible to begin with recreational activities on a local or regional basis and expand them to a national level as conditions demand.

5. Seaport activities:

As of the present, only Jeddah has had large-scale modern port facilities on the Red Sea; Jizan and Yanbu have had smaller ports without slips, so that cargo had to be transferred via lighter from ship to shore. This will be changed, as Jizan is identified by the national plan to become a major port. Two new berths, along with sea walls and cargo-handling equipment, are to be built; dredging equipment will be included. With the completion of the coastal highway and connecting roads, Jizan will serve as a national rather than regional port facility.



ASIR SUB-REGION

1. WADI BISHAH I (upper)
2. WADI HALI (upper)
3. WADI JANDALAH (upper)
4. WADI TATHLITH I (upper)
5. WADI HABAWNAH (upper)
6. WADI BAYSH, SABYA (upper)
7. WADI ITWAD (upper)

WADI QUADRANGLE SUB-REGION

8. WADI BISHAH I (middle)
9. WADI BISHAH II
10. WADI TATHLITH I
11. WADI TATHLITH II
12. WADI IDIMAH
13. no major wadis

NAJRAN SUB-REGION

14. WADI HABAWNAH
15. WADI NAJRAN

TIHAMA SUB-REGION

16. WADI LIYYAH, KHULAB, AMULAH
17. WADI JIZAN
18. WADI BAYSH, SABYA
19. WADI AS SIRR, SAMLAH, BAYD
20. WADI ITWAD
21. WADI JANDALAH

--- sub-region
 - - - wadi basin

FIGURE 3-1-5
 SUB-REGION

scale 1:2,000,000



4. water resources and development potential

4-1 WATER RESOURCES AND THE PLANNING FRAMEWORK

4-1-1 EXISTING CONDITIONS AND OPPORTUNITIES

The southern region has the largest ground water resources in the country, with an annual mean rainfall exceeding 500 mm in some areas. The total runoff is estimated to be in excess of a billion m^3 per year. Also usable is water in aquifers, rainfall to support nonirrigated farming and agricultural activities, and return flow. The total volume of water thus obtainable amounts to 2.0 billion m^3 /yr. This amount is equal to about 50% of the 1980 target of 4.0 billion m^3 /yr as stated in the current five-year national plan. It is equal to 80% of the estimated 1980 level of consumption of 2.46 billion m^3 /yr, and to just over ten times the predicted 1980 national total for desalinated water, which is 150 million m^3 /yr. Of the 2.0 billion m^3 /yr now available, only about 0.5 billion m^3 /yr are actually consumed, largely for agricultural and domestic purposes. Of the four sub-regions, Tihama has the greatest potential for water production, followed by Asir. The Wadi Quadrangle and Najran sub-regions have limited capacity for water production.

4-1-2 NATIONAL WATER POLICY AND ITS IMPLICATIONS FOR THE SOUTHERN REGION

The key national policies for water resource development, as specified by the current national development plan, are as follows:

1. Continue to develop ground water supplies to meet immediate demands in locations distant from the coast.
2. Accelerate development of seawater desalination systems to meet the demands of industrial and urban areas near the coast.
3. Establish a policy of allowing industrial activities with a high level of water consumption to be located only near the coast.
4. Limit the increase in the use of water for agricultural purposes unless it is for a use proven to be in the best long-term public interest.

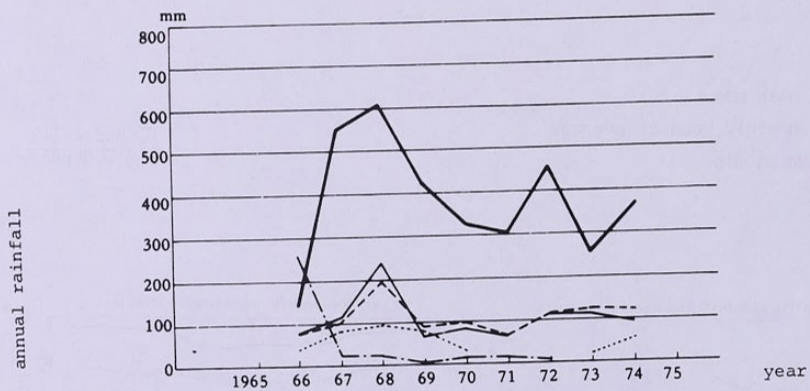
Among others, the following are implications of the national water policy.

1. Underlying the policy are the following concepts:
 - a. Awareness of the limited supply of ground water in the nation and the small likelihood of its availability ever being increased.
 - b. Awareness of the nation's deep need for water to meet a wide range of human,

- c. Confidence in the nation's financial capacity and a desire to optimize the use of these resources.
- d. Access to a practically unlimited supply of saline seawater.
- e. Therefore, a commitment to undertake a huge program of desalination to meet water needs.

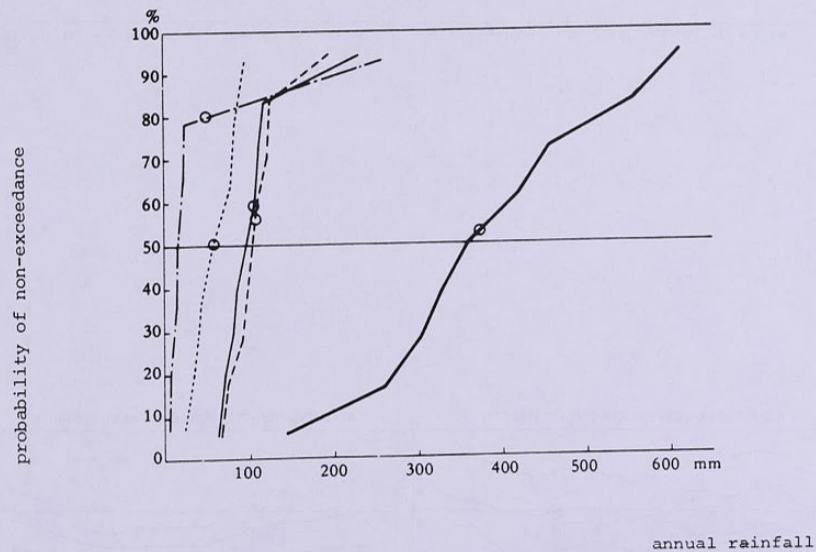
The projected 1980 supply of desalinated water is 150 million m^3 /yr, which amounts to only 6% of the projected 1980 demand of 2.46 billion m^3 /yr. Further, this projection is predicated upon a 360% expansion of output capacity between 1975 and 1980. Nonetheless, there is a strong commitment to the desalination project and confidence that within a few years it will be the major provider of water to the nation. This makes for a very promising future for the Red Sea coast, the southern region, and the Tihama sub-region in particular. Already favored with many natural resources, it will now be placed in a situation to accelerate its agricultural, industrial, and social development. The improved transportation facilities, such as the new Jizan seaport and the coastal highway connecting the area with the northerly part of the Kingdom, all contribute to a very favorable set of conditions.

2. Similarly, the planned desalination plant for the Farasan Islands (455 m^3 /day capacity in the first phase) provides an excellent opportunity for development.
3. In the Asir sub-region, there are some constraints. While it is estimated that there is 400 million m^3 /yr of ground water theoretically available, in reality only about 200 million m^3 /yr could actually be obtained, and this only with extensive water harvesting. Since approximately 100 million m^3 /yr is now being consumed, the potential for the immediate future is limited to no more than another 100 million m^3 /yr. And for the present time, the national water policy does not call for the extensive piping of water inland, especially not via the expensive process of pumping it up to the higher elevations as would be the case for Abha and Khamis-Mushayt. Careful planning must therefore be undertaken to ensure the most appropriate and effective distribution of the available water resources. Particular attention must be paid to the allocation between urban and rural-agricultural uses.
4. A natural consequence of the desalination program will be a shifting of the center of



\bar{X} Arithmetic mean of annual rainfall for recording periods shown in the graph below

- ABHA $\bar{X}=382.1$ mm
- - - JIZAN $\bar{X}= 49.3$
- BISHAH $\bar{X}=107.5$
- - - AL HEIFA $\bar{X}=109.4$
- NAJRAN $\bar{X}= 58.4$



- ABHA
- - - JIZAN
- BISHAH
- - - AL HEIFA
- NAJRAN
- arithmetic mean

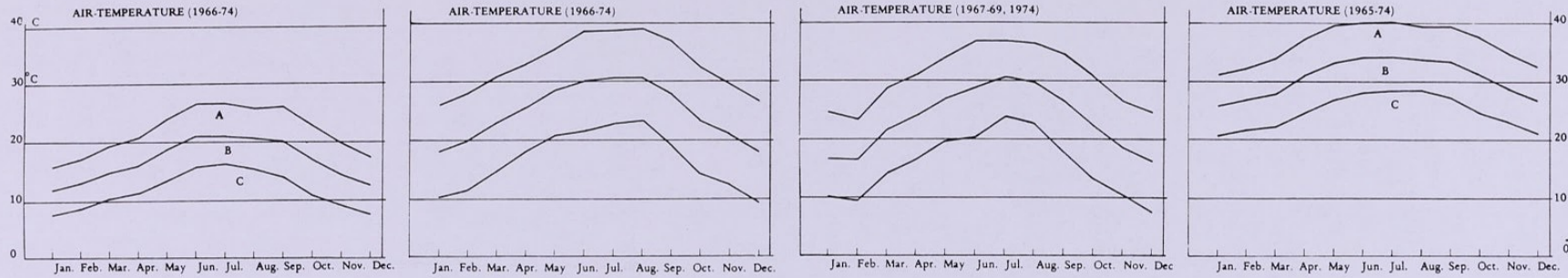
FIGURE 4-1-1
FREQUENCY OF ANNUAL RAIN

Asir Sub-Region
(ABHA)

Wadi Quadrangle Sub-Region
(BISHAH)

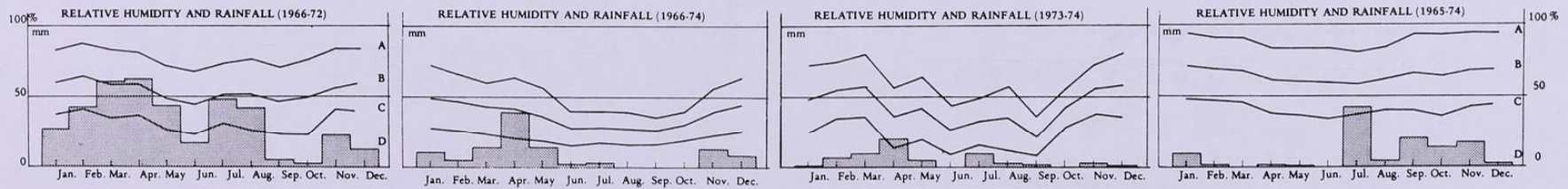
Najran Sub-Region
(NAJRAN)

Tihama Sub-Region
(SABYA)



A: mean max.
B: monthly mean of average
C: mean min.

FIGURE 4-1-2
AIR TEMPERATURE



A: mean max.
B: monthly mean of average
C: mean min.
D: average of monthly rainfall

FIGURE 4-1-3
RELATIVE HUMIDITY

gravity of regional development away from the traditional trade, oasis, agricultural, and caravan-oriented cities in the interior toward the coast. Settlements in the Asir, Wadi Quadrangle, and Najran sub-regions will reflect this and gradually lose their relative importance to cities in the Tihama sub-region. The regional plan and other planning activities must take this into account.

4-2 WATER RESOURCES

Existing water resources in the region at the present time (except seawater) consist of the following.

1. Rainfall is precipitation which fall directly on a given area and which is used primarily for the watering of crops. The mean annual rainfall may or may not be sufficient to support agricultural activities in a given area without other irrigation, since it is necessary not only to have an adequate overall supply, but also to have it on a fairly regular and dependable basis. Certain crops can be grown with as little as 300 mm/yr of rain; however the rainfall may vary widely from the mean figures, and sometimes may occur in a single major downpour once a year.
2. Runoff is rainwater which flows across the soil into Wadi basins. With such techniques as damming the basins, a fairly substantial supply may be obtained, at least during parts of the year. The dry, sandy soil that predominates in much of the region absorbs a large percentage of the water, however. The runoff coefficient is an indicator of how much of the water that falls on the ground actually flows into the Wadi basins, and may be as small as 1%.
3. Aquifers are subterranean pockets of trapped water. Extensive sheets of impervious rock prevent the water from flowing away, and the fact that these pockets are beneath the surface helps to prevent extensive evaporation. Springs and oases exist where aquifers are tapped or flow naturally to the surface.

Wadis and aquifers, properly utilized, can provide extensive water supplies. It must be remembered, however, that these supplies are not unlimited. While they may hold water for lengthy periods of time, they are ultimately dependent upon being recharged by rain or other means.

4-3 STRATEGY FOR WATER RESOURCE PLANNING

4-3-1 PROJECTIONS

Table 4-2-1 (a) indicates the mean annual water supply available to each of the sub-regions from runoff.

Table 4-2-1 (b) indicates the availability of runoff and recharge.

Table 4-2-1 (c) indicates the total expected mean annual water resources for the sub-regions and the region.

It is an essential first step to project the amount of water that can be made available to the sub-regions from existing sources under specified conditions. Since the national policy for the present time does not call for the piping of water away from coastal regions, the interior sub-regions will continue to rely on their own sources of water for the indefinite future. Table 4-3-1 indicates these projections.

4-3-2 AREAS OF NEED

Obviously water is a resource needed by activities in all sectors and levels of the Kingdom's economy, from the most basic, low-intensity, rural agricultural endeavors to the most sophisticated industrial activities. The previously discussed advantages possessed by the southern region with regard to agricultural opportunities suggest that the heaviest future demand here is likely to be in this area. Eventually up to 90% of the region's water use will be related to agriculture, initially in meeting fairly basic needs of crop cultivation and later including more secondary activities like processing and canning of products.

4-3-3 METHODOLOGY

There are several means by which water may be obtained and utilized.

1. Rainfall. Obviously the rain that falls on crops is directly used by them with no need for human intervention. Rainfall, as previously noted, ranges from an annual mean of 60 mm to nearly ten times that, with equally wide variations in the degree of reliability and predictability.
2. Runoff. The amount of water which flows into the Wadi basins and becomes available for use depends upon how much is lost by percolation

Table 4-2-1 (a)
BASIN AREA AND ANNUAL RUNOFF OF SUB-REGION

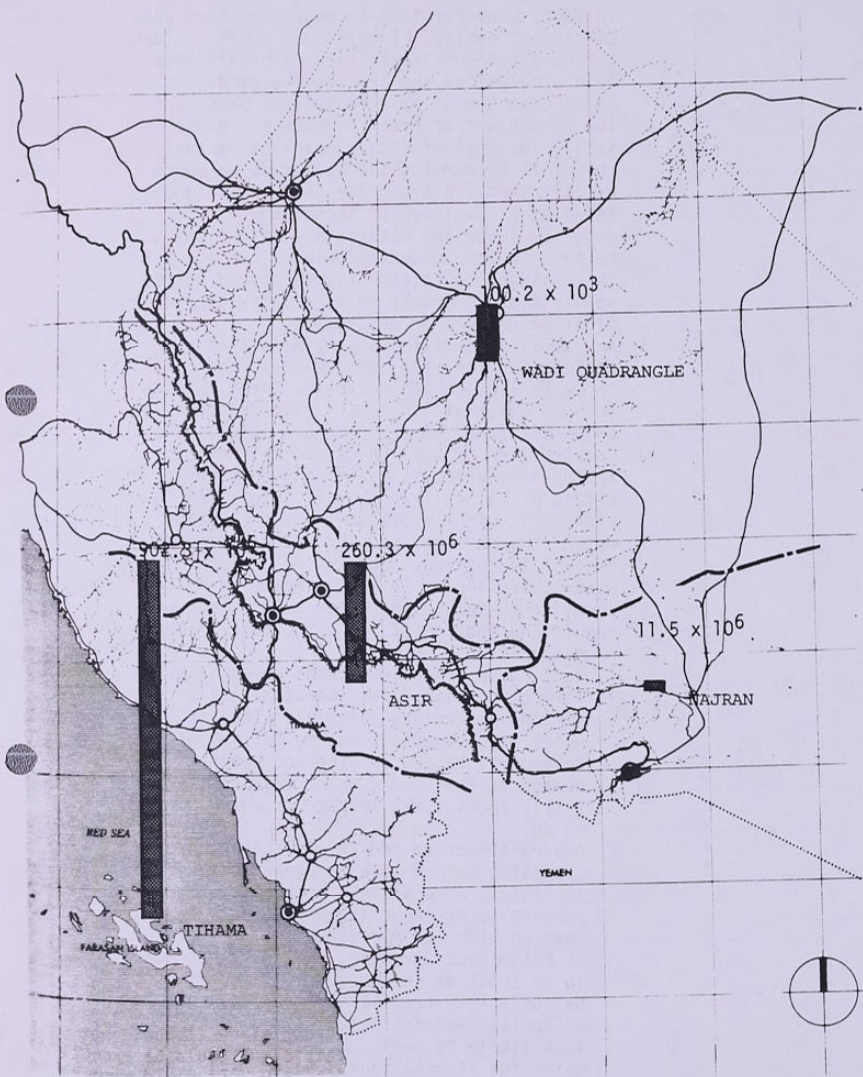
WADI BASIN	BASIN AREA km ²	AVERAGE ANNUAL RAINFALL mm	RUNOFF COEFFI- CIENT %	ANNUAL RUNOFF x10 ⁶ m ³
For Asir S.R.	13,540	-	-	404.1
-Wadi Bishah I	21,070 x 0.25	240	5.0	63.2
-Wadi Hali*1	6,750 x 0.5	590	7.9	157.3
-Wadi Jandalah	6,050 x 0.1	350	10.3	21.8
-Wadi Tathlith I	15,650 x 0.1	205	1.6	5.1
-Wadi Habawanah	5,300 x 0.1	150	1.0	0.8
-Wadi Baysh-Sabya	4,080 x 0.4	550	13.0	116.7
-Wadi Itwad	1,890 x 0.3	540	12.8	39.2
For Wadi Quadrangle S.R.	71,678	-	-	95.1
-Wadi Bishah I	21,070 x 0.75	240	1.0	37.9
-Wadi Bishah II	20,390	75	0.4	6.1
-Wadi Tathlith I	15,650 x 0.9	205	1.6	46.2
-Wadi Tathlith II	15,770	60	0.3	2.8
-Wadi Idimen	5,630	75	0.5	2.1
For Najran S.R.	11,740	-	-	19.1
-Wadi Habawnah	5,300 x 0.9	150	1.0	7.2
-Wadi Najran	6,970	155	1.1	11.9
For Tihama S.R.	12,434	-	-	815.7
-Wadi Liyyah, Khulab, Amlah*2	3,510 x 0.7	540	12.8	169.8
-Wadi Baysh-Sabya	4,080 x 0.6	550	13.0	175.0
-Wadi Juzan*2	3,130 x 0.7	560	13.2	162.0
-Wadi Assirr, Samra, Bayd	2,200	540	12.8	152.1
-Wadi Itwad	1,890 x 0.7	540	12.8	91.4
-Wadi Jandalah etc.*3	6,050 x 0.3	350	10.3	65.4
For Region (Total)				1,334.0

NOTE: *1 Lower half of Wadi Hali is outside of the region
*2 Upper north of basins belongs to Yemen
*3 Lower northern part of the basins is out of the regional boundary

Table 4-2-1 (b)
BREAKDOWN OF ANNUAL RUNOFF AND
AVAILABLE RUNOFF/RECHARGE (x 10⁶m³)

WADI BASIN	ANNUAL RUNOFF	RECHARGE FROM SAME OR OTHER BASIN	RECHARGE TO OTHER BASIN	RECHARGE OUTSIDE OF REGION OR IMPOSSIBLE RECHARGE	AVAILABLE RUNOFF AND RECHARGE
For Asir S.R.	404.1	0	143.8	0	260.3
-Wadi Bishah I	63.2	0	12.6	0	50.6
-Wadi Hali	157.3	0	12.6	0	157.3
-Wadi Jandalah	21.8	0	13.1	0	8.7
-Wadi Tathlith I	5.1	0	1.0	0	4.1
-Wadi Habawanah	0.8	0	0.2	0	0.6
-Wadi Baysh-Sabya	116.7	0	93.4	0	23.3
-Wadi Itwad	39.2	0	23.5	0	15.7
For Wadi Quadrangle S.R.	95.1	71.6	58.0	8.5	100.2
-Wadi Bishah I	37.9	12.6	30.3	0	20.2
-Wadi Bishah II	6.1	30.3	0	3.6	32.8
-Wadi Tathlith I	46.2	1.0	27.7	0	19.5
-Wadi Tathlith II	2.8	27.7	0	3.4	27.1
-Wadi Idimen	2.1	0	0	1.5*2	0.6
For Najran S.R.	19.1	0.2	0	7.8	11.5
-Wadi Habawnah	8.0	0.2	0	4.2*2	4.0
-Wadi Hajran	11.9	0	0	3.6*2	8.3
For Tihame S.R.	815.7	218.6	0	132.0	902.3
-Wadi Liyyah, Khulab, Amlah	169.8	0	0	0	169.8
-Wadi Baysh-Sabya	175.0	182.0*1	0	132.0*2	225.0
-Wadi Jizan	162.0	0	0	0	162.0
-Wadi Assirr, Samra, Bayd	152.1	0	0	0	152.1
-Wadi Itwad	91.4	23.5	0	0	114.9
-Wadi Jandalah etc.	65.4	13.1	0	0	78.5
For Region (Total)	1,334.0	290.4	201.8	148.3	1,274.3

NOTE: *1 Included the capacity of Jizan reservoir
*2 Impossible recharge from economical viewpoints




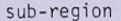
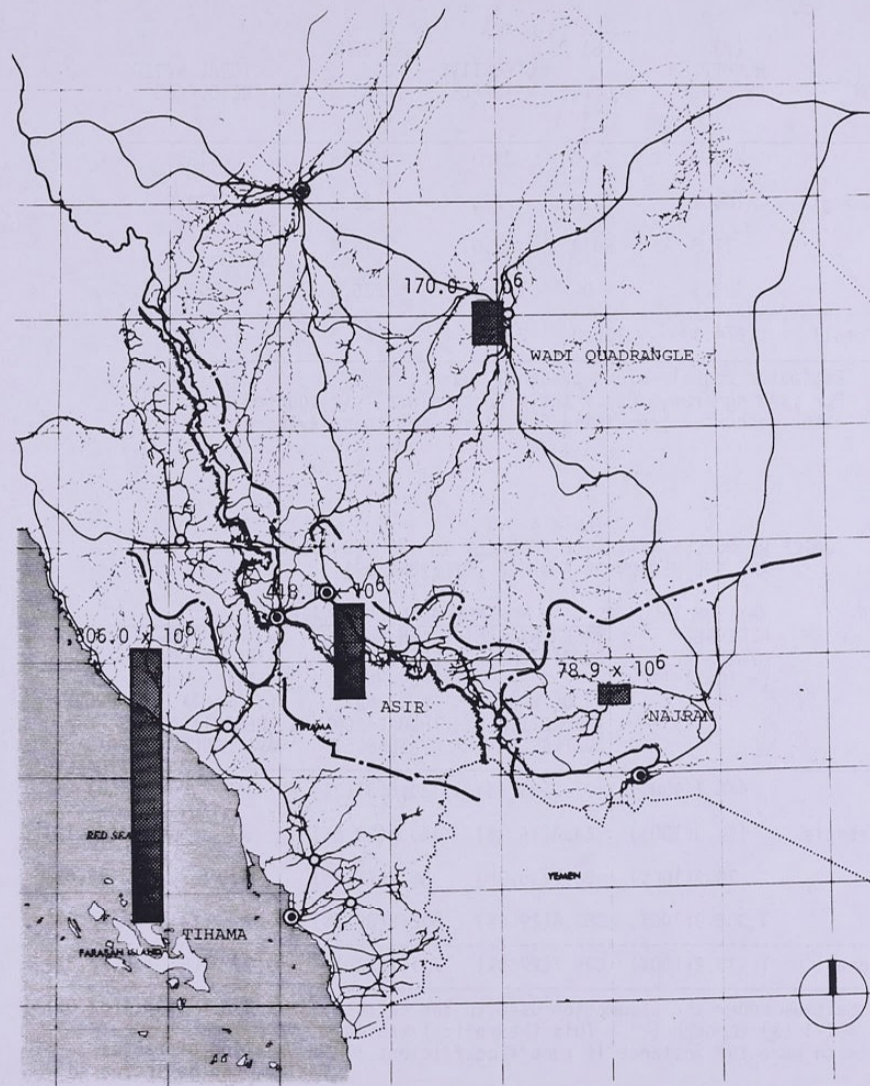
 available runoff and recharge (m^3)
 sub-region basin area (km^2)

FIGURE 4-2-1
AVERAGE ANNUAL
RUNOFF AND RECHARGE




 water resources (m^3)

FIGURE 4-3-1
WATER RESOURCES
AVAILABLE ANNUALLY
TO THE SUB-REGION

Table 4-2-1 (c)
AVAILABLE WATER RESOURCES (x 10⁶m³)

SUB-REGION	(A) RUNOFF OR RECHARGE	(B) AQUIFER *1	EFFECTIVE RAINFALL *2	RETURN FLOW (A+B) x 25%	TOTAL WATER RESOURCES
Asir	260.3	55.0	24.0	78.8	418.1
Wadi Quadrangle	100.2	30.0	7.3	32.5	170.0
Najran	11.5	50.0	2.0	15.4	78.9
Tihama	902.3	0	179.0	225.6	1,306.9
Region (Total)	1,274.3	135.0	212.3	352.3	1,973.9

NOTE: *1 Estimated annual volume presently used
*2 For farming area, 50% of the direct rainfall is counted as a water resources (remaining 50% is assumed to be evaporated)

Table 4-3-1
WATER RESOURCES AVAILABLE ANNUALLY TO THE SUB-REGIONS
AND THE REGION AS A WHOLE (MILLIONS m³)

SUB-REGION	MAXIMUM THEO- RETICALLY AVAILABLE (= 100%)*1	MAXIMUM ACTUALLY AVAILABLE		
		UNDER PRESENT CONDITIONS (% OF MAX. THEORETICALLY AVAILABLE)	WITH MOD- ERATE IM- PROVEMENT (% OF MAX. THEORETICALLY AVAILABLE)	WITH EXTEN- SIVE IMPROVE- MENT (% OF MAX. THEORETICALLY AVAILABLE)
Asir	418.1(100%)	97.2(23.3%)	130.8(31.3%)	368.3(88.1%)
Wadi Quadrangle	170.0(100%)	24.4(14.3%)	40.1(23.6%)	169.3(99.6%)
Najran	78.9(100%)	30.7(38.9%)	58.2(63.8%)	70.7(89.6%)
Tihama	1,306.9(100%)	387.4(29.6%)	502.8(38.5%)	1,009.8(77.3%)
Region (Total)	1,973.9(100%)	539.7(27.3%)	731.7(37.1%)	1,618.1(82.0%)

NOTE: *1 Maximum under the assumption used in the calculation of tables 4-2-1 (a) through (c). This theoretical maximum can be increased with more for instance if runoff coefficient is assumed higher.

into the soil. If the soil becomes sufficiently saturated, it will allow more water to flow across its surface than when dry. In fact, when rainfall exceeds a certain volume and intensity, flooding may occur. Given the rare but sometimes heavy rainfall, this is a problem for the area, aggravated by the large exposure of bare rock, lava beds, and low percentage of organic material in the soil. The most effective means of capturing runoff is by damming the Wadi beds at appropriate points, a technique that can be undertaken at a low level of technology with indigenous labor and materials. Attention must be paid to the tendency toward flooding, and the drainage or catchment area should not be so large as to entrap so much water that dams might be damaged or destroyed.

- Aquifers. The difficulty here is that the aquifers in the areas of greatest need tend to be shallow, which decreases their ability to hold water and increases evaporation. The only assistance that can be provided is the construction of small dams and channels in appropriate areas to maximize the recharge effect of rainfall and runoff. In a few instances it might prove worthwhile to pump water in from other sources (such as dammed basins) to recharge aquifers.
- Water harvesting. This is a means of increasing the amount of water available from runoff and storing it. The two major methods of accomplishing this are:
 - Setting up temporary ground cover in the form of plastic films, sheet metal, or similar impervious material. This is a quick and convenient method but subject to several hazards: wind and weather damage to the cover, deterioration over a fairly short time, leakage of water, and so on.
 - A more effective and only slightly more expensive method is a permanent catchment facility. A relatively smooth, cleared surface is prepared and then treated or covered with an impervious material, such as bituminous pavement. It would not need to be thick or strong since it would not be subject to traffic and could be expected to last indefinitely. It would also be less likely to leak. Besides obtaining water for storage tanks, water harvesting would be an effective means of recharging aquifers.

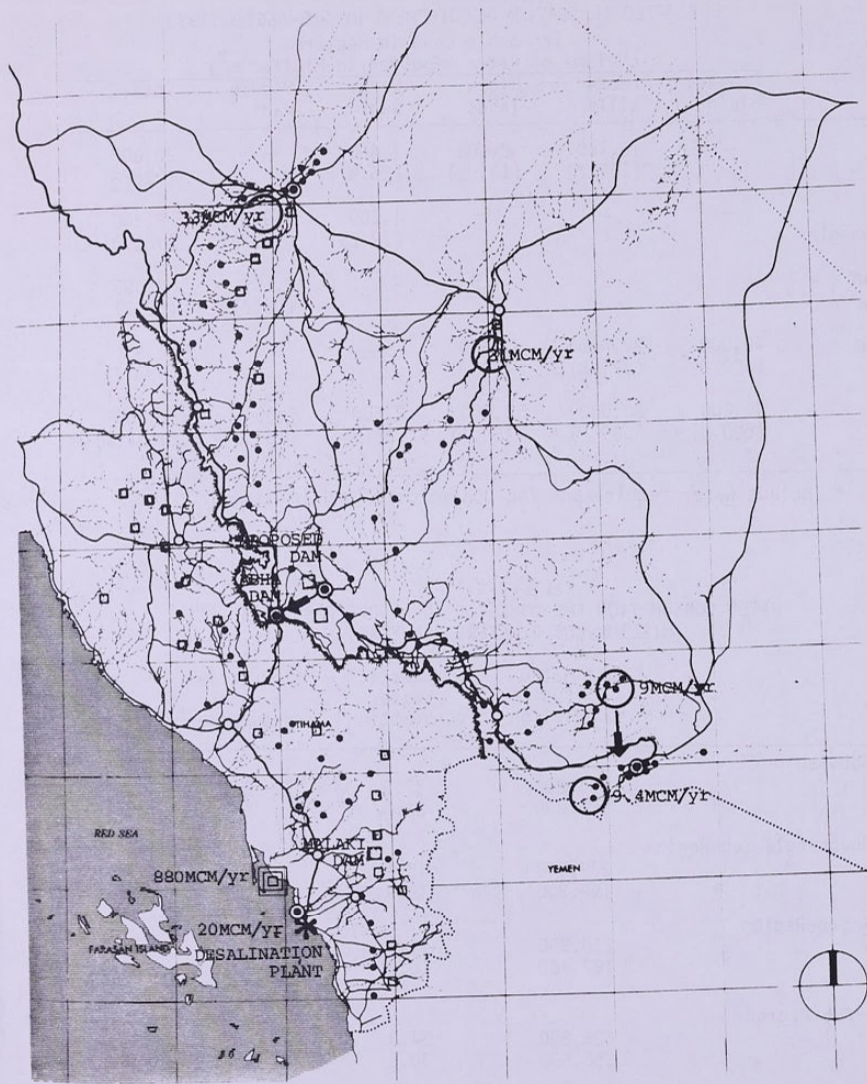
4-3-4 ALTERNATIVE STRATEGIES

- There are six Basic alternatives available for providing water resources to the sub-regions.
- Alternative 1: Importing water from outside the region or from a different sub-region.
- Alternative 2: Construction of dams, walls, and troughs, particularly in connection with Wadis.
- Alternative 3: "Artificial" recharge of aquifers.
- Alternative 4: Water harvesting with surface storage (reservoirs).
- Alternative 5: Water harvesting with subsurface storage.
- Alternative 6: Desalinization of seawater.

TABLE 4-3-2
LIKELIHOOD OF ALTERNATIVE METHODS

ALTERNATIVE	ASIR	WADI QUADRANGLE	NAJRAN	TIHAMA
1	○	—	△	—
2	○	—	—	○
3	△	—	○	△
4	○	△	—	—
5	△	△	△	△
6	—	—	—	○

- △ HIGH LIKELIHOOD
○ MODERATE LIKELIHOOD



- ← alternative 1
◻ alternative 2
○ alternative 3
◻ alternative 4
• alternative 5
* alternative 6

FIGURE 4-3-2
ALTERNATIVE
POTENTIALS OF
WATER RESOURCES

scale 1:2,500,000

In any instance, however, it appears that the water supply is going to fall short of the demand within the near future, and that water will continue to be the weakest link in the region's chain. Objectives therefore include the following:

- Careful planning to ensure the optimal allocation of existing resources and those likely to develop in the immediate future.
- Careful planning to ensure the maximum infusion of funding and technology to aid in the increase of water supplies. It should be remembered that (a) the southern region offers the greatest opportunity for providing many types of food and agricultural products needed to meet the national goals of self-sufficiency, and (b) the southern region's most severe shortcoming in meeting those demands is its lack of sufficient water.

4-4 IRRIGATION

Table 4-4-1 indicates two items: the maximum potential irrigable land area available for agricultural use in each sub-region, and the minimum volume of water required to cultivate the land.

4-5 POTENTIAL POPULATION GROWTH AND NON-AGRICULTURAL WATER REQUIREMENTS

As urbanization and industrial and commercial development occur, there will be increasing demands for water for non-agricultural uses. Table 4-5-1 indicates estimates of population for each of the sub-regions in 1995 and projects water demand based upon domestic and industrial uses. These projections propose the following rates of consumption:
 150 liters/day for domestic use by each person living in an urban area
 50 liters/day per employee by industrial concerns.

The figure of 150 liters per day per person is well in excess of the present consumption rate of about 40 liters/day. However, this figure was chosen because it has been clearly demonstrated that water use rises dramatically in the early stages of development. Already in the cities north of the Southern Region, the consumption has risen to as much as 100 liters/day. Further, this figure makes allowance for a certain amount of leakage, and spoilage as well as occasional use for other than personal purposes, such as firefighting. The following figures indicate how water use expands as a function of development: USA, 630 liters/day; England 250 liters/day; Japan, 200 liters/day.

On the other hand, even some countries with a bountiful supply of water from rainfall, rivers, and other natural sources, consume relatively little water to the small degree of development: Indonesia uses only 85 liters/day/person, and Tanzania only 60 liters/day.

The figure of 150 liters/day/person for the Southern Region can be reduced through strong management and control, if necessary. For purposes of health, welfare, and comfort however, it may be desirable to allow that volume of consumption. For conservative long-range planning purposes, 150 liters/day is an appropriate figure.

TABLE 4-4-1
ESTIMATED IRRIGATION REQUIREMENT BY SUB-REGION, 1995
Irrigable Land in Hectares
(Volume of Water Required in Million m³)

	Coastal Plain	Foot-hills	High-lands	Upper Wadi	Middle Wadi	Total
Asir	—	10,100 (167.7)	8,500 (135.2)	1,400 (25.9)	—	20,000 (328.8)
Wadi Quadrangle	—	—	—	1,200 (22.2)	4,900 (109.8)	6,100 (132.0)
Najran	—	—	—	—	2,600 (58.2)	2,600 (58.2)
Tihama	40,000 (600.0)*	22,400 (371.8)*	1,500 (23.9)*	—	—	63,900 (995.7)*
Total	40,000 (600.0)	32,500 (539.)	10,000 (159.1)	2,600 (48.1)	7,500 (169.0)	92,600 (1514.7)

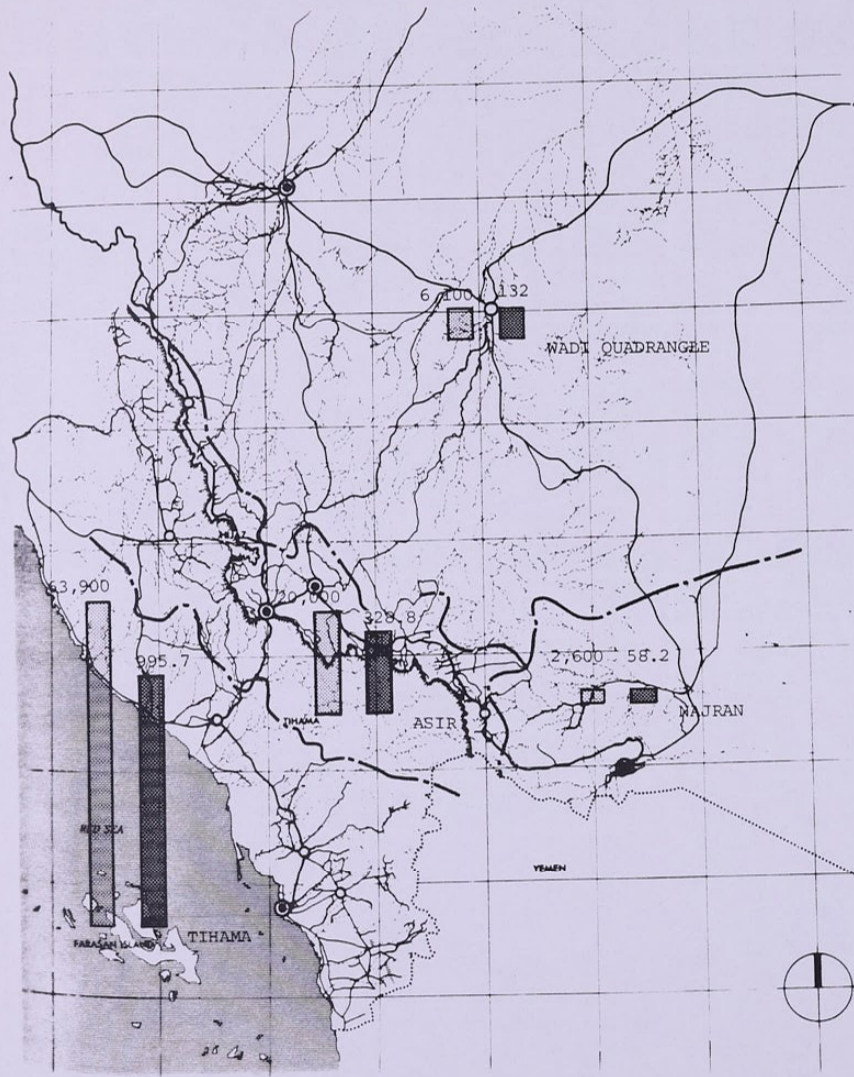
NOTE: * Include water requirement for unimproved land in Tihama.

Table 4-5-1
WATER CONSUMPTION FOR DOMESTIC AND INDUSTRIAL USES, 1995
(MILLION CUBIC METERS PER YEAR)

	estimated 1995 population	domestic water consumption ^a	industrial water consumption ^b	total
Asir Sub-Region				
High	685,200	37.5	2.0	39.5
Low	598,700	32.8	2.0	34.8
Wadi Quadrangle Sub-Region				
High	239,500	13.1	1.0	14.1
Low	199,200	10.9	1.0	11.9
Najran Sub-Region				
High	210,800	11.5	1.0	12.5
Low	187,400	10.3	1.0	11.3
Tihama Sub-Region				
High	625,800	34.3	3.0	37.3
Low	558,600	30.6	3.0	33.6
Total				
High	1,761,300	96.4	7.0	103.4
Low	1,543,900	84.5	7.0	91.5
			mean	97.5

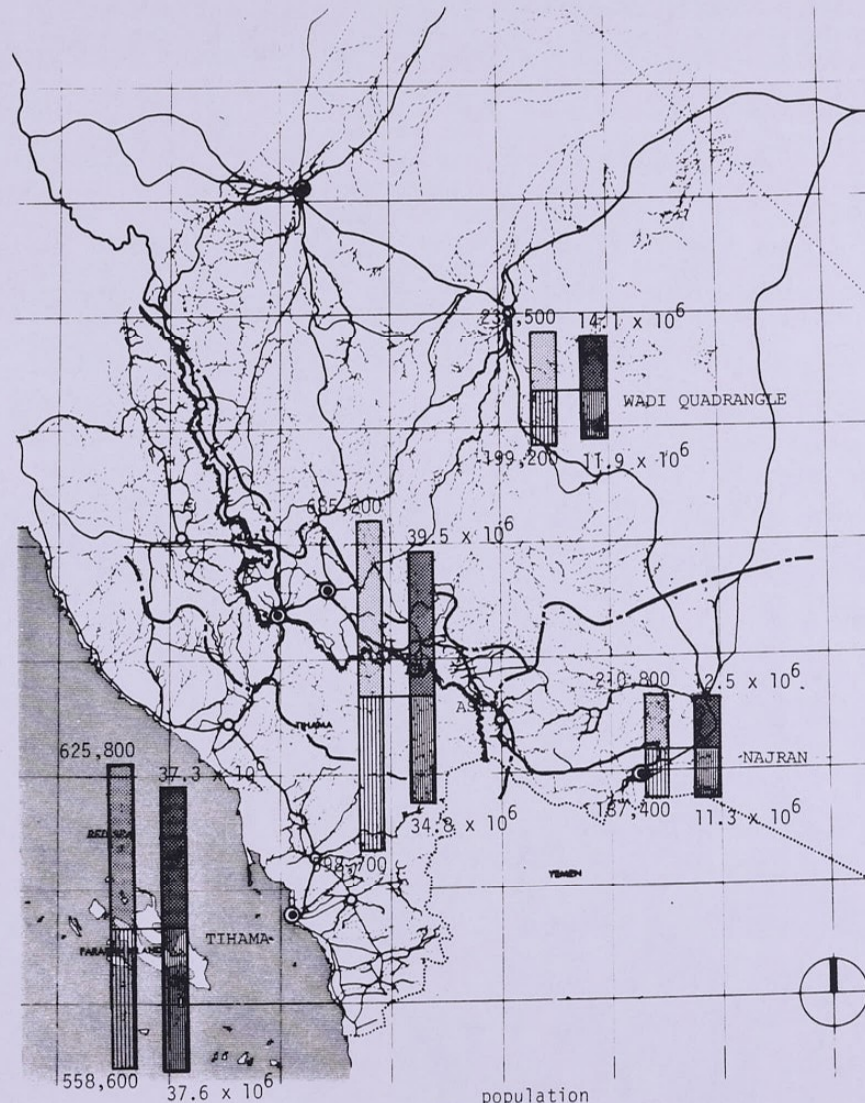
NOTES:

- a. Assume average domestic water consumption of 150 liters/person/day.
- b. Approximate estimates. Actual consumption is likely to be less.



irrigable land (ha)
 water required
 MCM ($10^6 m^3$)

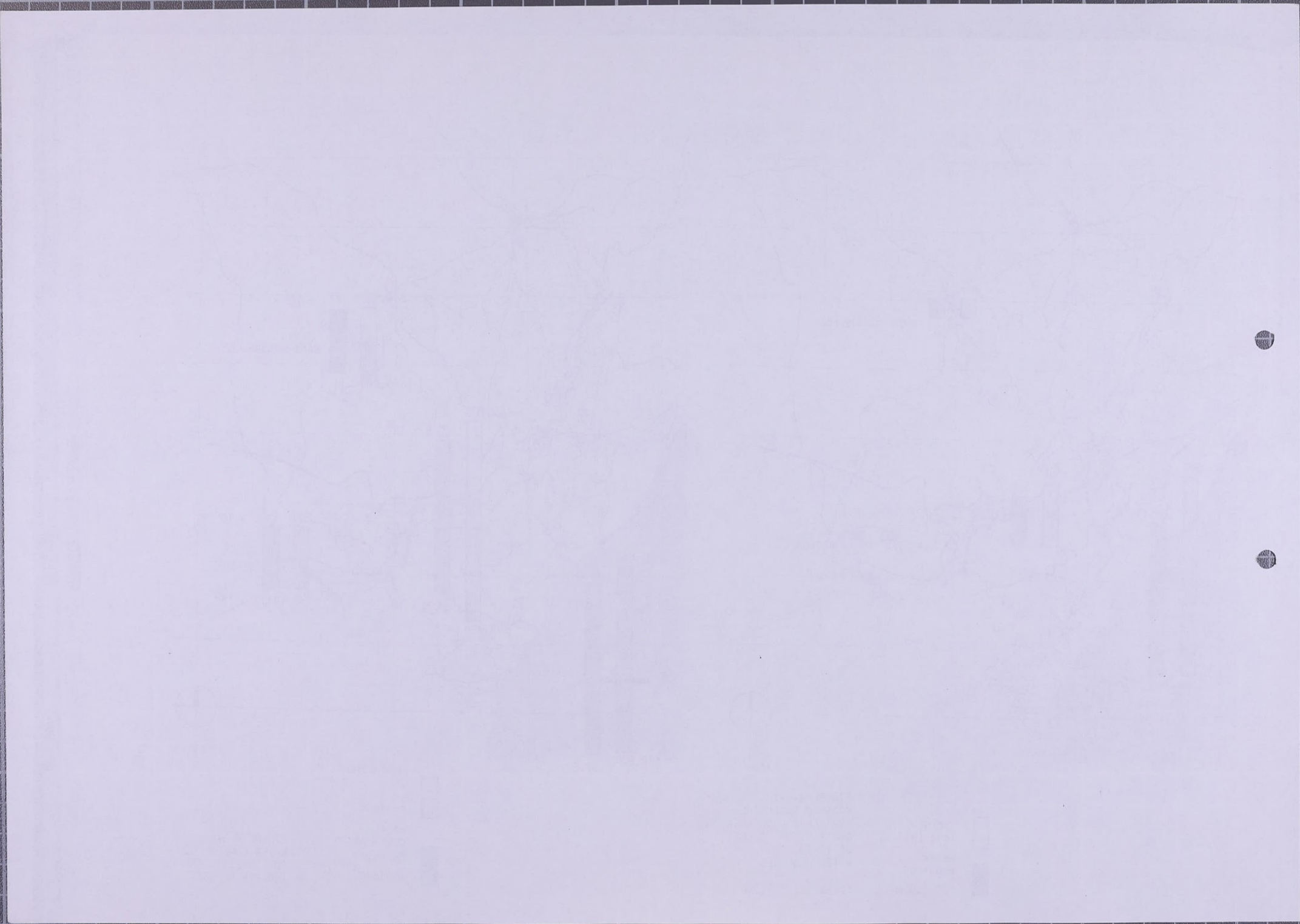
FIGURE 4-4-1
 MAXIMUM POTENTIAL IRRIGABLE LAND AREA AND MINIMUM VOLUMES OF IRRIGATION WATER REQUIRED
 scale 1:2,500,000



population
 minimum water consumption
 maximum water consumption (m³/year)
 minimum

FIGURE 4-5-1
 WATER CONSUMPTION FOR DOMESTIC AND INDUSTRIAL USES

PREPARED BY
 UNIVERSITY OF SAUDI ARABIA
 JEDDAH, SAUDI ARABIA



5. development policy for agriculture

5-1 NATIONAL POLICY AND
GENERAL FRAMEWORK

5-1-1 EXISTING CONDITIONS

Agriculture includes the cultivation of crops, the raising of livestock, forestry, and fishing activities. It is a major activity, with regard to both the economy and the social structure of the southern region, and is likely to maintain this pre-eminence for a long time. Crop cultivations is carried out primarily in the coastal plain and in the Wadi basins, due to the availability of water. Approximately 300,000 ha of arable land exists in the region, approximately half of which is used for dry farming (that is, there is sufficient rainfall to grow crops without manmade irrigation). Another 100,000 ha, mostly in Wadi basins, is irrigated by manmade facilities.

Of the region's total area of about 140,000 km², about 8,000 km² has potential for use as grazing land, but only about 3,000 km² are presently used on a regular basis.

The southern region includes the most heavily forested area of the entire Kingdom. In light of the present and future demands for building materials and other items that can be made of wood, this resource shows great potential.

The Red Sea is rich in fishing resources and Jizan is second only to Jeddah in activity.

Despite all these resources, the level of agricultural activity in the southern region is well below its maximum potential. A lack of skills, equipment, facilities, transportation, and marketing mechanism is the primary reason for this. An aggressive policy of agricultural development must take place if the southern region is to contribute at its maximum level to meeting national objectives.

5-1-2 DEVELOPMENT
OBJECTIVES
OF NATIONAL LEVEL

As listed in the current five-year national development plan, objectives in the area of agriculture (including cultivation, livestock, forestry, and fishing) are as follows:

1. To raise the per capita income and improve the standard of living of the rural people.
2. To minimize the Kingdom's dependence on imported foods and other agricultural products.
3. To release surplus labor for employment in other areas. [1]

5-1-3 NATIONAL AGRICUL-
TURAL POLICY

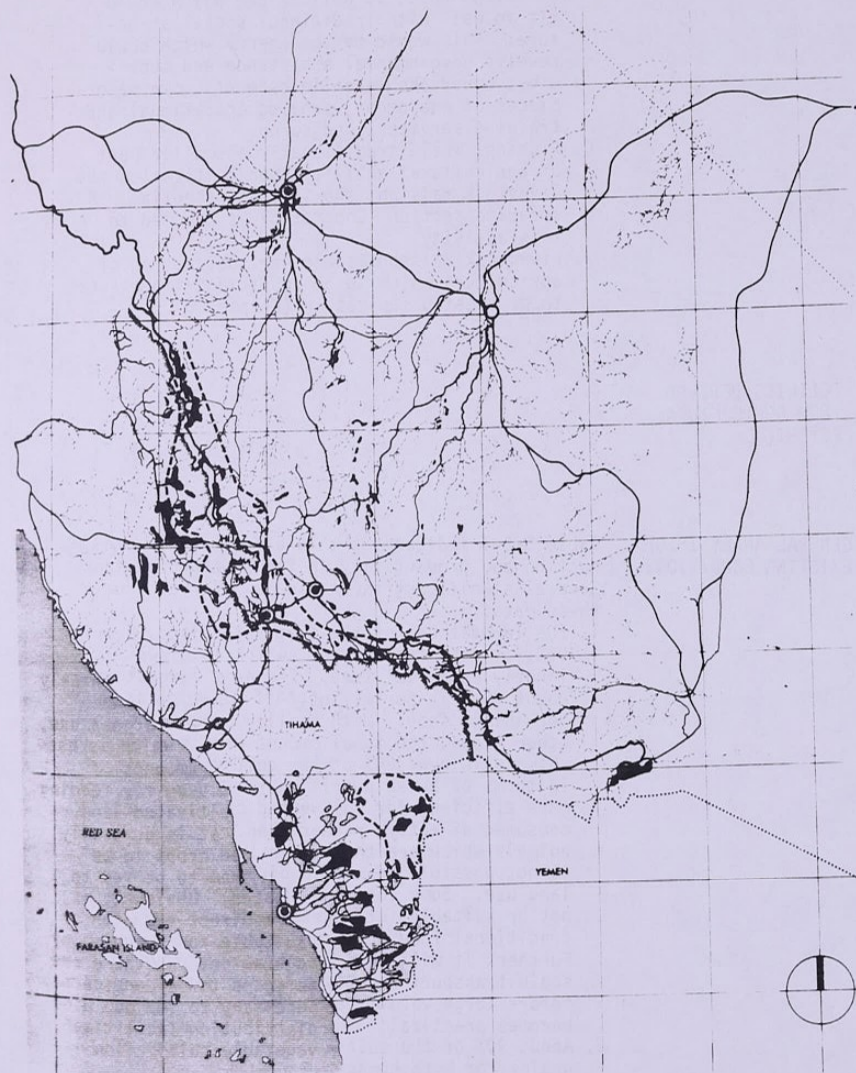
The key national policies for accomplishing these objectives are as follows:

1. To encourage private enterprise in food production, processing, and marketing with government intervention to occur in those activities where private entrepreneurs are unable or unwilling to become involved.
2. Establish and implement a reasonable balance in the allocation of resources between rural or agricultural activities and to urban commercial or industrial activities.
3. Plan carefully for the use of water resources, particularly those which are depletable.
4. Work for a high degree of self-sufficiency in the production of farm implements and machinery, seed, fertilizer, and other materials used in agricultural production.
5. Encourage private sector development of facilities required for food processing, marketing, and distribution.
6. Encourage the development of associations, cooperatives, and other organizations of producers to assist them to achieve stability and increase their production.
7. Encourage foreign development in the agricultural sector of the economy by providing the same guarantees as those provided for the industrial sector.
8. Encourage provision by the private sector of the physical infrastructure required for agricultural production.
9. Undertake to increase the credit available from government and private sources for the further development of agriculture, livestock production, forestry, and fishing.
10. Provide economic incentives as necessary to stabilize prices, support farm incomes, and otherwise assist agricultural activities.

5-1-4 NATIONAL POLICY IM-
PLICATIONS FOR THE
SOUTHERN REGION

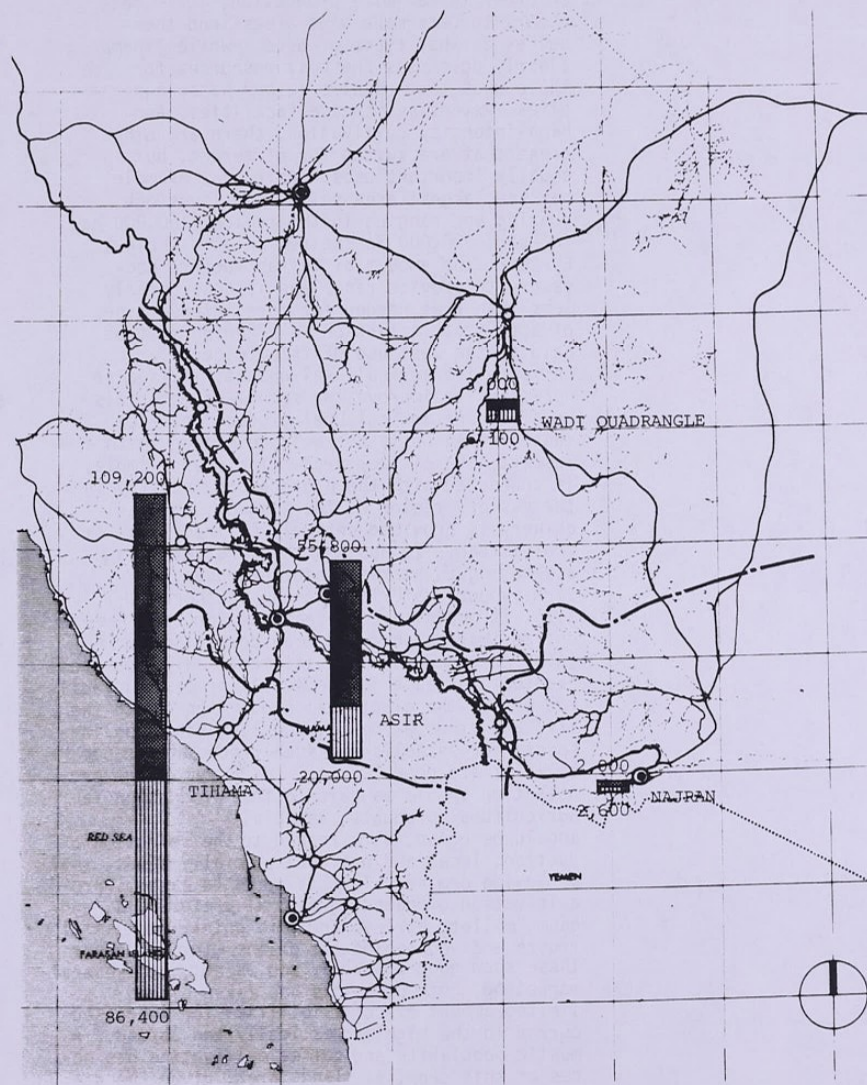
The following are some of the important implications of the national policy for the southern region:

1. The southern region has already obtained a dominant position in agricultural production, with 79% of the Kingdom's cultivated land located within it. The Tihama sub-region is of particular significance, since it contains about 70% of the southern region's irrigable land. The most rapid and practical method of working toward the goal of increasing national production will be to develop further those areas that have already proven fruitful. It thus appears reasonable and likely that the southern region will see an increased emphasis on its agricultural functions, with greater mechanization, irrigation, and other forms of investment. Plans



- irrigated land
- rainfed cropping arable land
- terraced arable land area

FIGURE 5-1-1
CULTIVATED LAND
BY TYPE OF
WATER USE



- dry farming area(HA)
- irrigated area(HA)

FIGURE 5-1-2
ARABLE AREA

- for the region, and especially the Tihama sub-region, must take this into account.
2. In order to maximize production, it is necessary to determine what areas lend themselves to what types of uses. While Tihama clearly possesses the best resources for those uses that require larger water supplies, extensive manmade facilities, and high-intensity cultivation, there are other areas that are suited for different, but equally important uses. Asir, for example, has the largest area suited for livestock grazing and ranging in the region (100,000 ha in Asir, 300,000 in the region as a whole.) Further, the amount of infrastructure necessary to provide rangeland is considerably less than that needed for more intense types of activity. Attention in planning must be paid to the best use of this resource.
 3. In improving agricultural output, it is also necessary to improve the supply of materials required for agricultural production. The southern region is not well developed in this respect. Fertilizer production, for example, is connected with the hydrocarbon industry in the eastern region of the Kingdom, and machinery is provided entirely by importing from abroad. It appears that, rather than attempting to attract major producers of farm-support materials to the southern region, it would be more feasible for the present to improve port and transportation facilities to expedite their shipment. With the eventual increase in the supply of desalinated water, the electrical production capacity, and other elements, the long-range prospects for establishing such production facilities are good.
 4. Attention should be paid to the selection of agricultural products, especially foods, that should be grown, with regard to ease of production, local and national preferences, and worldwide demand. To this point, successful cultivation of dates, grains (including sorghum, millet, barley, and wheat), and several fruits and vegetables has taken place. These show good possibilities for increased marketing, both domestically and abroad. A limited amount of coffee cultivation has occurred in the highlands area; given the domestic popularity and the rapidly rising prices of this crop, it shows a good potential for increased production.
 5. Further study is required to determine the best organizational structure for promoting investment, increased production, education, and other administrative activities. It

- appears that a community-oriented organizational unit would be the most effective and efficient unit, as well as one which would fit in well with traditional social structure. This would be the agency which could receive governmental assistance and subsidies, undertake large investments, own major pieces of equipment, provide educational and training services, and so on.
6. Fishing, while traditionally a smaller part of agricultural activity than cultivation and livestock raising, shows great potential. A separate section (Chapter 6) is devoted to this activity.
 7. Livestock raising is another sub-section of agriculture which is of sufficient importance to be treated separately (Chapter 6).

5-2 POLICIES DERIVED FROM AGRICULTURAL POTENTIAL

5-2-1 GENERAL ANALYSIS OF EXISTING CONDITIONS

Table 5-2-1 indicates the 1975 figures for production and productivity in the Southern Region. Several significant facts can be observed from these data:

1. The largest use of the cultivated land, nearly 50%, is used for sorghum, which is grown largely as animal feed. The next largest use, about 30%, is for millet, half of which is used for animal food. With smaller amounts of other crops, the total amount used for feeding animals is over 60% of the cultivated land. In terms of human nutrition, it is generally more efficient for cultivated crops to be consumed directly, rather than to be fed to animals which are then eaten. Obviously it is not possible to make a direct transfer of land use. Some land suitable for sorghum may not be suitable for vegetables, and there are traditional food preferences to be considered. Further, it will be necessary to improve wide-scale transport and distribution facilities before large volume vegetable cultivation becomes practical.
2. About 90% of the cultivated land is used for grains for both human and animal consumption). This is at least partly due to a government subsidy of 25 hahala/kilogram of annual grain production. Such a policy is useful in many respects, but the question must be asked whether this is the most productive use in all cases. There are, for example, many ad-

vantages to the cultivation of fruits and vegetables: they are more nutritious, they produce a greater monetary return, and (because yet at present only 1.3% of the cultivated land is used for that purpose their growth is more labor-intensive), they provide for more jobs. In any case, the government subsidy policy should be reviewed periodically to create the most desirable distribution of crop production.

3. Productivity is relatively low, the most important reason being the lack of water facilities. Productivity may be doubled by proper irrigation, and may be increased further still thereafter by means of fertilization, mechanization, and other techniques. In short, the key to overall improvement in crop production lies with (a) developing an appropriate set of policies for selecting crops to be grown, based on the nature and fertility of the land; the availability of water, fertilizer, and other supporting elements; the demand, need and popular preference for a given agricultural product; the availability of transport and distribution facilities; and other pertinent considerations; and (b) maximizing the production of a given crop once the decision has been made what to cultivate.

The per capita consumption has a direct effect on nutrition, and thus on the health, well-being, and comfort of the people. The present mean consumption of foodstuffs in the Kingdom amounts to about 2000 calories per day, a figure which is low in comparison with that typical for western nations. Thus, in addition to national self-sufficiency in food production, raising the mean level of nutrition should be a major objective. Protein is supplied largely by mutton and pulses (beans, lentils, and edible seeds). An opportunity here is for the introduction of new-varieties of pulses that have a higher protein value than the indigenous variety. The vitamins are supplied mainly through fruits and vegetables, the consumption of which is only about 50% of the rate in western countries. An opportunity for improvement in this area may exist in the increase of citrus cultivation in those Wadi basins with sufficient water.

5-2-2 GENERAL ANALYSIS OF EXISTING AGRICULTURAL PRACTICES

For the most part, agriculture in the southern region is a subsistence activity. Farmers themselves consume the largest part of their output, leaving relatively little for marketing in urban areas. This situation could be remedied if there were complete freedom to provide capital, expertise, infrastructure, and so on.

The process of agricultural development, and increasing agricultural output, should address the following areas:

1. Land tenure
2. Water resource development
3. Water management system development
4. Transportation
5. Marketing
6. Financial support for enlargement of farms and increase in production.

In the early stages of development, all of these areas seem to demand attention at the same time. It will be a complex matter to allocate the Kingdom's time, money, expertise, and other resources in a way that will maximize opportunities for growth. And, although it will be somewhat easier once the process is under way, it will still be necessary to monitor activity very closely since changes will occur.

For example, in the early stages of farm development, it is appropriate to emphasize labor-intensive activities, to increase both productivity and distribution of economic benefits. But at a later stage, it will be advantageous to mechanize operation, increase farm size, change crops and cultivation techniques, and otherwise modify the system of operation.

Among the steps necessary to develop a more modern agricultural system are the following:

1. The gradual replacement of subsistence-level agriculture with more productive techniques. This may include the following:
 - a. Adopting more labor-intensive and more productive methods of cultivation. For example, wheat production requires relatively little labor and produces about 2 tons/ha per crop. Tomato or melon production requires more intensive labor and produces about 10 ha/ton. The latter has the effect both of producing more food and of providing more jobs.
 - b. Consolidation of farms into larger units, thus allowing more efficient work methods.
 - c. Use of systems that provide year-round work opportunities. Cotton, for example, could be used to provide jobs during planting, cultivating, harvesting, ginning, milling,

- and oil extraction. Other crops may offer similar possibilities.
- d. Joint use of the same land. Forage crops, for example, might co-exist on the same ground as date or citrus trees.
- e. Other techniques may present themselves as implementation takes place. Flexibility, adaptability, and innovation are important.

Table 5-2-1
PRODUCTION AND PRODUCTIVITY OF
SELECTED CULTIVATED CROPS
IN SOUTHERN REGION^a, 1975

Item	Cultivated Area (ha)	Productivity		Production (tons)	Value (SRx10 ³)
		(ton/ha)	(SR x 10 ³ /ha)		
Sorghum	133,700	2.0	1.5	267,400	200,550
Millet	83,300	2.0	1.0	166,600	83,300
Wheat	32,900	2.0	1.7	65,800	55,930
Barley	8,900	2.0	1.2	17,800	10,680
Dates	3,100	5.0	3.0	15,500	9,300
Other Fruits	1,400	10.0	6.5	14,400	9,100
Vegetables	2,500	10.0	3.5	25,000	8,750
Oilseeds	10,500	1.0	0.8	110,500	8,400
Alfalfa	2,800	80.0	2.8	224,000	7,840
Fodder	2,900	4.0	2.0	11,600	5,800
Unspecified	3,100	--	---	--	350
Total	285,100		--	918,000	400,000^b

NOTES: a. Basic distribution via ILACO Study, updated by URTEC survey (Existing Condition Report, Table 4-1-4)

Table 5-2-2
1975 DOMESTIC WHOLESALE PRICE
OF SELECTED CROPS (SR/ton)

Sorghum	750
Millet	500
Wheat	850
Barley	600
Dates	600
Other Fruits	650
Vegetables	350
Oilseeds	800
Alfalfa	35
Fodder	500

Source: URTEC survey

Table 5-2-3
POTENTIAL PRODUCTIVITY OF
SELECTED CROPS (TONS/HA)

	Basic Flood Spreading		Improved Flood Spreading		Flood Spreading and Irrigation	Well Irrigation
	Coastal	Foothills	Coastal	Foothills		
Sorghum	2.0	2.6	2.6	3.5	3.0-4.5	3.5- 4.5
Wheat						3.5
Vegetables					20.0	20.0
Dates						10.0
Other Fruits					20.0	20.0- 25.0
Alfalfa (Green)						80.0-120.0
Sorghum Fodder						40.0- 60.0
Cotton Seed	1.2	1.2	1.6	1.6	2.5	2.5
Groundnuts	1.6	1.6	2.2	2.2	3.0	3.0

Source: URTEC Study

5-2-3 ANALYSIS OF PROBLEMS
IN DEVELOPMENT OF
AGRICULTURE

It is difficult to assess in advance the number and severity of problems that may effect agricultural development. Note is made of the following:

1. Lack of water resources.
2. Lack of water distribution system.
3. Shortcomings in soil (including excessive alkalinity in arid areas, salinity near the Red Sea, and a general insufficiency of minerals necessary for cultivation).
4. Labor problems. As mentioned before, agriculture is presently a low-income profession. Of 305,000 agricultural workers, 70,000 have migrated to other parts of the Kingdom (particularly the oil fields and the urban areas) and 40,000 have other part-time jobs in the region.
5. In the past, agriculture was undertaken largely for self-consumption, or at least for distribution over a very limited area. Since there was no need to increase production, there was no incentive to use modern technology in cultivation or distribution. At the present time, however, the five-year national development plan places great value on national self-sufficiency in food production. The people must therefore be made aware of the importance of productivity.

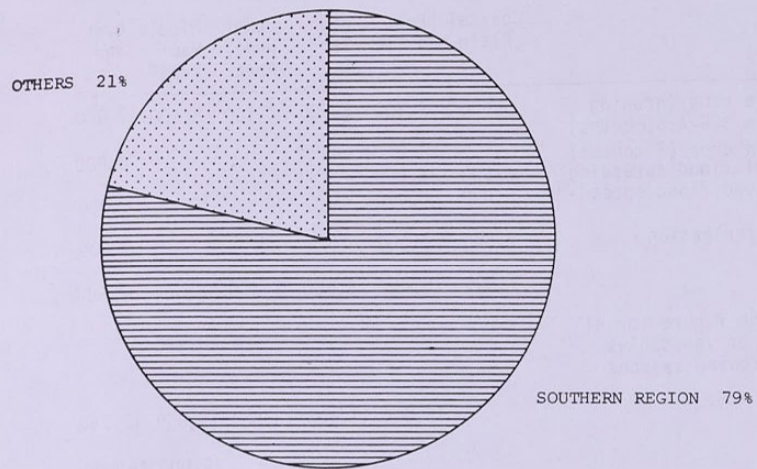
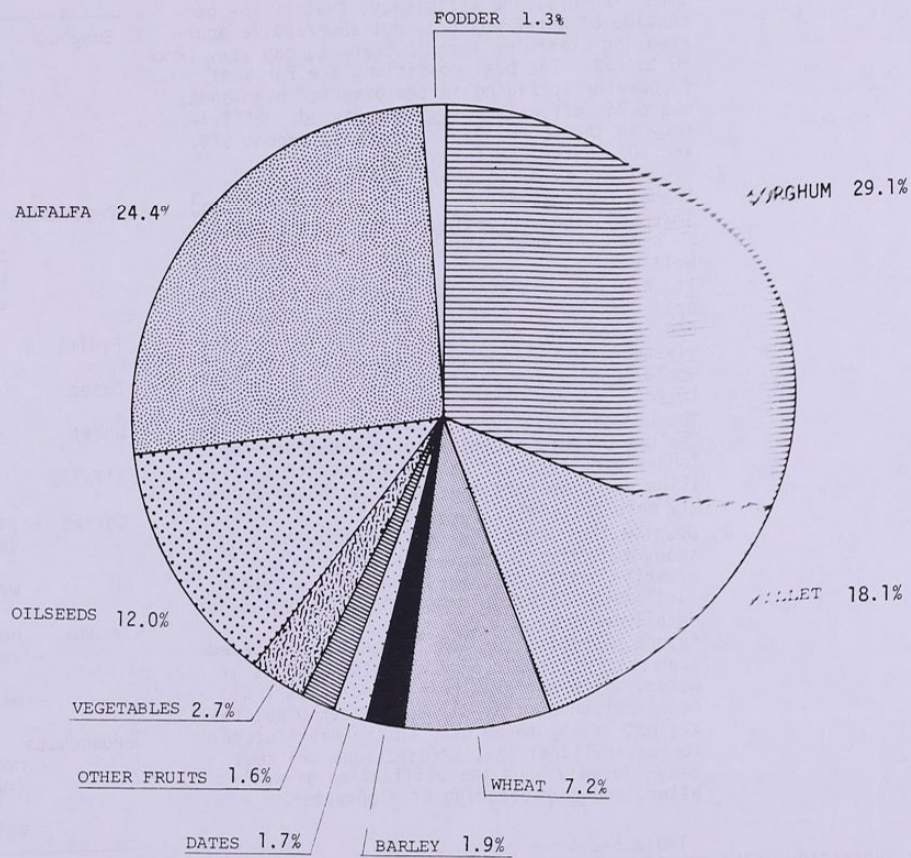
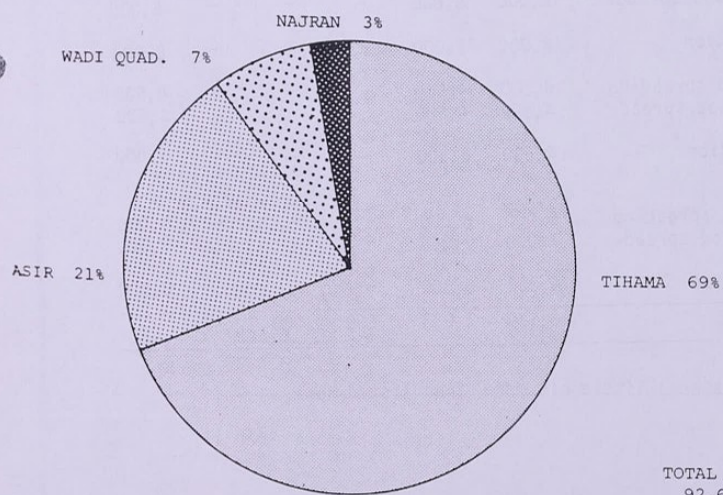


FIGURE 5-1-3
CULTIVATED LAND
IN THE KINGDOM
1975



PRODUCTION
912,100 t



TOTAL AREA
92,600HA

FIGURE 5-1-4
IRRIGABLE LAND
IN THE REGION (1995)
SOURCE: Table 4-4-1

5-2-1
PRODUCTION
PRODUCTIVITY
LISTED
LISTED CROPS
REGION (1975)
Table 5-2-1

5-2-4 COSTS OF IRRIGATION

The various techniques of obtaining water resources are discussed in Chapter 4. This section relates the cost and efficiency problems of applying irrigation to agriculture and cultivation.

1. Irrigation by well water or flood spreading of water contained in Wadis is not completely efficient. Depending upon the degree of effectiveness of the technique, the permeability of the soil, the distance and area covered, and other factors, the efficiency, that is the percentage of water which is not absorbed, evaporated, or otherwise lost in transit, may vary from 50 to 75%. The best conditions are for Wadi floodwater spreading in the dissected highlands, where 75% efficiency may be achieved. Efficiency in the foothills is generally around 67%, and 50% in the coastal plain.

2. Typical costs of water are as follows:

Normal flood spreading SR0.02/m³
 Improved flood spreading (via dams, channels, etc.) SR0.03/m³
 Well water SR0.05/m³

It should be noted, first, that these are figures for the gross volume of water extracted, and to meet the net need for water at the cultivated site, as indicated by Table 5-2-5, would require increasing these figure by 1.3 to 2.0. Second, these amounts are based upon the use of traditional, low-capital facilities. The use of more technically advanced equipment, longer pipelines, or other more modern facilities would be more expensive, although probably more efficient.

3. Despite the expense, a cost-benefit analysis shows that the increase in production would clearly justify the investment in new capital facilities. This information is presented in detail in Section 5-2-8.

4. Future possibilities for irrigation are based upon more intense use of existing sources of water, since national policy indicates that desalination or long-distance water pipelines are not likely to be used in the near future for agricultural use. Projections are thus based largely upon the utilization of well-water, and the spreading of floodwater.

Table 5-2-4
 NET IRRIGATION WATER REQUIREMENTS BY SUB-REGION AND GEOGRAPHICAL TYPE, 1975 (m³/ha/yr)

	Coastal Plain	Foothills	Highlands	Upper Wadi	Middle Wadi
Asir	-	16,604	15,906	18,500	-
Wadi Quadrangle	-	-	-	18,500	22,408
Najran	-	-	-	-	22,385
Tihama	15,000	16,598	15,933	-	-

Source: URTEC Study

Table 5-2-5.
 NET WATER DEMAND OF CROPS FOR IMPROVED IRRIGATION (m³/ha/harvest)
 BY GEOGRAPHICAL CATEGORY (ESTIMATION)

	Coastal Plain	Foot-hills	High-lands	Upper Wadi Area	Middle Wadi Area*	Average
Sorghum - Single crop (growing season 3.5-4.5 months)	5,000	8,500	6,000	7,500	8,500	7,100
- Ratoon crop (7 months)						6,000
normal flood spreading	6,000	6,000	-	-	-	-
improved flood spreading	6,000	6,000	-	-	-	6,000
well irrigation	9,500	9,500	-	-	-	9,500
Vegetables	7,500	8,000	6,000	7,500	8,500	7,500
Average figure for all kinds of vegetables and growing seasons						
Fruits	-	15,000	11,500	13,500	15,000	13,750
Dates	-	-	-	-	19,000	19,000
Wheat						
Alfalfa	-	-	5,500	5,000	5,500	5,333
Cotton - normal flood spreading	6,000	6,000	14,000	16,000	19,000	12,200
- improved flood spreading	6,000	6,000	-	-	-	6,000
- well irrigation	8,000	8,000	-	-	-	8,000
Sesame - normal flood spreading	4,500	4,500	-	-	-	4,500
- improved flood spreading	4,500	4,500	-	-	-	4,500
- well irrigation	4,500	4,500	-	-	-	4,500
Groundnuts - normal flood spreading	6,000	6,000	-	-	-	6,000
- improved flood spreading	7,000	7,000	-	-	-	7,000
- well irrigation	6,000	6,000	-	-	-	6,000
Average	6,179	7,033	8,600	9,900	12,583	

NOTE: * Najran Area takes a little bit more than listed here.

Table 5-2-6
MEAN COST IMPROVED IRRIGATION
PER ha (SR,1975, est.)

Coastal Plain	7,000
Foothills	6,300
Highlands	5,600
Upper Wadi	4,900
Middle Wadi	5,600
Mean	5,880

Table 5-2-7
AGRICULTURAL AREA IN 1975 BY SUB-REGION (HA)

Sub-Region	Arable Area		Range Land Area	Total
	Irrigated	Dry Farming		
Asir	20,000	55,800	130,000	205,800
Wadi Quadrangle	6,100	3,000	50,000	59,100
Najran	2,600	2,000	10,000	14,600
Tihama	86,400	109,200	89,810	285,410
Region (Total)	115,100	170,000	279,810	564,910
	Total	285,100		

NOTE: Table 5-2-7 indicates the area under cultivation as of 1975.

Table 5-2-8(a)
IRRIGATED AREA IN 1975
BY GEOGRAPHICAL CATEGORY (HA)

Sub-Region	Coastal Plain	Foothills	Highland	Upper Wadi	Middle Wadi	Total
Asir	-	10,100	8,500	1,400	-	20,000
Wadi Quadrangle	-	-	-	1,200	4,900	6,100
Najran	-	-	-	-	2,600	2,600
Tihama	62,500	22,400	1,500	-	-	86,400
Region (Total)	62,500	32,500	10,000	2,600	7,500	115,100

NOTE: Table 5-2-8 (a) and (b) break categories down into irrigated and dry farming areas.

Table 5-2-8 (b)
DRY FARMING AREA IN 1975
BY GEOGRAPHICAL CATEGORY (HA)

Sub-Region	Coastal Plain	Foothills	Highland	Upper Wadi	Middle Wadi	Total
Asir	-	4,000	51,800	-	-	55,800
Wadi Quadrangle	-	-	3,000	-	-	3,000
Najran	-	-	2,000	-	-	2,000
Tihama	100,000	8,000	1,200	-	-	109,200
Region (Total)	100,000	12,000	58,000	0	0	170,000

Table 5-2-9
DESIRABLE VOLUMES OF IRRIGATED LAND BY TARGET YEAR (HA)

Sub-Region	1980		1985		1995	
	Im-proved	Not Im-proved	Im-proved	Not Im-proved	Im-proved	Not Im-proved
Asir	8,000	12,000	15,000	5,000	20,000	0
Wadi Quadrangle	2,000	4,100	4,000	2,100	6,100	0
Najran	2,600	-	2,600	-	2,600	0
Tihama	7,000	79,400	37,000	49,400	63,900	22,500
Region (Total)	19,600	95,500	58,600	56,500	92,600	22,500

NOTE: Table 5-2-9 indicates desirable volumes of irrigated land by 1980, 1985 and 1990.

Table 5-2-10
CROPPING INTENSITY BY GEOGRAPHICAL AREA

Coastal Plain	133%
Foothills	160%
Highland	170%
Upper Wadi	133%
Middle Wadi	133%

NOTE: Table 5-2-10 indicates volumes of irrigation required by geographical area.

5-2-5 ANALYSIS OF AGRICULTURAL LAND USE AND RELATED POLICIES

In the existing conditions study, it was estimated that there was a total of 564,910 ha of land in the Southern Region being put to agricultural use during 1975, of which 285,100 ha is cultivated and 279,810 is rangeland. A more detailed breakdown of agricultural land use is given in Tables 5-2-7, 5-2-8 (a), and 5-2-8 (b).

An analysis of Existing Conditions and agricultural development policies leads to the following generalizations:

1. The agricultural population is not expected to increase significantly in the foreseeable future, either absolutely or as a percentage of the whole population. It may even decrease as general development in the Southern Region increases.
2. The most critical element regarding an increase in agricultural development and productivity per worker over the next twenty years will not be to increase the absolute area of land dedicated to agricultural purposes, although this may occur. Rather, it will be to increase the intensity of use and productivity of existing agricultural land. Most of the land best suited for agriculture is already used for that purpose, and so the greatest effort should be toward improving its capacity and productivity.
3. The biggest part of the effort to improve productivity should be to improve irrigation facilities and methods. Careful and comprehensive study should be undertaken to optimize the improvement process.

From these generalizations, the following set of more specific assumptions can be made.

1. The existing 115,100 ha of irrigated land will continue in that category. In addition, a portion of the land now used for dry farming (basically rainfed or with some minor irrigation facilities) will be converted to irrigated land. It has been shown that irrigated land, while expensive to develop, is clearly the most highly productive and well worth the investment (see Table 5-2-14), and so conversion of less intensively cultivated land into irrigated land should be a high priority.
2. Another portion of the present dry farming land will be converted into "Minor" Irrigated Land. In general, this will be land for which the cost of conversion into "Major" irrigated land would be excessively high, or which in some other way does not meet the conditions drawn from the studies proposed in Item (3) above.

3. As a consequence, the amount and percentage of rainfed land would decrease.

These assumptions and the relationship among the various categories of agricultural land use are shown in Figure 5-2-2.

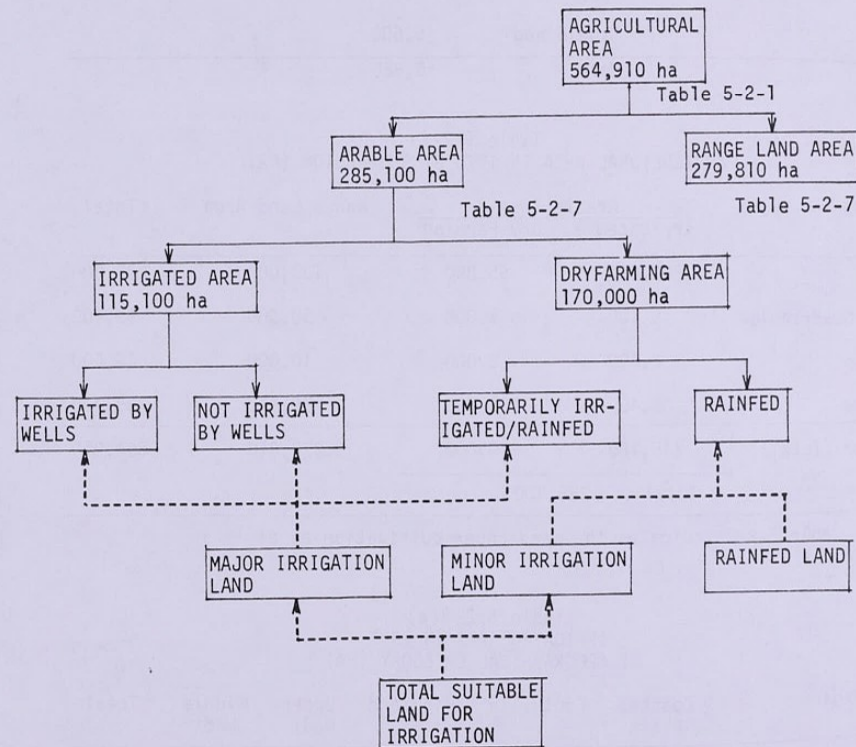


FIGURE 5-2-2
ESTIMATION OF AGRICULTURAL AREA IN 1975
AND FUTURE DEVELOPMENT OF AGRICULTURAL LAND

Table 5-2-11 (a)
WORKER DEMAND BY TYPE OF LAND WHEN IRRIGATED
(man-day/ha/yr)

Type of Land	Unimproved	With Maximum Improvement	Ratio
Coastal Plain	100	245	2.45
Foothills	100	250	2.50
Highlands	140	210	1.50
Upper Wadi	150	245	1.63
Middle Wadi	150	245	1.63
MEAN	128	239	1.87

Table 5-2-11 (b)
MEAN PRODUCTION VALUE OF IRRIGATED LAND (SR/ha)

Type of Land	Unimproved	With Maximum Improvement	Ratio
Coastal Plain	900	4,000	4.44
Foothills	1,200	3,500	2.92
Highlands	1,800	4,500	2.50
Upper Wadi	2,200	4,900	2.23
Middle Wadi	2,300	4,700	2.04
MEAN	1,680	4,320	2.57

Table 5-2-12
WORKER DEMAND AND MEAN PRODUCTION VALUE OF LAND
WITH DRY FARMING

Type of Land	Worker Demand (man-day/ha/yr)	Mean Production Value (SR/ha)
Coastal Plain	50	900
Foothills	60	600
Highlands	70	1,000
Upper Wadi	60	1,100
Middle Wadi	60	1,100
MEAN	60	940

Table 5-2-13
UNIT PRODUCTION VALUE OF RANGELAND (SR/ha)

Coastal Plain	70
Foothills	50
Highlands	50
Upper Wadi	N/A
Middle Wadi	N/A

NOTE: Grazing of livestock requires a very low demand for workers, typically less than one worker per hectare.

NOTE: Tables 5-2-11(a) and (b) indicate that two desirable consequences result from improving cultivated land. First, the number of workers that can be gainfully employed increases on the average by a factor of 1.87. Second, the projected value of the crop increases at an even greater rate of 2.57, and in some instances up to 4.44. It is seen that while more people may find employment in agricultural work, the productivity per worker increases substantially as well. Thus two goals are met: an increase in the rate of food production with a higher degree of nation self-sufficiency in that regard, and improved employment situation in the southern region.

Table 5-2-14
COMPARISON OF COSTS AND BENEFITS PER ha BETWEEN
UNIMPROVED AND IRRIGATION FACILITIES

Item	Unimproved	Improved	Difference
1. Gross Value of Annual Production	SR-1680	SR 4320	+ 257%
2. Mean Annual Cost of Irrigation*	0	SR 588	-
3. Net Annual Value of Production (Item 1-Item 2)	SR-1680	SR 3732	+ 222%
4. Mean Annual Worker Demand**	128 Man-Days	239 Man-Days	+ 186%
5. Mean Value of Production per Man-Day (Items 3 + Item 4)	13.1	15.6	119%

Note: *The mean total cost per hectare of constructing improved irrigation facilities is SR 5880 (See Table 5-2-6). It is assumed that this would be amortized at an annual rate of 10%, and so paid off in 10 years. Given the very favorable government subsidy provided for such facilities, this rate is actually quite conservative and it is possible that amortization could take place more rapidly.

** See Table 5-2-11 (a)

5-2-6 ANALYSIS OF IRRIGATION AND RELATED POLICIES

As shown in Table 5-2-5, there is a net need for irrigation of 6,179 to 12,583 M³/ha, or approximate mean need of 9,000 M³/ha. In the improved cultivation system, more than one harvest per year is expected, and so the actual annual requirement is projected as 1.5 times that amount. Further, the Net-to-gross conversion coefficient is 67%; the calculation may therefore be made as follows:

$9,000 \times 1.5 \div .67 = 20,000$; this is obviously a generalization (the actual volume depends on the crop, the geological and geographical category of the land, the location, and so on) but it serves for this purpose.

The maximum total of available water in the region is estimated at approximately $2,000 \times 10^6 \text{ M}^3$ (the exact amount is $1,973.9 \times 10^6 \text{ M}^3$; See Table 4-2-1(c)). Therefore, there is a theoretical maximum of 100,000 ha which can be extensively irrigated in the manner described above. It should be emphasized that this figure is both ideal and theoretical. It does not take into account water use for other purposes (domestic, industrial, non-intensive

agricultural use) nor does it apply to existing actual rates of water use even for land which is relatively intensely irrigated (but at a rate lower than 20,000 M³/yr). It also incorporates only existing sources of water and excludes, for example, agricultural use of desalinated seawater.

The conclusion here is that a greater return in terms of capital investment (as well as that of per worker productivity, as discussed in Section 5-2-5) is produced by maximizing the availability of water (up to 20,000 M³/yr.) to existing agricultural lands, rather than expanding the amount of land under cultivation.

5-2-7 ANALYSIS OF CROPPING PATTERNS AND RELATED POLICIES

The cropping pattern and the particular mix of agricultural products provided by the Southern Region are a complex function of many elements. The size of the population and the level of income are among the most important of these elements, but not the only ones. Further, these and other elements are subject to rapid changes which in turn affect the volume and pattern of crops to be produced.

The single most critical element is the future demand for agricultural products within the Southern Region itself and the nearby Mecca-Jedda-Taif Urban Belt. The demand is outlined in Table 5-2-15.

Table 5-2-15
ESTIMATED 1995 DEMAND FOR FOOD PRODUCTION IN SOUTHERN REGION AND MECCA-JIDDA-TAIF URBAN BELT
(1,000 ton/year)

Commodity	Domestic Demand in the Region in 1995	Domestic Demand in the Urban Belt in 1995	Total
Cereals - Total	426.0	822.0	1,248.0
Wheat	182.0	544.0	726.0
Sorghum/Millet	68.0	25.0	93.0
Others	175.0	253.0	428.0
Dates	87.0	57.0	144.0
Vegetables, Total	136.0	731.0	867.0
Fruits, Total	78.0	324.0	402.0

Note:

Demand Projections based on following assumptions:

a. 1995 Southern Region population estimated at 1652,600 (as average of high and low projection, Table 9-3-5).

b. 1995 Urban Belt population estimated at 5,100,000.

Source: 1973 ILACLO Report.

Another major element is the potential for maximizing production commensurate with the quality of land, the availability of water, and the need. The FAO has established an experimental station at Hakma to engage in field and pilot projects and obtain further information of this type. And even though greater food production is a national goal, it may be that long-range needs will be better satisfied by including other than food crops in future agricultural production. Cotton, for example, has shown promise in the FAO studies and may play a future role both as a crop and as a raw material assisting in industrial development.

In establishing future food demands, it is difficult to take into account all the variables relating to consumption. There is, for example, a greater variation between consumption in urban and rural areas than has originally been thought; this may be due to income levels, a difference in availability, differences in preferences, or simply the fact that rural households can be more self-sufficient and provide agricultural products for themselves without involvement in the market system. It nonetheless seems highly likely that the Mecca-Jedda-Taif Urban Belt is capable of consuming any surpluses of fruit and vegetable production that may come from the Southern Region. Already the Asir Sub-Region has the most favorable conditions of climate, and topography for growing of fruits and vegetables. It may be desirable to increase such production even further by engaging in high-intensity cultivation methods such as truck farming or greenhouses. This would accomplish a number of goals, including:

1. taking advantage of the nearest and economically most promising large market for high quality food crops.
2. Providing jobs of an appropriate level (high-intensity cultivation requires more work and greater skill than normal farming).
3. Helping to meet the goal of national self-sufficiency in food.
4. Helping to meet consumer needs by providing better quality, more nutritional crops on a year-round rather than seasonal basis.

In order to undertake such an effort successfully, it will be necessary to advance on several fronts, dealing both with problems within the agriculture sector (such as providing quality control of products) and with those outside it (such as transportation and distribution).

5-2-8 ANALYSIS OF NEED FOR CAPITAL INVESTMENT

As in all cases, it is necessary to pay attention to the ways that one element interacts with and supports another. For example, cultivation can support livestock raising by providing both highly nutritious feed materials (such as food concentrate based on soybeans and pulses) and sources for disposing of waste vegetables, stalks, and other unused parts of the crop.

The question which must be asked here concerns the desirability of making investments for capital development projects in agriculture, practically all of which would be for irrigation. The question can be answered with respect to several considerations.

1. Goal of increasing national self-sufficiency in food production. It is obvious that since there would be more than two and one-half times the production value from improved land over unimproved land, there is strong support from the national goal for investment. In general, increasing the amount of land with improved irrigation facilities is the single most important policy which could be adapted to promote greater domestic food production.
2. Mean annual cost of installing irrigation facilities. These costs are reasonable as a percentage of the expected return. Already the government has taken steps in the right direction by offering a 45% subsidy for such capital investments. It is important that this program be maintained and that the government makes certain that funds continue to exist and that the program is made known to all potential users.
3. Net annual value of production. There are two parts to this question: (a) is there an actual net increase in the production of crops? and (b) is that increase large enough so that income is made available to the individual farmer to carry on with his regular expenses and repay the loan at the same time? The answer to the first question is yes- Even taking the annual repayment (at a rate of 10%) into account, the increase in the value of the annual production is nearly two and one-quarter times that of unimproved land. The answer to the second question is yes in most cases. Certainly the amount of the increase is sufficient, but in some instances the time of the increase may be delayed. The establishment of irrigation facilities may make it desirable to change the cropping pattern, and the changeover may cause a delay in the income that the farmer would ordinarily expect.

Hence it may be necessary to institute a program to provide temporary financial assistance to persons with such needs.

4. Mean annual worker demand. Although Table 5-2-1(a) shows that there will be an increase of 186% in the number of man-days required per ha, this does not mean that there will be the same increase in the demand for the number of workers. This number will remain fairly constant, based upon (a) greater general efficiency due to modernization and mechanization, and (b) greater per worker efficiency due to higher skill levels, and more effective use of time. All of this means that the advantages of improved irrigation can be seized even if the number of workers in the agricultural sector does not increase.
5. Mean annual value of production. This sums up the previous criteria, both those which produce economic advantages and those which cause greater expenses. It is shown that there will be a net increase of nearly one and one-fifth of the value of production, which is a sufficiently large figure to justify the investment in improved irrigation facilities.

To maximize the potential increase just described, the government must undertake several efforts, including the following:

1. Continuing the 45% subsidy policy and making certain that funds are available for this use.
2. Making certain that the knowledge of the availability of the subsidy is known to all who may be able to take advantage of it.
3. Including provisions in loan policies to provide additional financial assistance when a desirable undertaking requires it. For example, a farmer may wish to change from cereal production to fruit trees as a result of new irrigation facilities becoming available. But while cereals produce a crop (and thus income) annually, fruit trees require seven to ten years to begin production. Because the eventual result is desirable, money should be made available to support the farmer during the interim period.
4. Using careful management and planning in the field of agricultural development. Policies must be designed to optimize production with regard to (a) greatest potential of the given land, (b) the appropriate mix of crops at the national and local level, (c) the availability of transportation and distribution systems (d) the availability of storage facilities or secondary industries and their ability to use the particular agricultural product. (e) consumer preferences and demands, and

5-3 POLICY FOR SUB-REGIONS

5-3-1 GENERAL ISSUES

There are a variety of conditions which must be met in order to establish a satisfactory agricultural system. Among them are:

1. A suitable climate with no extremes of temperature
2. A satisfactory topography, with the land free from large numbers of steep hills, boulders, and so on.
3. skilled agricultural workers
4. Fertile soil
5. water

Those parts of the Southern Region presently under cultivation have already met the first three criteria, and to a large degree have met the fourth one as well. For those areas where the soil is insufficiently fertile, or where its nutrients have been depleted by excessive use, the solution is fertilization. Most modern fertilizers are based upon petroleum, phosphates, or nitrates, all of which are available within the kingdom. Thus the most important element for developing agriculture in the Southern Region is water. The potential and actual resources for water and the agriculture development policy which follows from them are listed below by sub-region:

- 5-3-2 Asir Sub-Region
- 5-3-3 Wadi Quad "
- 5-3-4 Najran "
- 5-3-5 Thama "

5-3-2 ASIR SUB-REGION

Some of the most rapid and intensive development of irrigation systems will be expected to take place in the Asir Sub-Region. The consequence of this will be a transition of production from those crops associated with dry farming, such as cereals, to high value crops. Fruit trees seem particularly well suited, and there is likely to be a substantial demand (both domestically and abroad) for high-quality fruit, and although fruit trees require seven to ten years to reach their full production ability, they will continue to produce thereafter for decades. Because there is plentiful and regular rainfall in certain areas of the sub-region, it is possible that some vegetables requiring much water can be cultivated without extensive irrigation facilities. This would be a desirable use for parcels of fertile land too small and isolated to make capital investment worthwhile.

It is estimated that the annual value of crops produced in the sub-region will be SR 150,000; this includes both irrigated and non-irrigated land. Because of the good climatological and geological conditions and the proximity of the urban belt markets, it would be desirable to concentrate on crops of the highest value (fruits and vegetables) and to construct irrigation facilities as intensely as possible. In some instances, two harvests per year may be obtained.

5-3-3 WADI QUADRANGLE SUB-REGION

The Wadi Quadrangle Sub-Region varies from the Asir Sub-Region in several ways related to agricultural potential. It is generally hotter although it also has a wider temperature variation; it receives more solar radiation; its soil is less fertile, more permeable, and more affected with high concentrations of salinity; and it receives much less water. In addition, the water which it does receive, is likely to be concentrated in a very few heavy storms per year. There is a problem of soil erosion from both flooding and wind. There is sufficient ground water for wells, but the largest volume of water annually received is from rainfall collected in Wadi Bisha.

Several of the techniques now in use show possibilities for expansion. Dates have been of high quality and profitable. The idea of planting vegetables beneath date trees is a good one. The two crops do not compete for the same types of soil nutrients, and the trees offer some protection against solar radiation to the lower crops. This should be expanded to include a regularized tree planting pattern over a larger area so that protection against wind erosion is provided as well.

A problem exists in that crops must generally be planted close to the Wadi Basins to obtain water, but they are often damaged or washed away when flooding occurs. Consideration should be given to a system of dikes to protect cultivated areas, or to channelizing the Wadi Basins. In general, however, such projects should be of lower priority than irrigation facilities because of the benefit/cost ratio.

5-3-4 NAJRAN SUB-REGION

Many of the conditions of heat and aridity described for the Wadi Quadrangle Sub-Region exist for the Najran Sub-Region as well; there is even less water to be obtained from flooding and less arable land. Thus the existing arable land should be more intensely used. This means greater irrigation (which must be provided from wells and aquifers) and greater cultivation of high-value crops at the expense of reducing the amount of land used for low-yielding date trees. New techniques of water storage (such as underground tanks or recharging of aquifers from Wadi run-off) should be investigated. The Najran Sub-Region is unlikely ever to be as productive as the Asir Sub-Region, but with application of these techniques, it can show a high percentage increase, perhaps as much as a four percent mean annual growth.

5-3-5 TIHAMA SUB-REGION

The Tihama Sub-Region offers the possibility of eventually having 80,000 ha of land under intensive irrigation. It must be emphasized, first that this is an eventuality which is dependent upon the successful and economical development of seawater desalination facilities; and second, that such development must be done in accord with a comprehensive plan which analyzes the relative advantages of money-producing crops (such as cotton) and crops which contribute to food production. Similarly, even if the cultivation is to be directed largely toward food purposes, it must be determined whether it is preferable to grow crops for human or for animal consumption.

The existing cropping pattern consists of 90% sorghum (which is primarily used for animal feed) and millet (50% of which is used for animal feed) so that in the aggregate more than two-thirds of the crops are used for animal feed. This and the projected increase in the demand for animal feed by 1995, suggest that it would be appropriate to continue this line of production; conversely, the better quality soil and climate of the Asir Region would be most productively used for fruits and vegetables.

Even though this means that the Tihama Sub-Region would continue to concentrate in animal food production, there would be several changes. One would be a shift away from sorghum and millet to alfalfa which, although it requires more water, provides more of a usable crop. Another would be the expansion of the amount of land used for fodder production. (This is in contrast to the policy applied to most areas of increasing the intensity of cultivation rather than increasing the amount of land used.) The progress of these and other elements would depend heavily upon the rate of increase in water resources.

CHAPTER 5 NOTES:

1. Kingdom of Saudi Arabia, Ministry of Planning:
Second Development Plan, 1395-1400 AH/1975-1980
AD, Chapter 1.
2. Ibid.

6. development policy for livestock raising and fishing

6-1 GENERAL FRAMEWORK

Livestock raising and fishing are sub-areas of agriculture which merit special attention because of their potential to assist in meeting the needs of the southern region.

6-1-1 GENERAL ANALYSIS OF SETTLED LIVESTOCK RAISING

At present, there are approximately 88,000 head of cattle, 656,000 sheep, 701,000 goats, and 118,000 camels in the region. These are kept mostly in small flocks, as large-scale breeding has not succeeded. The cattle tend to be small, and the production is highly subject to variations in climatic conditions, such as the drought of 1388-90. Part of the reason that the number of cattle is substantially less than the number of sheep and goats is the ability of the latter to obtain forage for themselves more easily. It is noted that most of the southern region's cattle are concentrated in the coastal plain in Tihama, where they are fed largely on sorghum grain, straw, and stalks, but that the production of such valuable green fodder as alfalfa is limited generally to the Wadi basins and highlands of the other sub-regions.

About 20% of the cattle are owned by settled farmers, who feed them alfalfa and grass as well as turning them out to pasture. Barley and clover are occasionally fed to animals which have to work particularly hard or produce milk. The remainder are owned by semi-settled farmers, who remain in the vicinity of water supplies around the villages during the dry season but who wander to forage during the wet times of year. They may engage in the casual cultivation of hay on semi-desert rangelands.

The system of cattle raising is not very advanced. Sick animals are treated by feeding grain or by giving them certain herbs in accord with traditional remedies. The production of meat is not maximized, since the market system offers no incentive to fatten cattle before sale.

6-1-2 GENERAL ANALYSIS OF NOMADIC LIVESTOCK RAISING

Herders generally measure their wealth by the number of animals they own rather than their quality. They thus try to maintain as large a herd as possible, slaughtering or trading them only as absolutely necessary. This puts a rather severe burden on the scanty natural vegetation that exists in most rangelands in the region.

The prospects of settled farming are not attractive to the nomads. The general level of agricultural income is low, and the desire to wander is strong. Their goats, sheep, and particularly

their camels, are able to forage successfully on land unlikely to support anything else without extensive development. It is the Kingdom's policy to encourage the permanent settlement of nomads, but this should be done by a system of incentives and a demonstration of the advantages of settlement. It may be desirable in this regard to establish a system of schools to reach the children of the nomads.

The nomadic culture has, to a certain extent, been a useful means of making use of otherwise unproductive land. But some circumstances, overgrazing has resulted in the destruction of drought-resistant perennial plants and their replacement with annual plants that provide grazing for only a few weeks during the rainy season and which are less hardy.

A severe problem is the loss of foraging areas during times of prolonged drought. In the drought of 1388-90, for example, it is estimated that losses amounted to 80% of the normal production. In such cases, losses tend to be highest in limestone and marl soils, where permeability is slight and run-off and evaporation high. It is less in sand and Wadi basin areas, where subsoil moisture may be contained somewhat.

In improving the welfare of the people of the southern region, it is clearly necessary to confront these problems. It is important, however, that proper attention be paid to the culture, traditions, and social structure of the people to minimize the negative effects of settlement and other policies.

6-1-3 NATIONAL DEVELOPMENT OBJECTIVES AFFECTING LIVESTOCK RAISING AND FISHING

Both settled and nomadic livestock raising are affected by the current five-year national development plan. The objectives of the plan relating to livestock raising (as well as other elements of agriculture) are as follows:

1. To raise the per capita income and improve the standard of living of the rural people.
2. To minimize the kingdom's dependence on imported foods and other agricultural products.
3. To release surplus labor for employment in other areas.

6-1-4 NATIONAL POLICY CONCERNING LIVESTOCK DEVELOPMENT AND FISHING

The essential national policies for accomplishing the aforementioned objectives are as follows:

1. To encourage private enterprise in food production, processing, and marketing with government intervention to occur in those activities where private entrepreneurs are unable

- or unwilling to become involved.
2. Establish and implement a reasonable balance in the allocation of resources between rural or agricultural activities and to urban commercial or industrial activities.
 3. Plan carefully for the use of water resources, particularly those which are depletable.
 4. Work for a high degree of self-sufficiency in the production of farm implements and machinery, seed, fertilizer, and other materials used in agricultural production.
 5. Encourage private sector development of facilities required for food processing, marketing, and distribution.
 6. Encourage the development of associations, cooperatives, and other organizations of producers to assist them to achieve stability and increase their production.
 7. Encourage foreign development in the agricultural sector of the economy by providing the same guarantees as those provided for the industrial sector.
 8. Encourage provision by the private sector of the physical infrastructure required for agricultural production.
 9. Undertake to increase the credit available from government and private sources for the further development of agriculture, livestock production, forestry, and fishing.
 10. Provide economic incentives as necessary to stabilize prices, support farm incomes, and otherwise assist agricultural activities.

6-1-5 NATIONAL POLICY IMPLI-
CATIONS FOR THE SOUTHERN REGION IN THE
AREA OF LIVESTOCK
RAISING AND FISHING

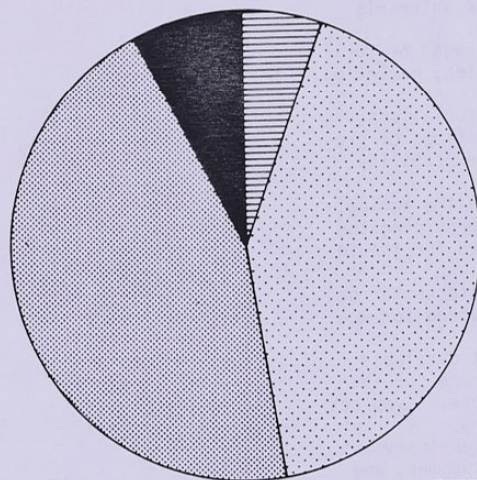
1. Studies should be undertaken to determine what areas lend themselves to what types of use. The Asir Sub-Region for example, has the largest area suited for livestock grazing and ranging in the region (100,000 ha in Asir 300,000 in the region as a whole.) Further, the amount of infrastructure necessary to provide rangeland is considerable less than that needed for more intense types of activity. Attention in planning must be paid to the best use of this resource.
2. In improving agricultural output, it is also necessary to improve the supply of materials required for agricultural production. The southern region is not well developed in this respect. Fertilizer production, for example, is connected with the hydrocarbon industry in the eastern region of the Kingdom, and machinery is provided entirely by importing from abroad. It appears that, rather than attempting to attract major producers of farm-support materials to the southern region, it would be more feasible for the present to improve port and transportation facil-

- ities to expedite their shipment. With the eventual increase in the supply of desalinated water, the electrical production capacity, and other elements, the long-range prospects for establishing such production facilities are good. The most critical element regarding livestock raising is the availability of high-quality nutritious fodder and concentrate for animal food.
3. Government intervention in the improvement of livestock quality is needed. The climatological and other conditions in the Asir region are excellent for development of a livestock raising system of internationally recognized excellence, but this potential has been unrealized. Such improvement may take the form of importation of frisian bulls for breeding with existing stock to provide the best qualities of hardiness with production of milk and meat.
 4. Expansion of certain underdeveloped elements of livestock raising and related activities is called for. These include poultry raising, which shows promise for expansion into the urban and semi-urban areas, and honey production by the adoption of modern techniques.
 5. While the government has undertaken several admirable steps to encourage further development of livestock raising and related areas, there is need for additional action. For example: (a) expansion of price subsidy program, (b) Provision of additional technical assistance. (c) greater promotional and public relations work concerning existing and future policies and opportunities. (d) direct action, particularly in new and expensive projects (such as importation of bread stock) (e) establishment of educational and training facilities as well as pilot projects. (f) additional experimentation to maximize productivity.
 6. Emphasis on high-skill, high-technology, high-productivity forms of livestock raising. Dairy Farming is an excellent example. The government must involve itself in all areas of this process, from the initial pilot projects to financing of new technology and capital facilities to the monitoring of production once it is underway.
 7. Development of processing, storage, transportation, and distribution facilities so that livestock products are used most effectively and beneficially.
 8. Special emphasis on fishing, including (a) modernization of the fishing fleet through mechanisms described above. (b) modernization of the port of Jizan. (c) development of processing, transportation, and distribution



75% CAMELS

CATTLE 5.5%



45% GOATS

SHEEP 42%



total number of livestock 1,563,000

FIGURE 6-1-1
LIVESTOCK
IN THE REGION
1975

facilities for fish products. (d) promoting greater consumption of fish.

6-2 POTENTIAL FOR FUTURE DEVELOPMENT OF THE REGION

6-2-1 ACTIONS FOR IMPROVEMENT OF LIVESTOCK RAISING

The following are among the actions which should be undertaken to improve the system of livestock raising.

1. Improve pasturage methods. Pasturing on cultivated ground is by far the cheapest means of feeding cattle, costing one-sixth as much as concentrates, one-third as much as hay, and one-half as much as silage. Alfalfa is one of the best crops for this purpose, although it is a heavy user of water. Sorghum and millet are satisfactory also, although they must be rotated annually because they remove so many nutrients from the ground. In allocating water and water delivery systems, foraging lands should receive an appropriate amount of irrigation.
2. Improving native rangelands. It is still possible to repair the damage and destruction that was done to the perennial plants in the rangelands. This is likely to continue to be a major source of livestock feeding, and good management techniques must be applied to prevent a recurrence of the damage. It is estimated that an improvement program could raise output by fifty to sixty percent.
3. Development of improved methods of slaughtering, processing, and cold storage. This process is discussed in Chapter 7-3.

6-2-2 ALTERNATIVE FOOD SUPPLIES

There is a potential problem in that most of the sorghum and cotton seed is produced in the Tihama sub-region and most of the alfalfa and green fodder is produced in the other three sub-regions. Attention must be paid to avoiding an imbalance in the supply system and to producing a complementary system of production. A possible means of supplementing this system exists in the utilization of vegetable by-products. Use of leaves, roots, and surplus or damaged vegetables might increase the supply of fodder by 20%. Still another possible new resource is the use of cottonseed cake which can be easily made from the by-products of cotton milling.

6-2-3 OPPORTUNITIES FOR DEVELOPMENT

Table 6-2-1 indicates the actual 1975 volume of livestock products.

- The following areas warrant particular attention.
1. Intensive sheep raising and fattening appears to be a good opportunity in the Tihama, Najran, and Wadi Quadrangle sub-regions.
 2. Dairy farming appears to be a good opportunity in the Asir sub-region.
 3. In both instances, selective breeding and genetic improvement activities should be undertaken to improve desirable qualities of the livestock.

Table 6-2-2 indicates the 1975 (actual) and 1995 (projected) demands for meat products.

It is seen that the present level of production amounts to only 50% of the national demand, and only 27% of the projected 1995 demand. Given the Kingdom's policy of attaining self-sufficiency in food and the southern region's resources for agricultural production, this is an area deserving of much attention. The traditional subsistence level of farming is insufficient to meet the need, and development of larger-scale commercial livestock raising is necessary.

Table 6-2-1
VOLUME AND VALUE OF LIVESTOCK PRODUCTION, 1975

Commodity	Volume (tons)	Value (SR x 1000)
Beef/Veal	60,000	36,000
Mutton, Lamb and Goat		--
Poultry	Negligible	
Milk	60,000	12,000
Eggs	Negligible	--

6-2-4 COMMERCIAL STOCK
RAISING AND DEMAND
FOR ANIMAL PRODUCTS

In connection with the generally rising standard of living in the Kingdom, the consumption of meat has been increasing in recent years. The mean annual per capita consumption of meat is 18 kg, higher than the mean for either African or Asian countries. This demand will continue to increase, largely as a function of:

- Increase in population
- Increase in average income and elasticity of income
- Increase in the number of pilgrims.

Table 6-2-2
PROJECTED DEMAND FOR MEAT AND DAIRY PRODUCTS
IN PRINCIPAL MARKET AREAS (1995)
(1,000 tons/yr)

Commodity	Demand in Region	Demand in Mecca-Jedda-Taif Urban Area ^b	Total
Beef and Veal	6.8	59.0	65.8
Mutton, Lamb, Goat	35.8	117.0	152.8
Poultry	4.6	54.0	58.6
Other	18.0	52.0	70.0
Total Meat	65.2	282.0	247.2
Fats and Oils	17.9	89.0	106.9
Whole Milk	102.2	67.0	169.2
Skim Milk	1.2	84.0	85.2
Eggs	4.6	44.0	48.6

Notes:

- Based on estimated population of the Southern Region in 1995 of 1,652,600 (average of high and low projections, Table 9-3-5).
- Based on estimated population of the cities of Mecca, Jeddah, and Taif in 1995 of 5,100,000. From ILACO Report, 1973.

6-2-5 AGRICULTURAL SUPPLY
INDUSTRY

As demands for livestock products increase, the need for innovative methods of growing and feeding them exist. In some instances, this supply sector can be merged with other commercial or agricultural activities. For example:

- Oilseed cake, often used as a supply of protein in sophisticated livestock producing systems, can make use of by-products of cotton milling (cotton seed).
- Roots, stems, leaves, and waste or surplus vegetables can provide as much as 30% of the cattle feed required, and can coincide with the increased production of vegetables for human consumption.
- Breeding and other experiments to produce a higher quality of stock can take place concurrently with the agricultural training programs described earlier.

6-2-6 POLICIES NECESSARY
TO ENCOURAGE AGRICULTURE
AND LIVESTOCK
RAISING

The government must continue its policies of providing subsidies and incentives for the increased production of agricultural products. Subsidies on the "input" side should include assistance in capital facilities, such as major equipment purchases and the construction of irrigation facilities. Subsidies on the "output" side include assistance to reduce the cost of land, labor, and marketing, which will also assist in attracting new investment from outside the region.

Subsidies will also assist in the development of products which are important, but which do not produce an immediate return. For example, fruit trees will provide a source of nutrition much needed in the nation, but they may require ten years or more to mature. Encouragement in this area of agriculture will require government assistance.

6-3 POTENTIAL FOR DEVELOPMENT
OF LIVESTOCK
PRODUCTION AND RELATED
ACTIVITIES

6-3-1 ASIR SUB-REGION

The following show possibilities for development:

- Vegetable production, including alfalfa and vegetable by-products that can supply fodder for livestock.
- Pasturing of cattle on rangelands.
- High-intensity dairy farming.
- Poultry production, particularly in the highlands.
- Beehive and honey

6-3-2 WADI QUADRANGLE
SUB-REGION

The following show possibilities for development:

- Alfalfa production.
- Sheep and goat production on rangeland.
- High intensity livestock production in specific areas.
- Slaughtering and processing of meat, hides, and related products.

6-3-3 NAJRAN SUB-REGION

Similar to Wadi Quadrangle. Sheep and goat production show the most promise.

6-3-4 TIHAMA SUB-REGION

The following show possibilities for development:

- Wide variety of high-intensity farming, due to favorable climate.

2. Meat packing and processing (of particular promise due to easy transportation by water to other parts of the Kingdom and abroad).
3. Fishing and fish processing.

6-4 FRAMEWORK FOR FISHERY DEVELOPMENT

6-4-1 GENERAL ANALYSIS OF EXISTING CONDITIONS

There are about fifty small villages in the Tihama District, ranging along the coast from Al Qunfidhah to Jizan itself, that draw their livelihood chiefly from fishing. Jizan has about 350 fishing boats, with about 1,000 men employed, making it second only to Jeddah in the volume of fishing done in the Red Sea [1].

The major parameters of fishing are as follows:

1. Location. Fishing is confined largely to an area between the coast and the set of coral reefs known as the Farasan Bank, about 40 km offshore. This is a rich fishing ground with numerous varieties which has not yet been exploited to full capacity. Modern, high-intensity fishing technology allows for up to 40 kg/ha to be harvested, while only about 1.6 kg/ha are presently being obtained. However, there are excellent possibilities in waters that are deeper or farther away. These have thus far been inaccessible due to the small and primitive types of boats that are commonly used.
2. Boats. Of the 350 boats operated out of Jizan, fewer than ten are mechanically powered by in-board motors. The remainder rely upon small outboard motors, sails and oars. Typically boats range in length from 6 to 15 meters and are constructed of wood which is imported from Ethiopia or the Sudan. The expected life of a wooden boat is only 5 years, so that it would be desirable to introduce hulls constructed of plastic or fibreglas. While such hulls cannot be constructed locally as the wooden ones have been, they can be repaired without difficulty. Thus new hull materials and mechanization are desirable improvements in this regard.
3. Techniques. A variety of methods are used for catching fish, from nets to traps to hook and line. Possible improvements here would include new materials of greater strength, greater resistance to rot and deterioration, and lighter weight. In addition, a variety of new techniques deserve exploration, such as additional

mechanization, refrigeration compartments for storage, and sonar fish-finders. Certain other techniques, such as garths or spearing of fish, have worked reasonably well on a small scale but can be used only at certain times and in shallow water, and thence have little promise for expansion.

4. Productivity. The annual harvest amounts to about 1,500 tons of fish, composed mostly of sardines (pilchards), sea bream, shark, barracuda, emperor fish, and several types of cod, along with octopus and lobster. This is taken from a fishing ground of about 10,000 km².
5. Employment. Nationally, about 18,000 persons are employed in commercial fishing activities, with an aggregate income in excess of SR 3 million. In addition, there are an undetermined number of part-time fishermen who engage in agriculture during the rainy season and fish when it is dry.

Among the steps that should be taken in the development of the fishing industry are the following:

1. Organization of the fishing trade into cooperatives or similar groups to provide a base for development of the industry.
2. Government incentives and subsidies for the purchase of a more modern fleet, particularly larger boats that can go out farther and remain out longer.
3. Updating of equipment and techniques.
4. Development of markets.
5. Development of processing and transport systems.

6-4-2 MARKETING OF FISHERY PRODUCTS

At present, fish are sold either directly from boats or at the wharves or in local markets. A lack of modern refrigeration techniques prevents marketing at greater distances. Yet it is in distant markets, such as the Mecca-Jeddah-Taif urban area, where the greatest potential exists for expanding markets.

As in the case of livestock, future increases in demand will be affected by:

1. increase in population;
2. increase in income and elasticity of demand;
3. increase in the number of pilgrims.

It is estimated that the potential demand may be as high as 52 tons/yr. for the urban belt and 80 tons for the Kingdom as a whole. This is more than 20 times the present level of production.

The central element of this problem is preserving of the fish until it can be transported from the

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boat to the shore, from the shore to the market-place, and thence to the place of consumption. The nature of fish, particularly in hot climates, is to deteriorate rapidly after death. Unless properly treated, it may become unfit to eat within a few hours.

Of the methods of retarding spoilage, refrigeration appears to be the most desirable. At present, this is done simply by placing fish in a box with a volume of ice, but this is limited to a day or so in effectiveness. Attention should be paid to encouraging use of small mechanized refrigeration systems aboard the fishing boats.

6-5 POSSIBILITIES FOR THE IMPROVEMENT OF FISHING METHODOLOGY

6-5-1 IMPROVING ECONOMIC CONDITIONS

There are certain economies of scale involved in fishing; that is, increasing the production of fish will serve several desirable objectives:

1. Meeting a greater portion of the national demand.
2. Lowering the per unit cost to consumers as a result of lower per unit production costs.
3. Providing a greater income to the fishing industry to support modernization and new equipment.
4. Stabilizing income to the industry to provide greater ability to withstand variations in the volume of the catch.
5. Greater productivity of fishing grounds through coordination and cooperation.

Several organizational needs exist. These include:

1. A mechanism for government assistance and private investment.
2. A means of coordinating fishing operations and training.
3. A means of stabilizing production and improving the regularity of output.
4. A means of supporting processing and marketing systems.

6-5-2 TECHNIQUES FOR INCREASING PRODUCTION

Several steps are involved in the orderly expansion of equipment and facilities and the utilization of more intense fishing techniques. This process will maximize the rate of increase and will allow a gradual exposure to and preparation for modernization.

1. First step. More intensive use of existing

techniques such as blanket fishing and dragnet fishing.

2. Second step. Medium-level net and trawl fishing, farther out.
3. Third step. Large-scale deep-sea fishing.

It is important that as primary functions are expanded, supporting activities are increased as well.

6-5-3 CLIMATIC AND OCEANOGRAPHIC CONDITIONS

In general, climatic conditions are excellent. The temperature is fairly consistent and warm, the wind is fairly low except for certain stormy periods in the year which are predictable in advance. There are no severe tides or currents. The calmness of the water is partly due to a series of coral reefs extending to about 40 km off the coast; these tend to protect the shore. However, they cause a problem of navigation. The charting of the offshore area should be a major priority.

6-5-4 FISHERY PRODUCTS AND THEIR PREPARATION

Fish may be used in a variety of ways, including:

1. Fresh fish. Satisfactory if used within a few hours of being caught.
2. Dried, salted, or smoked fish. Traditional means of preservation.
3. Frozen or canned fish. Require more modern facilities.
4. Fishmeal or fishpaste. A means of preserving protein products of fish.

The first two are means available to those areas without modern systems and are useful only on a small scale. The latter two, particularly canning, are necessary if fish products are to be used widely within the Kingdom or exported abroad.

6-5-5 RECREATIONAL FISHING

The pleasant coastline of the southern region offers many recreational opportunities. Jizan and the Farasan Islands are potential locations for sport fishing for shark, barracuda, mackerel, bonito, and other game fish. Boating, skindiving, and other possibilities are discussed in part of Chapter 8 dealing with tourism.

6-5-6 OTHER FISHING PRODUCTS

The possibilities of using fish products as a protein supplement to cattle feed, as fertilizer, or for other commercial uses should be explored.

CHAPTER 6: NOTES:

1. Report of the Central Coast Guard Office, Jeddah, 1971.

7. development policy for industry

7-1 GENERAL FRAMEWORK
FOR INDUSTRIAL DE-
VELOPMENT

7-1-1 GENERAL DESCRIPTION
AND OPPORTUNITIES
FOR DEVELOPMENT

Industry is not well-developed in the southern region. Existing activities are limited to small-scale facilities and cottage industry engaged in ice making, manufacturing of construction materials, and food processing; they are largely restricted to the cities of Abha, Khamis Mushayt, Bisha, and Jizan.

Among the reasons for this situation are:

1. Lack of hydrocarbon resources in the region.
2. Remoteness from major urban areas where most of the skilled labor and markets are.
3. Lack of sufficient skilled and semi-skilled labor.
4. Historical agricultural and rural orientation.
5. Lack of sufficient water.
6. Lack of sufficient energy resources.
7. Lack of raw materials.
8. Lack of transportation and distribution facilities.

The time is now ripe for industrial development, however, and the region should begin to make use of its advantages, which include:

1. The highest available ground water resources in the nation.
2. A potential for substantial volumes of desalinated seawater in Tihama.
3. Availability of agricultural products as a resource for industrial activity.
4. Improved seaport facilities at Jizan.
5. Generally good climatological conditions, especially in Asir.
6. Availability of certain important raw materials, such as the components for cement.
7. The national policy of supporting industrialization.

It appears that industry related to agriculture and to construction offers the greatest opportunity.

7-1-2 NATIONAL OBJECTIVES

The national objectives for industrial development are as follows:

1. To diversify the industrial base of the Kingdom to promote greater self-sufficiency and freedom from external disruption.
2. To increase employment and income.
3. To sustain the present high level of growth in the construction industry.
4. To expedite the expansion of the construction

7-1-3 NATIONAL INDUSTRIAL
POLICY

industry, including procurement of foreign resources.

The primary policies derived from these objectives are:

1. To focus the development effort on:
 - a. Hydrocarbon based industries and others in which the Kingdom has a comparative economic advantage,
 - b. Industries that are essential to national security and well-being, and
 - c. Appropriate regional manufacturing activities that will increase the employment and income of the citizens of the Kingdom.
2. To expand and equalize the distribution of hydrocarbon-related industrial activities, including:
 - a. Expansion of oil refining capability.
 - b. Expansion of natural gas facilities in the eastern region.
 - c. Construction of pipelines to the central and western regions.
 - d. Construction of new facilities to manufacture petrochemicals, fertilizer, and steel and aluminum products.
3. To expand those facilities necessary for general growth and modernization, including:
 - a. Cement producing facilities
 - b. Agricultural implement and irrigation equipment plants
 - c. Processing facilities for agricultural products, and
 - d. Household and essential consumer goods.
4. To provide assistance to the construction industry in the form of administrative guidance, promotion of new technology, and financing and credit help.

7-1-4 NATIONAL POLICY IMPLI-
CATIONS FOR SOUTHERN
REGION

The following are among the key implications of the national objectives for the southern region:

1. In light of its natural advantages, the southern region offers a number of possibilities for the processing of hydrocarbons and the manufacture of materials from them. The improved port facilities at Jizan and the pipelines now under construction will assist in the transport of unrefined hydrocarbons. Such activity is already underway, with a storage facility completed and a refinery in the planning stage at Jizan.
2. The national plan calls for a ten-fold increase in cement production in the coming five years. By 1985, it is hoped that 3000 tons per day will be produced. Limestone, clay, gypsum, and water are all essential to cement making and are relatively plentiful in the southern region. Further, it is expected that the electricity production capacity will expand as

well. Therefore this is another major opportunity for development in the southern region, particularly Tihama, Asir, and the Farasan Islands [1].

3. The aforementioned advantages in the agricultural and industrial sectors combine to present an excellent opportunity for agro-industry. This serves several goals, including:
 - a. The ability to start on a low level and expand as resources become available.
 - b. Compatibility with traditional activities.
 - c. Assistance in meeting the national goal of self-sufficiency in food.
4. While it is unlikely to become an immediate reality, the southern region is well-situated to become a center of manufacturing of agricultural equipment. It is closest to the main future markets of tractors, irrigation equipment, and related items; the expected 1995 demand in the southern region for tractors, for example, is 6000. Plans should be undertaken to maximize opportunities in this sector and to develop assembly plants if not complete and independent factories.
5. Attention must be given to the expansion of existing industrial activities, such as the making of doors, concrete block, and other items. They require little skilled labor, electricity, or water and can thus expand while placing little demand on these scarce resources. These and other "cottage" industries can help to provide employment and produce useful materials.

7-2 INDUSTRIAL POTENTIAL AND POLICY FOR THE REGION

7-2-1 ANALYSIS OF EXISTING CONDITIONS

Existing industries in the Region are, in fact, far from development. Table 7-2-1 summarizes the recent situation of industries in the Region in terms of the number and the kind of establishments.

The Region is not blessed with petroleum resources and this seems to be less favorable for industrial development. However, this can be attributed to the problem of transportation linkage, that is, poor connectivity with major sources of raw materials. Although road construction and improvement have been programmed and intensively under way, it will take some more time to complete the trunk ends.

Another basic obstacle to industrial development would be the shortage of surface water, and the level of underground-water is falling as a result of use of water by growing towns and farms.

Of the region's population, roughly 13% are estimated to be engaged in urban pursuits and marine activities. Although some local people engage in handicraft production, three kinds of prevailing industry in the region are; manufacturing, construction and marine enterprises-notably fishing. Miscellaneous activities such as food processing and dates packing are operating but on a small scale generally in households.

From this information, the following generalizations can be made concerning opportunities for industrial development in the Southern Region:

1. Small-scale service and manufacturing centers, to be located around the urbanized areas. Particular activities which show promise are:
 - (a) automobile service, repair, and maintenance shops
 - (b) foundries and metalworking shops
 - (c) bakeries
 - (d) factories for construction materials, beginning with very basic items (brick, concrete blocks, and so on) and expanding eventually into more complex and sophisticated materials (doors, roofing materials, windows, and so on). Generally such industries should be situated near population centers but not in the central area of cities; they are rather suited for the periphery
2. Mining and mineral extraction is already under way in small scale operation, the saltmines around Jizan being the best example. Other opportunities will exist, although the report specifying mineral resources has not yet been completed. It is likely that large volume, low-grade materials (phosphates, nitrates, sand, rock for construction) will be the first to be exploited although good possibilities exist for metallic ones. Once developed, these will be producers of very high-grade materials, with opportunities for smelting plants, mills, and related industries.
3. The construction industry has an excellent potential due to (a) the high level of economic activity in the Kingdom and (b) the availability of building materials in the Southern Region. Attention must be paid to efficiency, cost-effectiveness, and long term maintenance of activity, as well as the development of appropriate new construction technology. Pre-fabricated buildings are not

- recommended everywhere because of cost, and aesthetic reasons as well as the local supply of materials and a time-proven system.
4. Agro-industry should develop as agricultural output increases. Opportunities exist both for (a) large-scale processing of major crops and (b) production of fertilizer, implements, feed concentrate and other items for agricultural use.

Table 7-2-1
INDUSTRIAL ESTABLISHMENTS IN THE SOUTHERN REGION (1975)

Activity	Location	
1. Essential Oils	Abha	6000 Gram Rose Oil, 1000 Litres Perform, 10 Tons Honey/year
2. Ice	Jizan	100 units/day
3. Ice	Bishah	100 Units/day
4. Windows, Doors and Furniture	Khamis Mushayt	1160 Units/day
5. Windows, Doors and Furniture	Khamis Mushayt	1160 Units/day
6. Tiles and Brick	Bishah	100 Square Tiles, 2000 Bricks, 50 Metric ton 50 Sinks/day
7. Aluminum Doors and Windows	Khamis Mushayt	7500 sq. m/year
8. Iron Doors and Windows	Jizan	120000 kg/year

Source: List of Industrial Projects Existing and Under Implementation in Saudi Arabia up to the beginning of 1975, Industrial Studies and Development Center.

7-2-2 GENERAL POLICY FOR INDUSTRIAL DEVELOPMENT

The strategy to develop manufacturing industries must be based on an economic exploitation of the available resources. In the Southern Region industrial development has to start practically from scratch. The less favourable circumstances in the Southern Region form an extra restraint on the industrial development. Assuming that neither mining nor quarrying will be of great importance in the future, the main resources for industrialization in the Region are agriculture (including animal husbandry and fisheries) and manpower. Both resources have their limiting factors for the rapid growth of a manufacturing industry.

The development of these resources only is not enough to promote industrialization of the Region. The industrial development plan should also aim at creating a propitious industrial climate or, in other words, a social climate that encourages entrepreneurs to start manufacturing activities. At the same time, it should be stimulated to transform the artisan industry, which prevails in the Region, into small factory industry.

In summary, the development of industrial activities (other than agro-industry) should be based on the following:

1. Training of available manpower. Since the expectations for an autonomous growth of the manufacturing industry in the Region for the next twenty years are not high, the number of laborers in the manufacturing and construction industries will not increase substantially. The skill of these industrial laborers has to be improved during the coming years so they can become the backbone of a further expanding secondary sector.

Roughly estimated a sound regional manufacturing industry will require 5,000 skilled laborers in 1399/1400. This development of an industrial labor force asks for:

- a. training schemes for semi-skilled and skilled labor and
- b. training courses for supervisory personnel, managers and entrepreneurs.

The requirements for such training include a variety of formal programs, such as:

- (a) vocational training schools as a continuation of the regular public school facilities,
- (b) adult training centers to explain new

techniques, and (c) field training programs in which experts go to the shops and factory areas and teach short courses to the workers. It is estimated, however, that these formal programs would reach no more than 5% of the industrial population, and so additional techniques should be developed. For example, a senior skilled artisan might receive a small stipend to have several young men assigned to observe, assist, and learn from him. Exchange programs should be developed so that workers from one factory could visit another and learn new ideas. It may also be desirable for the Government to set up experimental or pilot industrial facilities, similar to those described for agriculture, to promote new ideas and opportunities.

2. Establishment of a favorable development climate for industrial activity. Modern manufacturing activities, the service sector and the organized distribution systems are interdependent both technically and economically. It is, therefore, recommended that some centers for industrial development should be selected in the Region. The most promising urban areas to be considered as such centers are (a) Jizan, which will have improved port facilities and potentiality of seawater desalination, and (b) the Abha/Khamis-Mushayt area, which is presently the largest industrial center in the Southern Region and which shows the greatest promise for future development.

The particular steps to be taken include (a) making land available (b) eliminating as many unnecessary barriers as possible in the way of excessive license or permit requirements, and (c) hastening the development of infrastructure such as water supply, transportation facilities, and utilities.

3. Establishment of a favorable economic climate for industrial activity. While the general policy of having an entrepreneurial system has been established by the Government, it will be necessary in some instances to provide financial support. This may be done directly, in the form of grants or subsidies, or indirectly in the form of relief from various taxes or fees. Among the policies of this sort which should be examined are (a) general subsidies to promote an across-the-board increase in industrial development, (b) special subsidies for certain critically needed manufactured items, such as tools,

7-2-3 POLICY FOR DEVELOPMENT OF MANUFACTURING INDUSTRY

Of 4,412 organizations covered by the establishment census of 1391 AH, only 758 (17.2%) are listed as manufacturing. Even with the addition of mining, utilities, transport, storage, and various agro-industries, the share amounts to only 18.3%, 55% of the manufacturing establishments employ only one worker, and 94% employ less than 5 workers. There are no establishments which have as many as 20 workers. This level must be borne in mind when discussing the scale of future manufacturing industry in the Southern Region. See Table 7-2-2.

The major manufacturing activities in the Region concentrate in goods for personal use-furniture, ironware, utensils, and so on. There is also manufacture of construction materials-cement block, doors, lumber and some low-level processing of food items, such as sesame oil extraction and baking. There are no industries which manufacture items that could have a "multiplier" effect (that is, supply additional industrial activities); and while it is unlikely that heavy industry will develop extensively, there is a good opportunity for limited manufacturing of spare parts for automobiles and other machinery.

The probably scarcity of the mineral and cheap energy resources, the absence of nearby markets with sufficient purchasing power do not promise a sizeable autonomous growth of the manufacturing sector. The possibilities of competing with manufacturing industries elsewhere in Saudi Arabia which are in more favourable circumstances are considered very small.

The development potential for manufacturing is almost entirely determined by marketable agricultural surpluses (fruit, vegetables, cotton, hides and skins, marine fish etc.), by simple commodities for domestic use (in demand with a population whose per caput income is growing modestly) and by a number of servicing industries such as building materials, cement and repair shops.

Given the rather large gestation period of agricultural projects it will take some time before the development of manufacturing will become noticeable. And in spite of the expected future size and purchasing power of the regional population, the contribution to the Regional product will remain modest.

Table 7-2-2
DISTRIBUTION OF ESTABLISHMENTS BY EMPLOYMENT SIZE
AND SECTOR IN THE SOUTHERN REGION, 1391 A.H.

Sector	Employment Size							Total	Percent
	1	2-4	5-9	10-19	20-49	50-99	100-		
Agriculture, Live-stock, Fishing, Hunting, etc.	3	4	-	-	-	-	-	7	0.2
Mining and Quarrying	1	-	1	-	-	-	-	2	-
Manufacturing	416	299	38	5	-	-	-	758	17.2
Electricity, Gas and Water	36	3	2	2	-	-	-	23	0.5
Construction	3	-	1	1	-	1	-	6	0.1
Wholesale and Retail Trade, Restaurant and Hotels	2,512	526	49	1	-	-	-	3,088	70.0
Transport and Storage	7	3	1	-	-	-	-	11	0.3
Financial Institutions, Insurance, Real Estate, and Business Services	10	5	1	2	1	-	1	20	0.5
Community, Social and Personal Services	282	201	12	2	-	-	-	497	11.3
Total	3,250	1,041	105	13	1	1	1	4,412	100.0

Source: Statistical Yearbook, 1392 A.H. Kingdom of Saudi Arabia

The major foreseeable manufacturing activities in the Southern Region can be grouped into the following categories:

1. Those related to cement production
2. Those related to manufacture of other materials for building and construction
3. Those related to repairing, maintenance, and the providing of replacement parts
4. Those related to food preservation and processing
5. Those related to processing of animal food agricultural materials.
6. Those related to processing of non-food agricultural materials.

The largest manufacturing activities in terms of value added in the future will be cement production. This requires quarrying of limestone and gypsum, which are available in the Region. The location of production should be determined by the following factors:

1. Location of limestone and gypsum
2. Source of fuel
3. Locations of markets

Among the above, the locations of markets are clear. They are the main cities and rural centers within the Region.

As to the sources of limestone and gypsum, there are several alternative locations including Farasan Islands, those near Abha and Najran. There are two possible main entries of fuel to the Region: Khamis-Mushayt through land transportation and Jizan through sea transportation.

By combining these factors, two locations stand out as the possible location for cement factory: Khamis-Mushayt and Jizan. Currently, an investigation is under way on this project and the final choice based on economic grounds cannot be made before more specific information is made available on the following:

1. Quantity and quality of limestone and gypsum at each alternative location, and
2. Cost of fuel at each alternative location
3. Cost and availability of water

However, additional factors should also be considered.

One is the policy decision relating to the pattern of development in the Region. In conjunction with the on-going and impending port development at Jizan, a large-scale industrial development would become feasible at the city. Cement production can be a major element in this development.

The second is the question of environmental protection. In order to protect the limited forest and vegetation resources existing in the Assir Mountains area, the establishment of noxious industries should be kept to the absolute minimum in the area. For this reason, Khamis-Mushayt and Abha are not recommended for extensive development of cement industry. Jizan is preferable, although care must be taken in planning the new city to accommodate environmental concerns. It may be desirable to locate certain types of noxious or dangerous industries in the old city.

Manufacturing activities related to building materials and construction and repairing are largely market oriented. Among them, repairing are particularly oriented to the market. Therefore, each city will need to have some repairing shops.

Building materials would include cement blocks, bricks, door and window frames. Although most of them have to be produced at each city, some which can be produced economically at a relatively large-scale plant should be produced at regional manufacturing centers. In view of the transport access to the central locations of the country and the geographic distribution of population, those regional manufacturing centers

should be Khamis-Mushayt and Jizan, with the former more oriented to distribution to urban centers in the Region and the latter to sea-borne materials, either imported or domestic, for further processing for regional use. In short, Khamis-Mushayt can be called an inland manufacturing center and Jizan a port-oriented manufacturing center.

The food processing activities will take place to some extent in all agricultural areas, but a notable development will take place in connection with the Wadi Jizan Irrigation Project.

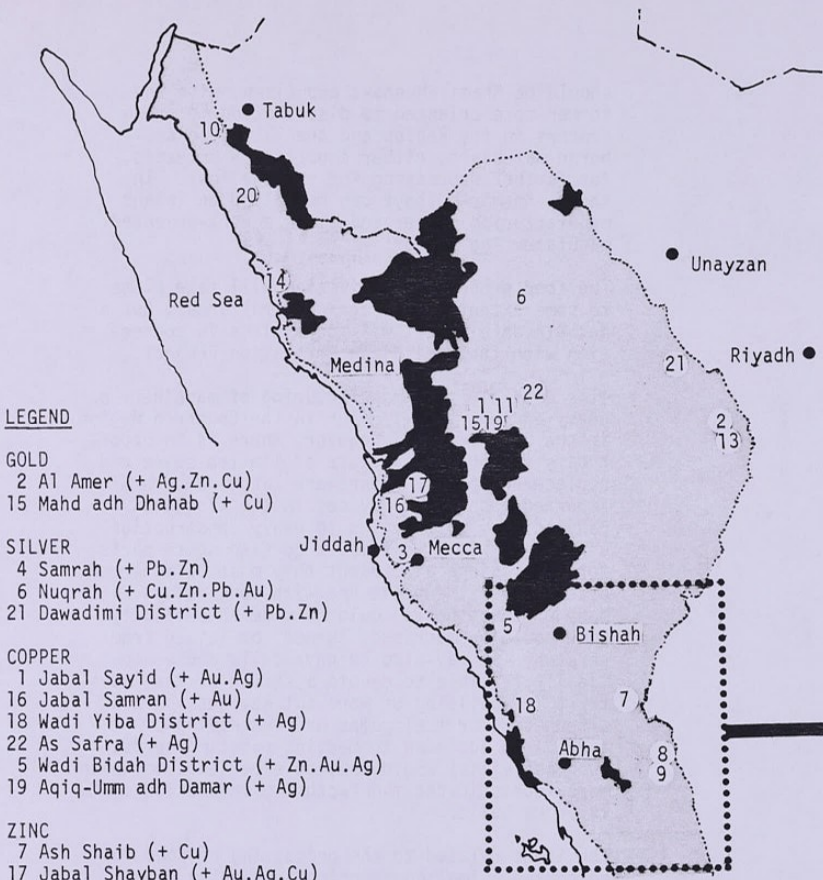
It's unlikely that manufacturing of machinery or heavy equipment will occur in the Southern Region in the near future. However, there is an opportunity for the manufacture of limited spare and replacement parts. There are large numbers of imported mechanical devices in the kingdom, ranging from motorcycles to heavy construction apparatus. It is difficult to find spare parts for them, since at present they must be imported, often at great expense and with long delays. Many of these parts could be made domestically. Some could be machined, turned, or lathed from scratch. It may also be physically and economically feasible to devote a sector of the industry to re-building of worn-out devices, such as alternators or fuel pumps or re-treading of tires. In addition to meeting existing needs, such activities would provide experience on which more sophisticated manufacturing industries could later be built.

The items related to the processing of food for human and animal consumption are worthy of a separate section. (7-3 "Agro-Industry")

The non-food agricultural product whose processing shows the greatest promise for development is cotton. Cultivation of long-fiber cotton has proven to be a successful enterprise in Egypt and other countries with a similar climate to that of the Southern Region, and studies are currently under way. If cotton farming is established, processing plants should follow-ginning, thread manufacture, cloth manufacture, and eventually even large-scale clothing manufacture may be developed.

In geological terms, the Southern Region is located on a part of the Cambrian Shield. The implication of this is that there is a significant possibility of mineral deposits, particularly metallic ores, being located in the Region. Through the present time, however, almost no exploration of mineral resources has occurred and

7-2-4 POLICY FOR MINING INDUSTRY



LEGEND

GOLD

- 2 Al Amer (+ Ag.Zn.Cu)
- 15 Mahd adh Dhahab (+ Cu)

SILVER

- 4 Samrah (+ Pb.Zn)
- 6 Nuqrah (+ Cu.Zn.Pb.Au)
- 21 Dawadimi District (+ Pb.Zn)

COPPER

- 1 Jabal Sayid (+ Au.Ag)
- 16 Jabal Samran (+ Au)
- 18 Wadi Yiba District (+ Ag)
- 22 As Safra (+ Ag)
- 5 Wadi Bidah District (+ Zn.Au.Ag)
- 19 Aqiq-Umm adh Damar (+ Ag)

ZINC

- 7 Ash Shaib (+ Cu)
- 17 Jabal Shayban (+ Au.Ag.Cu)

LEAD-ZINC

- 14 Jabal Dhaylan (+ Cu)

IRON

- 3 Wadi Fatima District
- 10 Wadi Sawawin District
- 13 Jabal Idsas

TITANIUM-IRON

- 20 Wadi Hayyan

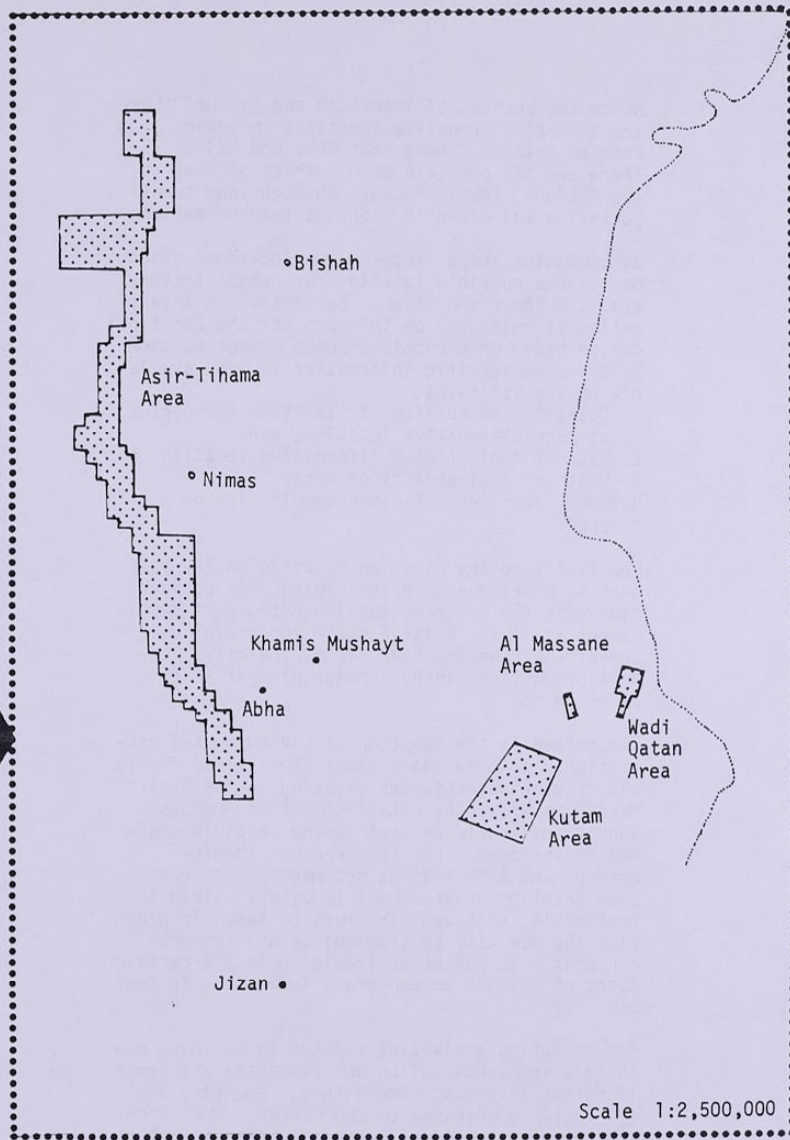
SULPHUR-IRON(PYRITE)

- 8 Wadi Wassat District
- 9 Adhbat-Katan

MAGNESITE

- 11 Ar Rockum

Scale 1:4,000,000



- Precambrian Boundary
- Tertiary-Quaternary Basalt
- Exploration license area

FIGURE 7-2-1
POTENTIAL MINING IN
SOUTHERN REGION

2. While it is impossible to be clear, the likelihood is that "Class A" heavy industry will not develop in the Southern Region during the period covered by this plan. There are several reasons for this: (a) A general analysis of all conditions in the Southern Region suggests that this type of industry is not necessarily going to promote the most rapid general development of the region; (b) this analysis also indicates substantial shortages in many of the prerequisite elements for heavy industry, ranging from large volumes of skilled manpower to the large-scale availability of raw materials (c) in terms of overall national industrial development, it is clear that the regions with hydrocarbon resources have a "Head Start" which is likely to cause them to develop more rapidly in other elements of industry. The experience of other nations bears this out - even in heavily industrialized countries, the industry tends to be concentrated in relatively small, contiguous areas, with the rest of the country dedicated to agriculture, small industries, and other sectors - and it appears unlikely that even vigorous efforts to counter this trend can succeed against such strong economic pressure. This is advantageous in certain ways.

Since the experience of other nations also shows that industrial facilities built under such pressure are often subject to becoming obsolete and inefficient, do not respect the environment, and have other problems less likely to affect facilities constructed under less strenuous circumstances.

3. Since it appears that "Class A" heavy industry is not eminent in the Southern Region, it may well be desirable not to engage in extensive planning efforts for it right now. There are certain things that are evident; for example, the fact that very heavy industry should not be placed in the cities because of its many incompatibilities with residential and commercial activities. On the other hand, attempting to plan at the present time causes the following problems: (a) different types of heavy industry require different types of conditions with regard to the availability of land, electric power, water, raw materials, and labor. Since no type of heavy industry has been clearly identified yet, it is impossible to engage in planning for it (b) prematurely identifying sites for heavy industry would cause speculation, and increase in land prices, and difficulty in obtaining the land when it was time to begin development. (c)

planning with insufficient solid information about the industry would cause the type of inflexibility discussed in section 7-2-5: It could have the effect of diminishing opportunities which could not have been clearly foreseen.

"Class B" Industry has a much greater likelihood of developing in the Southern Region. This category refers to the enlargement, extension, or modernization of industries which have already developed, such as the manufacturing of cement, concrete blocks, tile, lumber and other materials used in construction. Since the largest industries now in existence in the region do not employ as many as 20 people, it is appropriate to think in terms of future expansion of "Class B" industries to include 50 to 100 employees. The following points must be regarded:

1. It is likely that this category of industry will indeed develop in the Southern Region, and within the time covered by this plan. It is therefore appropriate and necessary to incorporate "Class B" industries (although not necessary referred to as such) in the plans for the Region and its sub-areas.

2. This category of industry unlike "Class A", should be located in the urban areas. Each of the city plans incorporate provisions for industry of this type and the parameters of prerequisites and of land acquisition, location, and related physical planning aspects are discussed later in this chapter.

At a minimum, the following conditions are prerequisites for the successful development of this category of heavy industry.

1. Availability of raw materials insufficient quantity and of sufficient quality. In many instances, these materials will be agricultural products and are worthy of a separate section of their own (7-3, agro-industry). In the medium range period, it may become feasible to import certain of these materials. A study concerning cotton mills, using both domestic and imported raw cotton, is under way.

2. Availability of labor with an appropriate degree of skill. Among the steps which can be taken in this regard are (a) development of a variety of training facilities, ranging from schools for both young and old workers to field demonstration projects (b) incorporation of training programs with the programs related to settlement of Bedouins and the urbanization of rural people. Trained labor may become in short supply if steps like this are not taken; in ad-

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that this is crucial for the company's financial health and for providing reliable information to stakeholders.

2. The second part of the document outlines the specific procedures for recording transactions. It details the steps from identifying a transaction to entering it into the accounting system, ensuring that all necessary details are captured and verified.

3. The third part of the document discusses the importance of regular reconciliation. It explains how comparing the company's records with bank statements and other external sources helps identify and correct errors, ensuring the accuracy of the financial data.

4. The fourth part of the document addresses the role of internal controls in preventing fraud and errors. It describes how a strong system of internal controls can help ensure that transactions are recorded correctly and that assets are protected.

5. The final part of the document provides a summary of the key points discussed and offers some concluding thoughts on the importance of a robust accounting system for the company's success.

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10. The final part of the document provides a summary of the key points discussed and offers some concluding thoughts on the importance of a robust accounting system for the company's success.

it must be emphasized that until extensive additional studies are completed, the idea of extensive mining industry in the Region remains problematical. The fact that extensive hydrocarbon exploitation is now being carried out in other parts of the kingdom presents both advantages and disadvantages. It is advantageous in that it provides good experience for obtaining geological resources; and it is disadvantageous in that its size, volume, and proven economic feasibility make it relatively less likely that the exploration, and pilot efforts necessary to begin mining in the Southern Region will occur for the time being.

With regard to hydrocarbon resources, it seems unlikely that they exist in substantial volume. Preliminary exploration has located pockets of gas offshore in the Red Sea, but they are small and there are indications of high temperatures and other problems which complicate tapping.

With regard to ore deposits, the following have been identified as deserving of priority investigation by the Director-General of Mining Resources (DGMR):

1. Copper and silver in the Wadi Yiba District, approximately 100 KM north of Khamis-Mushayt.
2. Zinc and copper in the Ash Sharb area 150 KM Northeast of Khamis-Mushayt.
3. Titanium, iron and nickel in the Wadi Wassat and Adhbat-Katen District approximately 150 KM east of Abha.
4. Copper, zinc, gold, and silver in the Wadi Bishah District about 200 KM north-northwest of Abha.
5. Copper in the Al Massane area approximately 100 Km East of Abha

It must be noted that while highly concentrated metallic ores have the greatest general value, they always require sophisticated smelting and refining operations before they can be used. In light of facts presented later in this chapter (See Section 7-2-6, policy for heavy industry), the priority of such operations must be questioned. There are other geological resources which require less complicated operations for extraction and processing. Among the possibilities of this sort which have been identified are the following:

1. Marble for high-quality construction and other purposes, in the Bishah area.
2. Salt, for industrial and domestic purposes in the vicinity of Jizan and in the Farasan Islands.
3. Phosphates, nitrates, and alkaline chemicals

throughout the more arid portions of the Southern Region

4. Limestone in the reefs near Jizan.
 5. Lower grade rock and sand for construction material, in practically the entire region
- In addition to the direct exploitation of such resources, it may be possible to take advantage of other activities to obtain them. Sea water, for example, is rich in many kinds of minerals, even metallic ores. If large scale desalination is to occur, it would be possible to recover many of these from the water.

If explorations for higher grade geological resources prove fruitful, the planning for the actual development of facilities must be done on a smaller scale, by sub-region or even by city. In general, there are three steps:

1. First step: basic quarrying or extraction operation on the site
2. Second Step: Initial refining and processing which may occur either on site or elsewhere
3. Third Step: Final processing and transformation into usable products. In addition, the third step includes the use of by-products.

The requirements for each step have many implications for the planning and location of the activity. The first step is determined mostly by the location of the resource, although in some instances it may be possible to make a choice (for example, in deciding at what point along the coastline to construct a desalination plant). The second step is concerned with the elements necessary to accomplish the work, and vary with the given resource. For example electric power may be a critical factor for one mineral, water for another, labor for another. The third step incorporates many of the same elements as the second, but also must include marketing and distribution of the finished product.

7-2-5 POLICY FOR OTHER INDUSTRIES

Establishing too rigid a plan at this moment have the effect of reducing flexibility and of preventing opportunities for development which could not have been foreseen. It is therefore important to strike a balance on the one hand to plan specifically for those industries which are clearly going to become important, and on the other hand to allow for those whose importance could not be predicted. In the establishment of a generally favorable climate for industry (as described in 7-2-2), this will be possible. Attention should be paid to the following:

1. Those industries which can be based upon local or domestic raw materials. These will be predominantly agriculturally or geologically oriented, as discussed in Sections 7-3 and in 7-2-4 respectively, but will be producing items that may not be specifically listed therein.

2. Those industries based upon unique local talents. For example, there is a tradition of high-quality leatherwork in both the Southern Region and in nearby Yemen. As there is also likely to be a satisfactory supply of hides and skins, it may be possible to develop production of high-quality hand-made leather goods, which should bring a substantial price abroad.

3. Those industries serving local consumer demands. This includes both those which cater to unique preferences and tastes, such as the making of koofia in Jizan, and those which meet general demands for food, clothing and other necessities that are now imported.

4. Those industries which are interrelated with existing or planned industries. The following are among the opportunities for interrelated activities: (a) use of by-products or waste products. If cotton mills are established, it might be feasible to develop a furniture industry using lint, waste cloth, and low grade cotton for stuffing, pillows, etc. (b) Production of components needed by major industries. As date production expands, it will be necessary to have tins, crates, and packaging materials for shipping. (c) small personal service industries. If industries develop which cause large numbers of people to come together to work, it will be possible to have service industries to provide food and drink.

5. Those industries which are additions to or extensions of existing or planned industries. If a tire-retreading plant becomes successful, it may be possible for it to expand into the production of other types of rubber goods.

6. Those industries which provide personal services. This type includes barber shops, restaurants, and an almost unlimited variety of small facilities which provide related goods, services and luxuries. It is important to pay attention to this sector because (a) industrial development will be bringing large numbers of people together to live and work in a more concentrated environment than before. There are certain things like the gathering of firewood which can be done by individuals in a rural setting, but

cannot be done easily in an urban setting. It will be easier to attract people if these services are made available (b) It is more efficient in many cases to provide certain services to people than to make them provide them themselves. In a factory, for example, it would be better to sell workers their lunches rather than to shut the factory down while they cooked them on their own. (c) As the standard of living improves, people will wish to buy goods that are presently unavailable, or to buy higher quality goods than those they now get.

These functions form an important part of the economy as well as contributing to the efficiency and pleasantness of daily living. In planning, it is necessary to allow for entrepreneurial opportunities to be developed in accord with economic demand. While certain regulations are important to ensure health, cleanliness, and quality of the products and services sold, it should be remembered that excessive requirements in the form of licensing, fees, or heavy taxes can unnecessarily reduce these opportunities.

7-2-6 POLICY FOR HEAVY INDUSTRY

In discussing the policy for heavy industry, it is necessary to make a distinction between two general classes of this activity (a) heavy industry as it has developed in nations like Japan and the United States, and as it is now developing in parts of the Northern and Eastern Regions, employing very large numbers of people, using very large amounts of land, buildings, and capital equipment, and producing large, complex products. For the purposes of this discussion, this will be referred to as "Class A" Industry and will be defined as facilities employing at least 100 persons on a single site, having capital facilities valued at least SR 15 million, and producing manufactured goods. (b) heavy industry as it is most likely to occur in the Southern Region, which is an enlargement of existing types of Industry and will be referred to as "Class B"

The following points should be made regarding "Class A" Heavy Industry:

1. It is possible that it may develop in the Southern Region. It already shows clear signs of beginning in the Northern and Eastern parts of the Kingdom. The activities there, however, are overwhelmingly related to hydrocarbon extraction and processing, and since there are no proven resources of this type in the Southern Region, that particular type of industry is unlikely to develop in near future. It is simply speculation to predict what other form of industry may come.

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dition, they would ease the transition process for the people being resettled. (c) having a relatively unrestricted policy of allowing Yemenis and possibly others to come into the Kingdom.

3. A program of incentives, similar to those for agriculture, to encourage purchases of capital equipment and promote the transition from an artisan system to a factory system.

4. Special support in the particular area of labor supply, which could become the weakest link in the industrial development process. Among the types of projects which might be undertaken are (a) provision of housing for workers, perhaps initially dormitories for men and later more elaborate facilities for workers and their families (b) amenities and services that would serve to attract workers, such as subsidized food, medical care and schools for their families, and so on (c) subsidies so that an approximate wage parity (relative to the overall cost of living) is reached in comparison with other parts of the kingdom. It is now possible for a skilled mechanic to make several times as much money in the oil fields as in the Southern Region, and this produces a severe draining effect. (d) land of the appropriate type and in the right location. This is discussed in the following section.

There are several options for establishing locations and site plans for "Class B" Industry; they depend upon the particular type of activity and the broader plans for the given cities. There are discussions of this in each of the city plans; however the following general statements can be made.

1. There are two types of areas which should be reserved for this category of industry: (a) areas within the industrial parks to be established within the urban areas, and (b) areas on the periphery of each city, along the Ring Road or the road of highest hierarchical order. (See Section 7-2-8, Policy For Industrial Location) The first category refers to land within the industrial parks whose primary functions will be small services and repair operations. Industry should be placed here only if it is relatively free of pollution and other nuisance or obnoxious factors. In planning, the important element to bear in mind is to avoid over-subdivision. While most of the facilities in these parks will be quite small, the industrial activities will require more space and must not be crowded out. The second category refers to land which is close enough

to the cities to take advantage of the availability of labor and materials, but far enough away to avoid interference with residential and other urban activities. Transportation will also be easier from such a site. The same problems referred to in the "Class A" section concerning planning for and acquisition of land apply here - too specific planning without the capacity to implement immediately is likely to produce speculation and higher land prices as well as inflexibility. Thus it is appropriate to have an alternate land policy.

2. The alternative policy is to be prepared to purchase land along the extended rights of way of the major roads. This overcomes the problem of excessive inflexibility and allows industrial land to be purchased where such activity has already proven successful. It is especially applicable to roads like that between Abha and Khamis-Mushayt.

7-2-7 POLICY FOR INDUSTRIAL START-UP

The Southern Region is about to undertake a major expansion from a situation of small, artisan-oriented enterprises to a more complex and sophisticated level of industrial development. This is a difficult and highly complicated process requiring much attention. It is necessary to point out certain factors which must be borne in mind as planning and implementation of industrial development takes place. These factors are:

1. Determination of those industries which show the greatest promise of success. The clearest indication, quite simply, is the identification of those enterprises which have been successful in the past.
2. Determination of the maximum multiplier effect with regard to overall economic development goals, such as the utilization of interrelationships and the establishment of a balanced economic system.
3. Determination of the maximum multiplier effect with regard to other national goals which have been established, such as self-sufficiency in food or settlement of bedouins.
4. The relative ease of starting up a given industrial activity in terms of financial support required and the amount of time from initiation to full-scale production.

7-2-8 PO
LO

5. The establishment of priorities in the development of infrastructure, constructing roads and water supply systems in the most effective order.
6. The development of other support facilities for industry, such as housing for workers and schools for their children so that they are attracted to work.
7. The establishment of national policies as seen fit, such as protective tariffs.

7-2-8 POLICY FOR INDUSTRIAL LOCATION

The central issues in establishing a policy for industrial location are the following:

1. To ensure the availability of land of proper quality in sufficient quantity for industrial development. Given the high priority which has been set for industrialization and the general abundance of land, it would be a serious shortcoming if development were to be restricted in this fashion.
2. To ensure compatibility in land use with other categories (such as residential) so that one type of use does not devalue, inconvenience, or infringe upon the other.
3. To ensure that infrastructure (roads, water systems, electrical distribution systems, and so on) develop at an appropriate and balanced rate commensurate with the general level of industrialization.
4. To avoid problems with the orderly acquisition of land (such as speculation and inflated land prices) as well as avoidance of rigidity and inflexibility in planning.

In accordance with these objectives, four general categories of industrial land use and location have been developed.

1. For the larger cities of Abha, Khamis-Mushayt, Bishah, Najran, and Jizan, the concept of the industrial park is used. These parks would range in size from 30 to 100 ha and would be located immediately outside the central portion of the city. They would thus be able to take advantage of the city's proximity for their supply of manpower and materials, but would avoid conflicting with or intruding on other types of urban land use, such as residential areas. The land for the park would be purchased by the municipality which would have the responsibility of providing roads and other elements of the infrastructure. The park would then be subdivided and the parcels leased or sold to the individual user. These users would, for the largest part, be small service and repair facilities which would require only small parcels of land (0.1-0.2 ha) but in some instances there would be larger facilities such as factories that would require more land. Thus it is important to make certain that the overall tract of land is sufficiently large and that some of the individual parcels are as large as 1 ha or more.
2. In those villages which are smaller than the major cities but still serve as social, commercial, and industrial centers, the need for industrial locations will exist as well. It is less likely that industrial land will be as strongly in demand, however, and much of that which is in demand will have its location determined by its use—automobile service stations, for example, will be located along major roads. It is therefore less critical to provide large tracts of land than it is to institute a system of plans and regulations to control noise, traffic, dust, and other nuisances, and to ensure proper separation or buffering between incompatible types of uses.
3. In the case of heavy industry of various types, there are special considerations which apply and which are discussed in detail in Section 7-2-6. In general, they call for location of very heavy industries outside urban centers altogether, and location of less heavy industries on the periphery.

4. There are certain types of uses which do not fit conveniently into the preceding categories. These include utilities, desalination plants, and the special port and storage facilities at Jizan. Because of their unique characteristics, it is not possible to establish a general policy for their location and they are discussed on a sub-regional or city basis.

7-3 AGRO-INDUSTRY

7-3-1 AGRO-INDUSTRY POSSIBILITIES BY SUB-REGION

Agro-industry serves many functions in the southern region:

1. It is an area of maximum potential development in light of existing resources and opportunities.
2. It assists in meeting the national goal of food self-sufficiency.
3. It can function at a variety of levels, from very simple and small-scale to very sophisticated.
4. It is compatible with the traditional social and employment situation in the region.
5. It provides opportunities for employment, basic education, on-the-job training, and other desirable activities.

Planning for the further development of agro-industry must be in general accord with economic trends. For example, it would be best to propose future development in those areas which have already demonstrated success, such as the Jizan and Abha/Khamis Mushayt areas. This recognizes the interdependence of modern industrial activity.

Phasing is an important function of planning. It must be realized, for example, that certain types of agricultural products will take a fairly long time to develop--cotton and citrus are among them. Further, it is likely that the demand for fresh products is likely to increase so that allocation will have to be made between immediate sale and processing of some products.

The following are examples of agro-industry promising for the southern region:

1. Date production and packing in Bisha and Najran
The dates produced in these areas are shipped to Jeddah and Riyadh, though they are not usually exported to foreign countries as are the

dates of Hofuf in Al Hosa and Medina in Hijaz. Dried dates are packed in tin-box containers which are made by local tin smiths, and then sent to other cities by truck. If the road conditions for transportation is improved, date production activities will possibly become more prosperous in these areas due to the expected increase in the demand. This will in turn stimulate the production of tin-boxes and packing activities.

2. Vegetable oil extraction
Vegetable oil can be supplied from locally produced oilseeds such as groundnuts, cotton seeds and sesame. As the technology required is simple, an extraction plant can be located anywhere in the region where a sufficient quantity of materials is produced. Three cities, Khamis Mushayt, Jizan, and Najran, can be considered as a prospective site for extraction activities.
3. Slaughtering and meat packing
There is considerable availability of meat animals in the region, and a need to maintain a high standard of sanitation in their preparation. The level of activity and economic need is sufficiently high so that each of the major cities in the region should have a modern slaughterhouse.
In order to preserve the meat obtained, a meat packing plant should also be considered as a complementary activity to each slaughterhouse. The type of processing--canning, salting and drying or other--and the type of meat to be packed--lamb, beef, chicken or other--should be decided through a feasibility study on the public preference and the supply capabilities.
4. Cotton farming and processing in Jizan
The growing of cotton is heavily dependent on rainfall, but recently, there has been an increase in the number of artesian wells being drilled. Construction of the Malaki Dam and a new irrigation network, though yet incomplete, has also stimulated agriculture in the Wadi Jizan basin. Cotton in particular is presently considered most promising. It will likely be so identified in the FAO's decisive recommendation which is expected to come out soon when the station completes its study on agronomic and economic feasibility for crops and methods. Moreover, it may be possible to get cotton wool at a favorable price from nearby foreign countries in the future. The establishment of a cotton mill in Jizan therefore seems reasonable from the viewpoint of economic significance and raw material availability. However, precise timing of the establishment and magnitude of operation should remain unde-

cided until the plan for the development of the local port capacity and facilities is formulated. Of course, the development of a cotton factory should be a factor for determining the port development plan. It must also be noted that the setting up of the minimum guaranteed price for cotton wool may be necessary to encourage cotton cultivation in the Jizan area once the establishment of a cotton factory is decided upon.

7-3-2 NEED FOR EQUIPMENT

Power equipment is important in maintaining a high level of agricultural production, and comprises a major part of the need for imported equipment. There are many reasons for this: a high yield of crops cannot be obtained without clearing, plowing, harrowing, and smoothing the fields, and human labor cannot compare with the speed and efficiency of mechanical equipment. It has been estimated that the minimum volume of power equipment necessary for high-yield farming is 0.5 hp/ha, and more if the terrain is steep or rough. Table 7-3-1 indicates the need for power equipment based upon an average of 0.75 hp/ha and an average tractor power of 30 hp.

At present there are about 177,000 workers engaged in agricultural labor. It is estimated that about 59,000 of them, or one-third, could be released for other employment and other newly created agriculture or agricultural industry by the full implementation of power equipment.

Table 7-3-1
NEED FOR POWER FARMING EQUIPMENT [2]

	Arable (ha)	hp Required @ 0.75 hp/ha	No. of Tractors Required @ 30 hp Each
Asir	75,800	56,850	1,895
Wadi Quadrangle	9,100	6,825	228
Najran	4,600	3,450	115
Tihama	195,600	146,700	4,890
Total	258,100	213,825	7,128

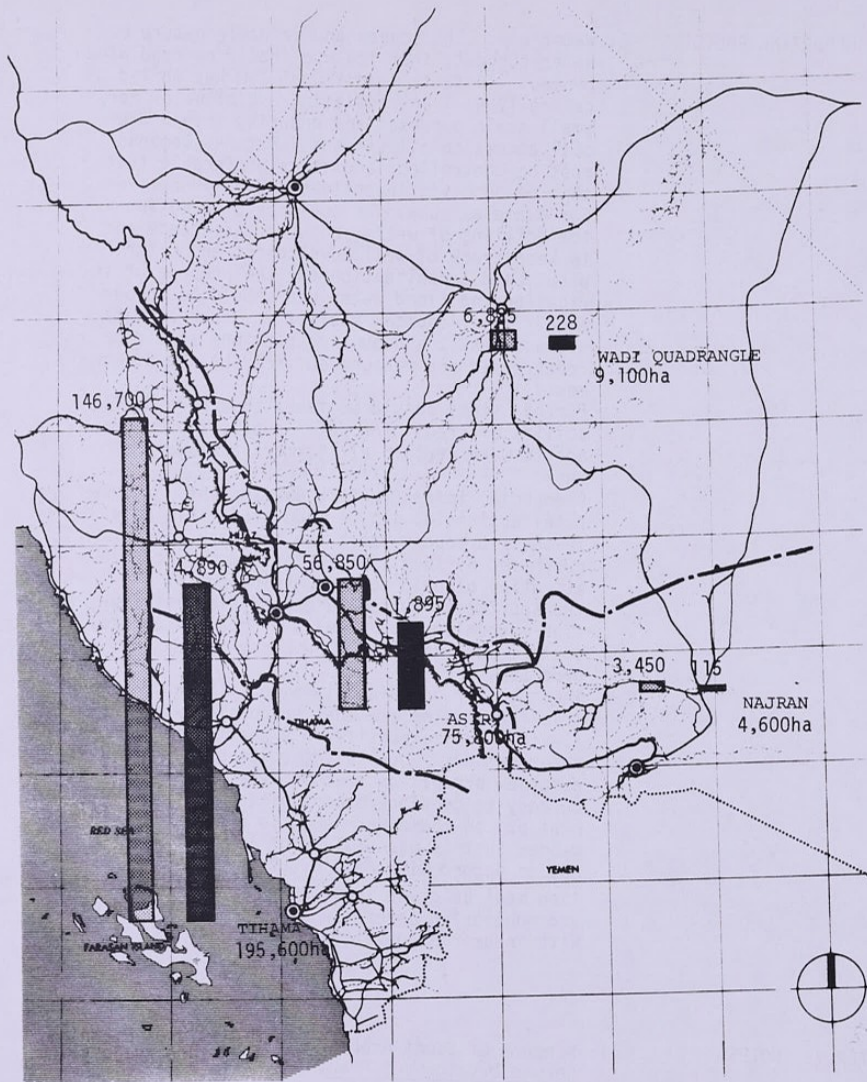
Note: for arable area, see Table 5-2-7.

7-3-3 SUPPORTING POLICIES

1. Water use. The scarce and valuable nature of water suggests that its use should be regulated by law. In fact, traditional law has worked generally well in regulating use of water for small-scale purposes and ensuring free and equal access to all persons. But new demands must be controlled, and it is preferable that this be done via incentives and disincentives. For example, subsidies could be offered for the drilling of wells, both as assistance and to keep track of well development and water use. Land consolidation for the purpose of irrigation and flood water use should be encouraged. Major capital facilities, such as dams, storage tanks, and pumping stations should be constructed and managed entirely by the Government. Further steps should be taken to ensure availability of credit for water-supply improvement and to make certain all farmers are aware of them.
2. Commercial infrastructure development. Industrial activities can be made profitable only if their products reach the consumers and are purchased by them. It is thus important that attention be paid to the development of a transportation system, a dependable distribution mechanism, and a means of quality control so that purchasers will be happy to buy the products.
3. The need for on-going planning. Those industrial activities are most successful which are flexible and responsive in a short time to consumer demands. Due to the quick buildup of industrial production that is expected, it will be easy to overlook opportunities for development or, on the other hand, to produce in a manner that is wasteful or of low quality or not in accord with demand. Particular attention must be given to planning comprehensively and monitoring carefully all items associated with industrial development.

CHAPTER 7: NOTES

1. Kingdom of Saudi Arabia, Ministry of Planning, Second Development Plan, 1395-1400 AH/1975-1980 AD.
2. Data from Clawson Et Al, The Agricultural Potential of the Middle East (El Sevir, 1970).



▨ required horse power
▨ required no. of tractors (30HP/each)
▨ average area by sub-region(HA)

FIGURE 7-3-1
NEED FOR
POWER FARMING
EQUIPMENT

8. development policy for commerce and service industry

8-1 GENERAL FRAMWORK

8-1-1 EXISTING CONDITIONS

Commercial activities are one of the major activities in the Southern Region. The reason is that the local production of goods is limited in quantity and variety, therefore a large volume of commodities has to be brought in to the Region. In fact, a striking nature of retail and wholesale shops is that almost all goods handled by them are produced outside of the Region and mostly outside of the Kingdom. This suggests that commercial activities in the Region are closely connected and supported by transport activities.

The size of each commercial establishment is generally small in terms of the number of employees, but the activities are widely spread in the Region in accordance with the distribution of the population and of agricultural activities. Main cities of the Region form a market center with some hierarchical orders among them.

8-1-2 DEVELOPMENT OBJECTIVES OF NATIONAL LEVEL

The national objectives for commercial and service industry are as follows:

1. To provide effective support for the social and economic development activities within the Kingdom. (The domestic product of the commercial sector is expected to double in five years.)
2. To provide such support with maximum efficiency and at reasonable cost [1].

8-1-3 NATIONAL POLICY

The key policies derived from these objectives are:

1. Promoting in the wholesale and retail subsectors a system of sound and responsible control and inventory practices, efficient use of facilities and personnel, and maintenance of trade margins at a reasonable level.
2. Promoting the development of intercity truck transport, passenger transport, and appropriate terminal facilities.
3. Continuation of the development of financial institutions and widening of their range of services.

8-1-4 NATIONAL POLICY IMPLICATIONS FOR THE SOUTHERN REGION

The following are among the implications of these objectives and policies for the southern region.

1. While the retail, wholesale, and urban service industries are expected to double their level of activity within five years, it is proposed that the land area occupied for such purposes will not increase with the same magnitude. Specifically,
 - a. floor area per store will be increased but

- b. land area per person will not be increased because,
- c. facilities will be located in proximity of each other and make combined use of parking lots and other services.

The purpose of this will be to maximize the efficiency of use, encourage use of common facilities (as in a "shopping center") and discourage disorder and sprawl. This shall be reflected in the regional and city plans.

2. Inter-regional truck and highway traffic will be increasing, with several negative effects possibly occurring.
 - a. General safety hazard to those living in the vicinity of highways.
 - b. Disruption of traditional and private activities.
 - c. Blocking of local traffic and other inconveniences from large truck maneuvering in narrow local streets.

Large trucks traveling at high speeds over long distances will become common, since the priority for intercity transportation is trucking. Thus it is necessary to pay attention to the following items:

1. Avoidance of disruption to traditional caravan and walking routes, which will continue to be used for small-scale, short-distance travel.
2. A hierarchical order of roads and highway systems, with separation based upon size and type of vehicles (i.e. large trucks or camels), speed and intensity of traffic, and distance to be travelled (inter-village or inter-region).
3. Location of terminal, distribution, and transfer facilities at the points of intersection of the several road systems. Wholesale, storage, and warehousing facilities will probably be associated with these nodes as well.
4. Aggressive and comprehensive planning to maximize the efficiency of land use in the central part of the cities (which is a major objective of the entire planning process). It is projected that office space and tertiary industry space will increase by two to five times in the next twenty years, on the part of both governmental and private sector agencies. This demand must be carefully coordinated, and use made of vertical expansion and other efficient techniques of creating space.

8-2 DEVELOPMENT POTENTIAL OF THE SOUTHERN REGION

8-2-1 GENERAL

Commercial activities are flourishing in the southern region, because of its agricultural and

other products. The area has many trading centers. There are fixed and daily shopping centers found in the major towns of the region. Some villages have their own commercial suqs (market places) on a weekly basis.

The major center of commercial activities in the whole region is the area of Khamis*Mushayt and Abha. The two towns form an urban center which functions as a focal point in the trading hierarchy of the region. Most of the goods consumed in the region are basically either locally or imported from Jeddah and/or Riyadh. Khamis Mushayt also has two commercial banks. The two towns, especially Khamis Mushayt serve as a regional redistribution center of commodities to Jizan and Najran. Bishah, because of its closeness to Jeddah, has a directly established connection with it and with Riyadh. Bishah is a central market area for the surrounding agricultural area.

Most prepared goods come to the cities of the region from Jeddah and Riyadh, via Route 54 which runs from Jeddah to Abha to Jizan. These goods, including rice, sugar, tea, and canned foods come from outside the region. Natural bottled gas is imported from Dammam to Khamis Mushayt and then distributed throughout the region. Jizan supplies fish, from the Farsan Islands, to Abha, Khamis Mushayt and Najran. Bishah gets fish from Jeddah because it is closer. Vegetables are distributed to Khamis Mushayt from Bishah, Najran and Jizan. Some of the vegetables produced in the Jizan area are transported as far as Jeddah, Riyadh, Qatar, and Kuwait. Bishah and Najran supply locally produced canned dates to Jeddah and Riyadh. They also serve as the central market for the surrounding agricultural areas. In addition to foodstuffs, these products include pottery and crafts.

Construction materials, especially cement, is provided mainly from Hofuf, Jeddah, and Riyadh--the three largest cement producing cities in the Kingdom.

According to the census of commercial establishments taken by the Central Department of Statistics, Ministry of Finance and National Economy, in 1391 A.H., there are 4,412 economic establishments in 13 major cities in the southern region. Among

*The word Khamis means Thursday which is the town's market day.

them 70% are in the wholesale and retail trade, restaurant and hotels. If various service establishments are included in the wholesale and retail category, more than 80% are engaged in commerce and services. Most of these establishments are small, 74% having only one employee. Employers who hire no more than four employees are 98% of the total.

The total volume of commercial establishments has been increasing. In the four large towns Abha, Khamis Mushayt, Najran and Jizan, which were covered by the establishment census of 1387 and 1391 A.H., the number of establishments increased from 2,136 in 1387 A.H. to 2,704 in 1391 A.H., or 27%, and the number of employees rose from 3,369 to 4,691, or 39%. This pattern of growth implies that the average size of establishment is increasing.

The census of commercial activities that took place in 1391 A.H. covered thirteen cities in the southern region and showed the following distribution of establishments: Khamis Mushayt had the largest number, with 811; followed by Jizan with 682, Najran with 647, and Abha with 564. In these four towns were concentrated 65% of all commercial establishments in the thirteen towns. Increases between 1387 and 1391 are indicated in Table 8-2-1.

The growth which has taken place in recent years in the towns of Khamis Mushayt and Abha is phenomenal. Khamis Mushayt in particular has been the focus of efforts to promote economic growth in the southern region, and quickly becoming the main center of commercial activities in the region. In general, there has never been a systematic means of merchandise marketing in this region. The flow of goods is not adequate, and patterns of production and consumption will demand a significant marketing and distribution network in the near future. The development of adequate transportation system and communication linkages are prerequisites for efficient commercial planning and development.

Table 8-2-1
COMMERCIAL ESTABLISHMENTS AND EMPLOYMENT, 1387 AND 1391 [2]

	No. of Establishments			No. of Employees		
	1387	1391	Increase	1387	1391	Increase
Abha	424	564	33%	541	785	45%
Khamis Mushayt	473	811	71%	651	1578	143%
Jizan	614	682	11%	1247	1359	9%
Najran	625	647	4%	930	969	4%

8-2-2 VOLUME OF COMMERCIAL
ACTIVITY AND EMPLOY-
MENT

The Central Department of Statistics undertook a census of Establishments and Workers in 1387 and 1391 ah, which demonstrated a number of noteworthy points about the degree of commercial activity, both within the region and relative to the rest of the Kingdom. Over that four-year period, the number of workers in the commercial sector and the number of establishments both doubled. (2.02 and 2.07 times respectively). In the aggregate, this is the fastest rate of growth of any of the regions of the Kingdom. Although the Northern Region grew more rapidly in the number of workers employed, it grew less rapidly in the number of establishments. These figures are contained in table 8-2-2.

The mean number of employees per commercial establishment is small, slightly more than one and one-half per business, and this serves to indicate that most institutions are family run (a father and a son, two brothers, etc.) It should be noted, however, that even in the Eastern Region, which has the highest mean number of workers per business, this rate is less than 3. This suggests that, even with a much more intense type of development, the mean number of employees per business is likely to remain small. This information is contained in Table 8-2-2. Table 8-2-3 supports this, pointing out that 74% employ fewer than 5 persons. Less than a third of one per cent have between 10 and 19 employees. Altogether the Southern Region has a total of 6797 commercial employees in 4412 establishments; as a share of the national level of activity, these figures are 4.6% and 7.2% respectively; in the aggregate this places the Southern Region second to the Northern Region in having the least amount of commercial activity in the Kingdom.

Within the Southern Region, it is seen that Jizan has the largest number of commercial establishments, 862. However, if Abha and Khamis-Mushayt are regarded as a single entity for commercial purposes, that becomes the largest, with 1375. It is reasonable to consider them as such since they are only about 30 km apart and this distance is actually diminishing as the two grow toward each other. It is also likely that expansion will occur both in the absolute size of the two cities' commercial activities and in their inter-relatedness, since Abha is the point through which goods from the northern parts of the Kingdom pass en route to the Southern Region and Khamis-Mushayt has the largest suq in the region. Largely because of its function as a distribution center, Khamis-Mushayt had the most rapid growth in its commercial activities of any of the region's cities and by 1391 was second only to

Jizan in this respect. Najran was third followed by Abha and Bisha.

With regard to the distribution of commercial activity in the thirteen largest cities of the Southern Region, nearly two-thirds of all establishments are located in the four largest cities of Jizan, Khamis-Mushayt, Najran, and Abha. With Bisha added, this figure rises to 70%. Thus the degree of activity in the five largest cities averages nearly four times that of the eight next largest cities. Tables 8-2 and 8-2- provide a graphic demonstration of the distribution of commercial facilities (both permanent and temporary) in the cities of the Southern Region.

Commercial activity is a part of what is referred to as the Tertiary Sector. The primary Sector is essentially farming and mining, the Secondary Sector is essentially manufacturing, and the Tertiary Sector is made up of the following:

1. Wholesale and retail trade
2. Finance and insurance
3. Real estate
4. Transport and communication
5. Electricity, gas and water
6. Services

The employment intensity of these subsectors in the five cities as measured by employment per 100 persons of city population is shown in Table 8-2-6. Invariably, the trade subsector is the largest subsector and has the employment intensity of about 2-5 workers per 100 persons. The tertiary sector as a whole has the employment intensity of about 4 to 6 workers per 100 persons with the average of 5 for the five cities together. The tertiary employment intensity depends largely on the employment intensity of the trade subsector. Bishah, Jizan and Najran have relatively large employment intensity in the trade subsector and, consequently, have relatively large employment intensity for the tertiary sector as a whole. The relatively large size of the trade subsector in these cities is due to the major role of these cities as the distribution-collection center for surrounding agricultural settlements.

The tertiary sector in Abha is particularly small. This is due to the administrative nature of this city rather than the distribution-collection center. In addition, Abha is sharing with Khamis Mushayt the service functions for agricultural hinterlands. This also explains the low employment intensity of Khamis Mushayt in the trade subsector.

Table 8-2-2
NUMBER OF COMMERCIAL ESTABLISHMENTS AND WORKERS
BY REGION 1387 AND 1391 A.H.

Region	Number of Workers				Number of Establishments			
	1387	%	1391	%	1387	%	1391	%
Central	24,130	23.7	37,220	25.4	10,023	23.0	16,435	26.9
Western	51,409	50.5	64,626	44.1	21,856	50.1	26,654	43.6
Eastern	19,974	19.6	30,405	20.7	7,433	17.0	10,332	16.9
Northern	3,015	3.0	7,662	5.2	2,173	5.0	3,276	5.4
Southern	3,369	3.3	6,797	4.6	2,136	4.9	4,412	7.2
Total	101,897	100.0	146,710	100.0	43,621	100.0	61,109	100.0

Table 8-2-3
DISTRIBUTION OF ESTABLISHMENTS BY EMPLOYMENT SIZE
AND CITY IN THE SOUTHERN REGION, 1391 A.H.

City	Employment Size							Total
	1	2-4	5-9	10-19	20-49	50-99	100-	
Jizan	632	207	19	2	1	1	-	862
Abu Arish	204	29	4	2	-	-	-	239
Sabya	247	47	10	2	-	-	-	306
Dhamad	29	8	-	-	-	-	-	37
Shuqairi	34	7	-	-	-	-	-	41
Bish	73	19	-	-	-	-	-	92
Samitah	79	23	1	-	-	-	-	103
Abha	449	104	9	2	-	-	-	564
Khamis-Mushayt	480	294	33	3	-	-	1	811
Al-Baha	63	45	4	-	-	-	-	112
Beljorashi	172	40	6	-	-	-	-	218
Bishah	306	72	2	-	-	-	-	380
Najran	482	146	17	2	-	-	-	647
Total	3,250	1,041	105	13	1	1	1	4,412
Percent	73.7	23.6	2.4	0.3	-	-	-	100.0

Source: Statistical Yearbook 1392 A.H., Kingdom of Saudi Arabia

Table 8-2-4
GROWTH IN THE NUMBER OF ESTABLISHMENTS IN
MAJOR CITIES IN THE SOUTHERN REGION

City	1387 A.H	1391 A.H	Index 1391/1387 A.H.
Jizan	614	862	1.40
Najran	625	647	1.04
Abha	424	564	1.33
Khamis-Mushayt	473	811	1.71
Abu Arish	-	239	-
Sabya	-	306	-
Dhamad	-	37	-
Shuqairi	-	41	-
Bish	-	92	-
Samitah	-	103	-
Al Baha	-	112	-
Beljorashi	-	218	-
Bishah	-	380	-
Total	2,136	4,412	-

Source: Statistical Yearbook, 1392 A.H., Kingdom of Saudi Arabia

In an entrepreneurial economic system, which is the type that the Government of the Kingdom has instituted, it is important that the tertiary sector be allowed to develop with as few restrictions as possible. Participants do not produce in the same direct fashion as those who farm or mine, but they have the responsibility for seeing that farm and mine products are sold and consumed. They also play a major role in ensuring that production takes place in a way that is responsive to consumer demands and needs, so that there are neither shortages nor over-production, and that quality is uniform and high. To encourage the tertiary sector, it should be the policy to apply as few impediments (such as heavy taxes, excessive licensing requirements, or over-regulation) as possible, other than assuring that the basic standards for protection of health, welfare, and fair trade practices are met.

In general, the tertiary sector will increase as growth and development continue in the Southern Region. There will, however, be substantial changes in the sub-sectoral distribution of workers and facilities. Among the major elements to be considered are the following:

1. Employment in Trade. This sector is expected to increase quite rapidly. At present, only about 2.9% of the employment is in wholesale and retail trade, while in highly developed countries this is usually in excess of 20%. In the United States, for example, nearly 21% of the employment is in this sector, so it may be anticipated that the percentage of people so employed will eventually expand to about 7 times its present size. In the immediate future, the expansion will more likely be by a factor of two or three.
2. Retail Sales Facilities. While Employment in retail sales will expand, it is expected that the per capita amount of land area dedicated to this use will remain about the same or increase in small degree of it increases. The reason for this include the following:
 - (a) more intensive use of floor space by proprietors of shops and businesses; that is a greater amount of goods kept in a given area.
 - (b) more intensive use of facilities by time; that is a larger ratio of permanent shops (increasing from the present ratio of about 1:1 to 2 or 3:1) and the keeping of longer operating hours.
 - (c) a practical limit on the land area which a shopping center can occupy. Such a collection of shops cannot successfully cover more area than the customers can

walk to and within, and that overall size limit has already been reached in some cases. Thus the only opportunity is to increase the intensity of use of that volume of space already occupied.

- (d) An increase in land costs, which is to be expected during times of economic expansion, will make it more economical to use existing space effectively rather than expand.
 - (e) More efficient handling methods and equipment.
3. The service subsector will expand on a per capita basis much faster than the mean level of growth. Experience in other countries has shown that during periods of rapid development, this area grows at an exponential rate. This is particularly likely for the Southern Region since the present level is less than one third of one per cent, and in developed countries it may be as high as 10 per cent. On a general basis, this is a function of greater interaction; the following are some specific examples:
 - (a) As people live in more dense surroundings, it becomes less convenient for them to undertake certain tasks. For example, in rural areas it is possible to cut down trees for cooking fires. In urban areas however, there are fewer trees for capita, and it is desirable to leave them for beauty and shade. Thus the opportunity is developed for the sale of firewood or other fuel.
 - (b) As people spend more time in professional or technical employment, it becomes less efficient for them to engage in certain kinds of jobs. For example, a skilled electronics technician can make more money in wages than it would cost for him to pay someone to paint his house. Thus the opportunity is developed for painters.
 - (c) As the population grows and new facilities are built, it is necessary for activities supporting the new facilities to follow. For example, a community may grow to such a size that a hospital is constructed. There is then a need for people to engage in a wide variety of supporting tasks. Some, such as janitors and orderlys require little skill and could be opportunities for new arrivals. Others, such as skilled maintenance technicians, would be sophisticated and well-paying positions.
 4. It is desirable that the Governmental Employment Subsector not expand further, since it is already the largest percentage. In highly developed countries, this figure is typically

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Table 8-2-5 (a)
KIND AND NUMBER OF SHOPS

KIND OF SHOPS	ABHA	KHAMIS MUSHAYT	NAJRAN	BISHAH	JIZAN	TOTAL
PERMANENT FACILITY:						
SHOPS:						
Clothing and Shoes	90	88	21	30	61	290
Foodstuffs	78	103	60	68	60	369
Ironware, Construction Materials, etc.	9	28	18	18	23	96
Car and Motorcycle dealers and Spare Parts	9	50	39	10	11	119
Stationery, Books and Magazines	4	5	2	1	4	16
Midicines	2	5	2	1	3	13
Radios, Watches and Jewelry	13	24	13	2	9	61
Cosmetics and Haberdashery	12	82	10	4	11	119
Electrical Appliances	7	11	9	3	5	35
Furniture and Carpets	4	11	4	-	6	25
Benzine Stands	8	13	11	5	9	46
Others	5	4	5	3	3	20
SERVICE SHOPS:						
Photostudios	4	12	5	4	7	32
Bakers	-	-	11	-	8	19
Barbers	9	20	9	4	8	50
Cleaning	8	29	9	4	4	54
Tailors	24	33	25	6	19	107
Restaurants	7	22	9	15	11	64
Ghahwah	7	17	11	11	9	65
TEMPORAL FACILITY:						
Shops and Stalls for Foodstuffs	111	149	158	30	30	478
Others	87	293	218	70	70	738
TOTAL	498	999	649	289	371	2806

NOTE: Source, URTEC Feild Survey (September 1975)

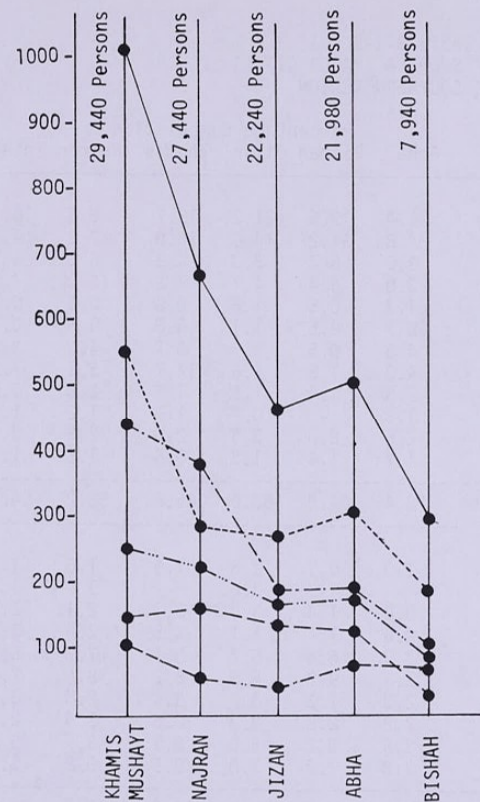


FIGURE 8-2-1
NUMBER OF COMMERCIAL FACILITIES BY 5 CITIES

— Total number of commercial facility
 - - - Total number of permanent shop
 - · - Total number of temporal shop and stall
 - · - Total number of foodstuffs shop and stall
 - · - Number of permanent foodstuffs shop
 - · - Number of temporal foodstuffs and stall

Source: URTEC 5% survey, 1975
Population: 5% survey area only

Table 8-2-5 (b)
COMPOSITION OF SHOPS AT MAJOR CITIES
IN THE SOUTHERN REGION

Kind of Shop	Percentage Composition					Total
	Abha	Bishah	Jizan	Khamis	Najran	
Retail and Wholesale Shops:						
Clothing and Shoes	21.4	9.6	21.2	13.7	6.5	14.3
Foodstuffs	24.8	31.2	14.9	16.0	17.8	19.6
Ironware, Construction Materials	3.0	8.3	3.3	4.3	5.5	4.7
Cars, Motorcycles & Spare Parts	3.0	6.4	4.1	7.8	12.0	7.0
Stationery, Book & Magazines	1.3	0.5	1.5	0.8	0.6	0.9
Medicines	0.7	0.5	1.1	0.8	0.6	0.7
Radios, Watches & Jewelry	4.3	0.5	3.3	3.7	4.0	3.4
Cosmetics & Haberdashery	4.0	1.8	5.6	12.7	3.1	7.0
Electrical Appliances	2.3	1.4	1.5	1.7	2.8	1.9
Furniture and Carpets	1.3	-	0.7	1.7	1.2	1.2
Engine Stands	2.6	2.8	3.3	2.0	2.5	2.5
Others	1.7	1.4	1.5	0.6	1.5	1.2
Subtotal	70.4	64.2	62.0	65.8	58.2	64.4
Processing and Service Shops:						
Photo Shops	1.3	0.9	2.6	1.9	1.5	1.7
Bakers	-	-	3.0	-	3.4	1.1
Barbers	3.0	1.4	3.0	3.1	2.1	2.7
Cleaning	2.6	1.4	1.1	4.5	2.8	3.0
Tailors	7.9	6.4	6.7	5.1	7.7	6.5
Car & Motorcycle Repair	3.3	9.2	8.6	8.2	8.6	7.6
Restaurants	2.3	7.3	3.7	3.4	2.8	3.6
Qahwah	2.3	2.8	3.3	2.6	3.4	2.8
Furniture & Cement Block Makers	3.6	3.2	3.0	2.9	3.7	3.2
Others	3.3	3.2	3.0	2.5	5.8	3.4
Subtotal	29.6	35.8	38.0	34.2	41.8	35.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0

Source: URTEC Field Survey, 1975

around 20 to 25 per cent but in Abha, for example, it is 62 per cent. There are many tasks which have been undertaken by the government since, at the present level of development, it has been unprofitable for the private sector to do them. Growth will establish new economies of scale, however for example in the future it may be less expensive for a municipality to contract garbage collection to a private business than to do it on its own, thus improving its own finances and providing a new opportunity for private business.

- Growth and development in themselves establish new types of commercial activities. For example, real estate and construction are major sub-sectors during such times. These functions will therefore be likely to grow and remain active for the period covered by this plan, although at some point there will be a gradual diminution of their percentage.

At the present time, employment by the tertiary sector (excluding government) in the Southern Region is 5 per cent of the labor force. By the time of maximum economic development in the region, this figure may well have expanded to incorporate fully one-third of all employees. A more realistic projection likely to occur within the period covered by this plan is to 20 per cent.

8-2-3 TYPES OF COMMERCIAL ACTIVITY

There are four general categories of commercial activities taking place in the Southern Region: (a) wholesale, the trading of fairly large quantities of goods which are subsequently re-sold at retail, (b) retail, the trading of goods on a small volume or piece-by-piece basis directly to those who will use or consume them, (c) personal service, such as cleaning or barbering, and (d) repair of items already owned and the sale of spare parts. Obviously there can be a large amount of overlap - a tailor, for example, engages in both retail sales and personal service in the preparation of clothing for a customer, and may later engage in repair.

Similarly, there may be mixing of wholesale and retail sales. In actuality, there appears to be little purely wholesale activity in that less than ten per cent of the commodities sold are traded on a wholesale basis before being sold at retail. Accordingly, this distinction is not worth making at the present time but will become more important as the sophistication of the region's economy increases.

It is noteworthy that of all permanent commercial facilities, more than three times as many are engaged in sales (either wholesale or retail) than in service and repair. This is an indication of a potential problem - An insufficient number of certain types of skilled craftsmen and mechanics. The figures mentioned above might not indicate a problem in more developed areas with better access to factories and supplies of spare parts. Such items, however, are always in short supply during times of rapid development as the Kingdom is now experiencing. This problem is further increased by the Southern Region's relative isolation from the other parts of the Kingdom. In such circumstances, it is highly desirable to have repairmen, mechanics, and craftsmen who have the skill to fix machines and other items and possibly make their own spare parts. Otherwise there are liable to be long periods in which important pieces of equipment, automobiles, electrical goods, and even personal items are inoperative.

The problem is not merely one of education; chapter 7 discusses the establishment of facilities for training such workers. It is also due to a substantial wage disparity that exists in certain professions between the Southern Region and the parts of the Kingdom where oil extraction and refining is taking place. In some instances, a worker in the oil fields may be making several times as much money as one with similar skills in the Southern Region. This suggests that some type of wage subsidy program should be undertaken by the Government. Otherwise there may continue to be a major drain of the Southern Region's skilled manpower, with severe consequences for its future development.

Another significant breakdown of commercial activities is between those which are permanent and those which are either temporary or operate on a part-time basis, such as the suqs. In many areas, the process of setting up such shops has been regularized and institutionalized so that it always occurs on the same day. (Khamis-Mushayt is an excellent example.) In such cases, people wishing to sell or buy goods know to come to the suq on that day because others will do the same.

As far as the number of such facilities is concerned, there is an almost even division between permanent shops and temporary shops and stalls (1209 and 1216 respectively, as shown in Table 8-2-5(a)). It is difficult to ascertain the difference as far as the actual volume of trade is concerned. For the most part the permanent

facilities are likely to engage in a larger per capita volume of sales because they are open throughout the week and usually have a larger capacity for storage of stock. On the other hand, it is likely that a large volume of certain major commodities such as livestock are traded without the use of a permanent commercial establishment.

Finally, it is noted that by far the largest concentration of all types of activity, retail and wholesale, permanent and temporary, is in basic commodities such as food and clothing. It is highly likely that as the level of economic development in the Southern Region rises, there will be demand by consumers for higher quality and greater variety of goods.

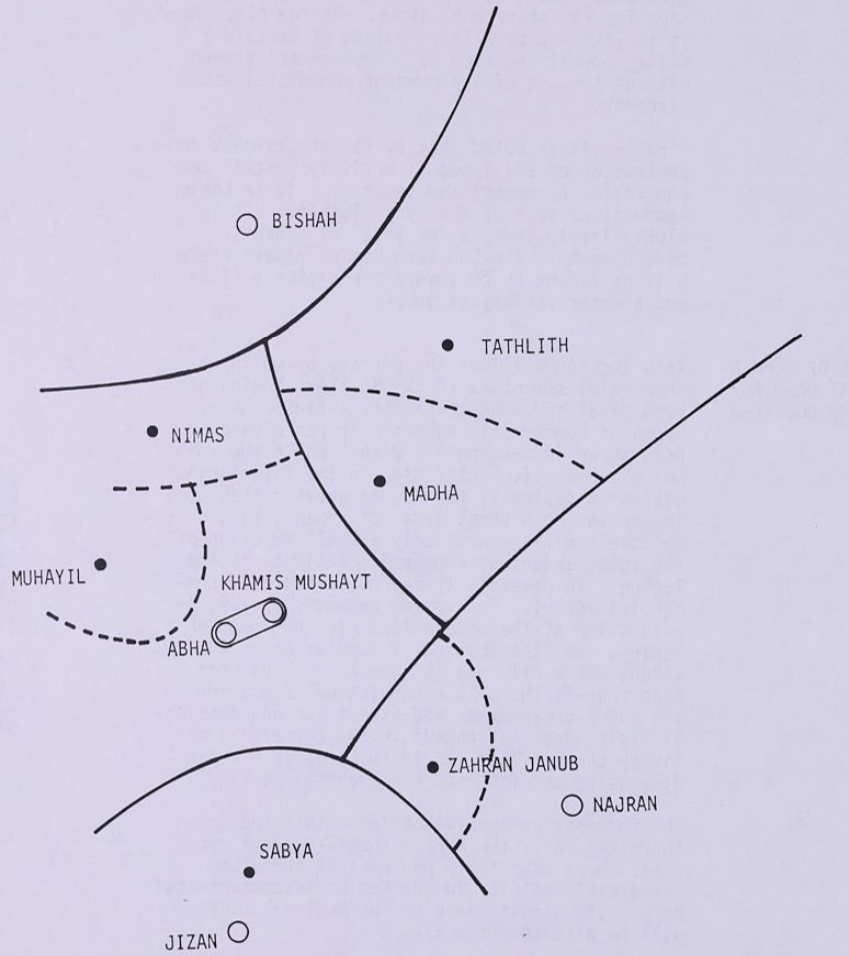
8-2-4 STRUCTURE OF COMMERCIAL RELATIONSHIPS WITHIN THE SOUTHERN REGION




This section outlines the process by which the commercial structure in the Southern Region has been developed and establishes a hierarchy of types of commercial centers. It has already been shown in Section 8-2-2 that while the volume of commercial activities in the five largest cities is typically four times greater than that in the second highest order of urban areas, this nonetheless represents only a small fraction of the total amount of commercial activity in the Region. In general, it may be stated that commercial activity in a given category is largely a function of the population. In the Southern Region, the distribution of population is 19% urban, 56% rural, and 25% nomadic. Thus more than four-fifths of the population is outside the major urban areas and except for an occasional visit, does not engage in the commercial activity there. This should be borne in mind in discussing the internal hierarchical ranking.

The foremost commercial center within the Southern Region is the Abha - Khamis-Mushayt urban area. More than fifty per cent of the urban commercial activity in the Region is concentrated here. Its significance as the Regional Center will be discussed shortly.

Along with Najran, Jizan, and Bisha, the Abha-Khamis Mushayt area also serves as a sub-regional trading center. The establishment of these cities as sub-regional centers was initially a function of several elements:

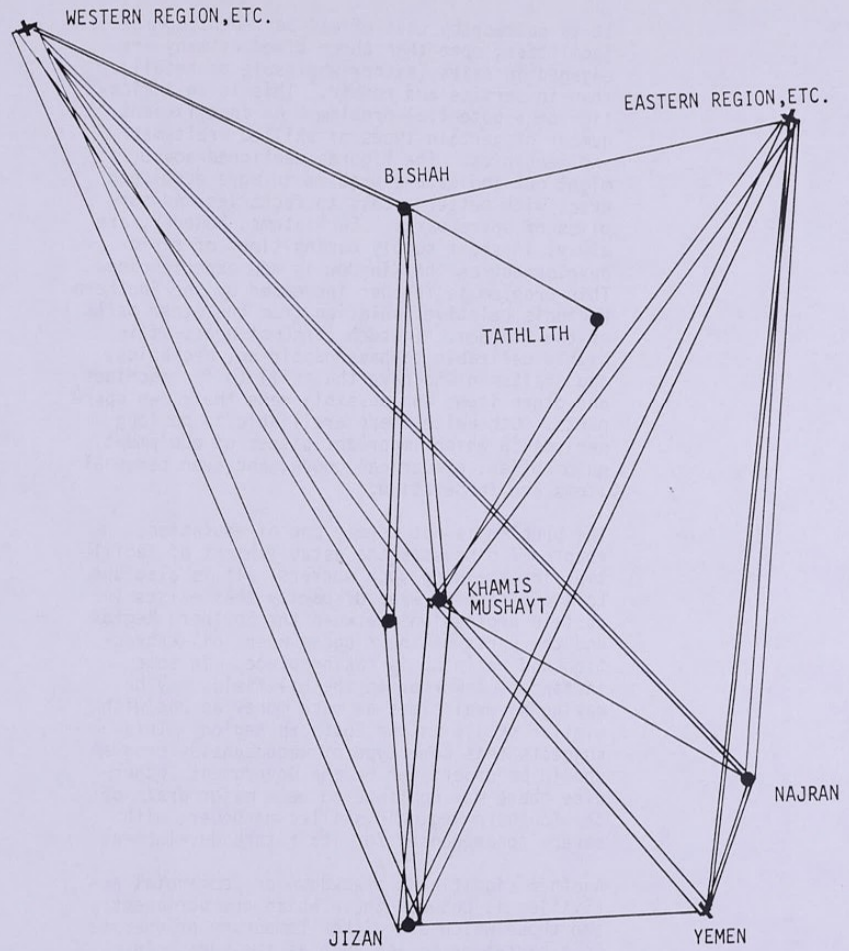
1. The need for a sub-regional center for commercial activities, due to a certain concentration of population and commercial activity having been reached.
2. Some natural advantage which gave the city an edge over other cities which might also have served as a subregional center. For example,



-  First Order Population Center
-  Second Order Population Center
-  Third Order Population Center

Scale 1:2,500,000

FIGURE 8-2-2
HIERARCHICAL SYSTEM
OF URBAN CENTERS



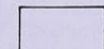
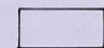
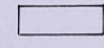
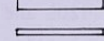
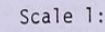
-  1,000 ton/12 hours
-  800
-  600
-  400
-  200

FIGURE 8-2-3
COMMODITY FLOW DIAGRAM
SOURCE: URTEC SRUVEY 1975

Scale 1:2,500,000

(a) in the case of Jizan, its function as a seaport, (b) in the case of Khamis-Mushayt, its central location in the highland agricultural area, and (c) in the case of Najran, its proximity to the old caravan routes.

3. Accessibility to the population served by it.
4. Association with other types of activities, such as administrative function, that would cause people to be brought together.

Once established, their commercial pre-eminence caused them to advance and grow, even if the reason for which they were originally founded lessened in importance.

The third hierarchical order (in descending importance) includes the villages of Tathlith, Baysh, Nimas, Zaharan and Muhayl. These are trading centers which are subordinate to the sub-regional centers and receive a large portion of their commodities through them.

It would be possible to continue the analysis to even smaller units in the order of commercial importance, but it would not be discussed here.

It has been shown (section 8-2-2) that the degree of activity on a per-city basis drops off sharply as a function of decreasing size, so that it is not critically important to continue the graduation beyond the three levels already discussed. By this point, commercial activity has become so dispersed that it is no longer a function of commercial center, but rather a form of interaction that occurs in the rural and nomadic sections of the region.

The factors which determine the order of the commercial centers include the following:

1. The overall size of the urban center
2. The overall level of commercial activity within it.
3. The extent to which it serves as a "Pipeline", that is, the volume of goods which passes through it en route to other centers lower in the hierarchical order.
4. Its association with other types of activities that promote interaction among people
5. Its growth in recent years as a demonstration of commercial viability.

These are the reasons that the Abha-Khamis Mushayt urban area has developed into the foremost position in the hierarchical order of commercial activity in the Southern Region. A graphic representation of this order, and the geographic market areas is shown in Figure 8-2-2. It should be noted that this refers to the structure of commercial relationships within the Southern Region, and the actual pattern of commod-

ity flow, as well as the relationships external to the Region, are discussed in the following section.

8-2-5 COMMERCIAL RELATIONSHIPS BETWEEN THE SOUTHERN REGION AND OTHER AREAS

There is a strong dependence by the Southern Region on the northern areas of the Kingdom for practically all goods not produced within the region itself. Both domestically produced and imported commodities are transported from or by way of Jeddah and Riyadh. At one point Jizan was an entry port for a limited volume of imported goods from relatively close-by countries such as Ethiopia, but in recent years the Port's activity has declined severely. What few commodities that may be brought in within the foreseeable future are likely to be bulk materials like oil transported from other parts of the Kingdom for storage. Thus it is probable that the existing dependency on north-south land routes connecting with the northern areas will continue.

Functions of the Regional and Sub-Regional Commercial Centers is as follows:

1. Khamis Mushayt functions as the focal point in the trading hierarchy of the Region. Some of the goods are directly distributed without going through Khamis Mushayt. Most of the goods imported into the Region, however, are carried in either from Jeddah or Riyadh to Khamis Mushayt, which serves as a regional redistribution center of commodities to other urban centers in the Region. For instance, bottled natural gas is imported from Damman to Khamis Mushayt and then distributed throughout the Region. The production of chicken in Khamis Mushayt does not meet the local demand and additional chickens are imported from Jeddah.

The advance of intra and inter regional transport systems might stimulate commercial activities and the position of Khamis Mushayt will be still more important as a redistribution center of the Region. The only exception is Bishah and the area under Bishah's trading umbrella. For the purposes of this discussion, Abha is regarded as part of Khamis Mushayt.

2. Jizan functions as a sub-regional center and also supplies fish from the Farasan Islands fishing grounds to Abha, Khamis Mushayt and Najran. Bishah gets fish from Jeddah because of the relatively short distance between them. Some of the vegetables produced in the Jizan area are transported as far as Jeddah, Riyadh, Qatar, and Kuwait. Jizan has declined with

the wane of seaport activities. However, the implementation of the Jizan seaport extension plan and the construction of the petroleum supply base will stimulate commercial activities once again. Thus, Jizan will be an important distribution center of imported commodities upon completion of the road to Abha (Route 54).

3. Najran mainly supplies fresh and locally canned dates to Jeddah, Riyadh and major suqs in the Region.
4. Bisha also produces dates. In addition, its proximity to Jeddah allows it to obtain goods for use within the urban area and for redistribution to the surrounding areas. The scale on which this occurs is nevertheless much smaller than that of Khamis Mushayt.

The functions and relationships discussed above are shown graphically in Figure 8-2-3. The following are central to an understanding of commercial relationships in the Region.

1. Almost all of both intermediate and finished goods come to the major five cities from Jeddah and Riyadh via Route 54 running from Jeddah to Jizan passing through Abha, as do the main foodstuffs such as rice, sugar, tea and canned foods. Khamis-Mushayt serves as a regional redistribution center of these commodities for Abha, Jizan and Najran while Bisha has direct connection to Jeddah and Riyadh.
2. Natural gas contained in gas cylinders is transported from Damman to Khamis-Mushayt and then redistributed to the neighbouring cities and villages.
3. Jizan, which has rich fishing grounds around the Frasan Islands supplies fish to Abha, Khamis-Mushayt and Najran with Bisha getting fish from Jeddah. In light of the fact that fish consumption is not large except in Jizan (where people know how to cook fish and like to eat them). The following are required in order to promote fishery industry in Jizan: (a) development of a well-furnished fishing harbor, (b) arrangement of distribution system (such as fish markets, storehouses and transportation facilities), (c) encouragement of greater fish consumption. An increase in the ice-making capacity and other possible strategies will contribute significantly to the growth of fishing industries in the Jizan area.
4. Khamis-Mushayt gets vegetables from Bisha and Najran as well as from Jizan where a big-scale agriculture complex (covering about 6,000 ha when it is completed) is now being developed

under Wadi Jizan Area Development Project, a joint venture between the Kingdom and FAO(UN). Some vegetables produced in the Jizan area are transported as far as Jeddah, Riyadh, Qatar and Kuwait.

5. Bisha (and Najran) supplies their date-products to Jeddah and Riyadh but does not export them to foreign countries as Hofuf in Al Hosa and Medina in Hijaz do. Dried dates are packed in box-type containers which are made by local tin-smiths, and then sent to other cities by truck.
6. Chicken is supplied from Jeddah to Khamis-Mushayt whose chicken consumption is so large that the local supply can not meet the huge demand. This fact vindicates the establishment of a local poultry-processing factory.
7. Cement for the region is provided mainly from Hofuf, Jeddah and Riyadh, the three largest cement producing cities in the Kingdom. But Jizan can simultaneously take advantage of its local port to import cement relatively cheaply (compared with cement transported from outside the city by truck via inland roads) from Egypt, Kenya (Mombasa) and Ethiopia (until recently). There is a huge and urgent demand for cement from both private and government sectors due to the recent rapid increase in construction activities in the Region. As matter of fact, cement shortage has caused, together with other factors, the delay of housing development and infrastructure improvement to appropriately accommodate those who are locally needed. For instance, at Al-Faisaleyah, a newly developed city in Najran, all lots (about 950) developed for residential units have already been sold out. Many purchasers of the lots have postponed building houses because of the recent extraordinary increase in cement price. Another example is the recent appearance of the quarters observed here and there jammed up by poorly designed barracks made of sheet-zinc. Accordingly, a special effort should be made to increase the cement supply over the Region to avoid possible economic and social problems.

As stated above, materials (except fuel) are available within the Region. Only remaining issue is the size of demand in the Region: whether or not the demand is large enough to justify an independent production plant. SANTS (Saudi Arabian National Transport Survey) already proposed a plant with the annual production capacity of 750,000 tons within the South-

western Region. Further studies are needed for demand projection and the quantity and quality of available limestone and clay in the Region. Among alternative prospective locations, however, Jizan appears to be most promising because of its ready access to sea transport for procuring fuel and the availability of limestone nearby.

8. Fertilizer and pesticide. It is estimated that a total of about 260,000 tons of fertilizer nutrients are required annually. Therefore, the possibility of establishing a fertilizer plant or plants should be considered. However, the quantity of production requirement is not sufficiently large for economic production. A similar conclusion can be drawn for pesticide production.
9. Farm machinery. As stated in the preceding subsection, more farm machinery is needed for adequate development of agriculture in the Region. However, production of farm machinery should be undertaken at the national level as a large production is needed for economic production. Because it has linkages with production of other commodities such as steel, plastics and rubber, it should be undertaken within a larger industrial area such as the one in Jeddah. However, repair shops of farm machinery should be established wherever farm machinery is used. In this sense, each of the five major cities and other rural centers should have a repair shop.
10. Abha gets certain types of commodities via Ash Shuqayq port but only negligible amounts of goods via the Jizan port, which ranks third among the Red Sea Coast ports of the Kingdom. Jizan's port facilities can simultaneously accommodate only two cargo boats of several thousand tons, a much smaller capacity than the ports of Jeddah and Yanbu. However it should be clearly understood that, while Jizan's port activities may not be satisfactory at present, it has the potential development in functioning as a port of call, a port of distress and a port of loading and unloading. Jizan will become a strategic key to the development of the agricultural complex in its hinterland. Both agricultural products and manufacturing products associated with the agricultural complex have to be transported to their domestic and/or foreign markets. In order to meet this requirement the port capacity and facilities should be improved to include sufficient warehousing service and cargo handling facilities. One of the possible alternatives for this purpose is the

introduction of barge carrying vessel (BCV) system. One major factor to be considered is the nature of the commodities to be produced here. These include agricultural products, cotton-related products, and sugar. Many of these items are either in a relatively raw state or are bulky and are quite time-consuming when loaded or unloaded. Further, they cannot be conveniently containerized. Other factors to be considered are the characteristics of commodities to be imported through the port, the relatively poor condition of the present port facilities and a unique marine-geographical environment. Taking these factors and others into consideration of the feasibility for the introduction of BCV type of barge service at Jizan.

11. It is worth mentioning that an increase in the supply of block ice will increase the potential commodity flow from agricultural areas to more urbanized areas resulting in the reduction of "one-wat loading" which places a burden on the Region.

8-2-6 ESTABLISHMENT AND IMPROVEMENT OF COM- MERCIAL FACILITIES

In planning for commercial facilities, it is necessary first to establish a hierarchical order related to the type and volume of activities taking place at each level. There are four basic orders of commercial facilities. (See Section 8-2-4). In descending order of magnitude, they are:

1. Regional Commercial Center. There is only one such center, the preeminent city through which the goods flow from outside the Region to the distribution points, and thence to the points of sale. The Abha-Khamis Mushayt urban area has already attained this position and, since it is a logical choice and since it is functioning well, there is no need to consider alternatives.
2. Sub-Regional Commercial Centers. There are four centers in this category (a) Najran, (b) Jizan, (c) Bisha, and (d) Abha-Khamis Mushayt, (which functions in this category as well as being the Regional Commercial Center). Similarly, the existence of these urban centers in this order is a long-established fact, and is not likely to be modified by any planning action.

3. Community Commercial Center
4. Neighborhood Commercial Center

Obviously the greatest need, as well as the greatest opportunity for implementation, is at the two lowest levels of the hierarchical order. With this in mind, the following points are emphasized:

1. The planning should be based initially on existing conditions and should make realistic projections of likely future development. If planning varies too far from this standard, either by being too grandiose or insufficient, it will cause waste and loss of time and opportunities.
2. It should provide sufficient land of the right kind in accord with the existing use and projected growth. There should be no shortage in either the gross amount or the per facility amount.
3. It should ensure sufficient facilities so that commercial services are uniform and of high quality in all areas.
4. Careful attention must be paid to infrastructure, particularly transportation and utilities (water, electric power, sewage, etc). An imbalance in the order of development can produce damaging shortcomings and loss of time.
5. There should be a good relationship, spatial and otherwise, to the related and supporting services such as manufacturing and warehousing.
6. Similarly, commercial development should respect other incompatible types of land use, such as residential, and should provide adequate space or buffers as necessary.
7. Planning and development of commercial facilities should be done in such a way to maximize opportunities for "multiplier" effects. In other commercial functions, in related areas, and in meeting national goals.

In planning for commercial centers of each hierarchical order, the following specifications should be used.

1. Regional Commercial Center:
 - Number: 1 (Abha-Khamis Mushayt)
 - Size of Population Served: Entire Region, 1,000,000+
 - Main Functions: Main Regional Commercial Center; Main Point through which goods pass in coming from outside the Region
 - Radius of Area Served: of approximately 200 KM
 - Land Area Requirements: Equivalent to largest urban area

- | | |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Location | Approximate center of Region |
| 2. Sub-Regional Commercial Center Number: | 1 (Abha-Khamis Mushayt, Jeddah, Makkah and Bisha) |
| Size of Population Served: | 100,000 or more |
| Main Function: | Down town shopping center to serve the regional population. It could also be located along a major arterial extending from the city center. It will provide in addition to the stores normally found in the neighborhood and community shopping centers, fashion goods, furniture, household equipment, women's apparel, etc. |
| Radius of Area Served: | City and its neighborhood communities. Regional population beyond city and its surroundings also uses on a less frequent basis. |
| Land Area Requirement | 0.5m ² to 1.0m ² per inhabitant (i.e. 5 to 10 Ha for 100,000 inhabitants) is recommended |
| Floor Area Requirement (Sales Area): | 0.1m ² to 1.0m ² per inhabitant (i.e. 10,000 to 100,000m ² /100,000 inhabitants) is recommended. |
| | The Table 3-1-4 indicates per capita sales areas for different sizes of the city population (including neighborhood, community and regional shopping centers). |
| Location: | Situated in the downtown area of major cities or along the regional arterials leading to the major city centers. |

Other Requirement: 4:1 parking is recommended. 2:1 is also acceptable if located in the middle of downtown.

3. Community Commercial Center
 Number: As many as called for by population

Size of Population Served: Approximately 30,000 inhabitants.

Main Function: Basic retail service to the "Community" population. Shops whose financial viability requires larger population than neighborhood population are located in the community shopping center (such as florist, shoe shops, gift-shops, candy, lingerie, book stores, toys, childrens' wear, radio and TV repairs, etc.) "Second Floor Office" could be included.

Radius of Area Served: In urbanized area, maximum 1200m (20 minute walking distance) is recommended. Larger radius is also acceptable if density is less than 50 pph and ample parking space is provided.

Land Area Requirement: $0.5m^2$ to $1.0m^2$ /inhabitant is recommended. (i.e. 1.5 ha to 3ha/30,000 inhabitants.)

Floor Area Requirement (Sales Area): $0.1m^2$ to $0.2m^2$ /inhabitant (i.e. $3000m^2$ to $6000m^2$ /30,000 inhabitants) is recommended.

Location: Situated at the center of community with population size of 20,000 to 40,000 or along the arterial road connecting community center to city center. Close to or integrated with community center, park and other community facilities.

Other Requirement: When a regional shopping center or a downtown shopping center is in the vicinity, the community shopping center may be incorporated into the larger shopping center. 2:1 parking (i.e. parking area: sales area = 2:1). Less than 2:1 is acceptable if density is more than 100 pph.

4. Neighborhood Commercial Center
 Number: As many as called for by population.

Size of Population Served: Approximately 4,000 inhabitants, (2,500 to 5,000.) but varies according to density and accessibility.

Main Functions: Food market, drugstore, bakery, barber shop, laundry and dry cleaning hardware, stationery, restaurant, etc.

Radius of Area Served: In urbanized area, maximum of 300m (i.e. 5 minute) is also acceptable. If density is less than 50 pph, a larger radius may be acceptable depending on the situation.

Land Area Requirement: 2 to $4m^2$ /inhabitant, i.e. 0.8 ha to 1.6ha/4000 inhabitants) is recommended.

Location: Situated at the center of neighborhood with population size of 2,500 to 5,000 or along the local distributor road connecting the center of the neighborhood to the "Sub-Community" with a population of 10,000 to 20,000. Closely located to or integrated with neighborhood center, neighborhood park and other neighborhood facilities.

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Other Requirement: If a shopping center for a higher hierarchical group order exists in the vicinity, the neighborhood shopping center is incorporated into the larger shopping center. A portion of neighborhood shopping center could be substituted by the corner stores in the neighborhood. 1:1 parking (i.e. parking area:sales area = 1:1) is recommended. Less than 1:1 is acceptable if density is more than 100 pph.

Table 8-2-6
SALES AREA PER CAPITA

CITY POPULATION	COMPONENTS (m ² /inh.)	TOTAL (m ² /inh.)
4,000	0.25 to 0.5	0.25 to 0.5
30,000	0.25 to 0.5 0.1 to 0.2	0.35 to 0.7
100,000	0.25 to 0.5 plus 0.1 to 0.2 plus 0.1 to 0.2	0.45 to 0.9

8-2-7 DISTRIBUTION CENTER FACILITIES

The concept of the distribution center has been developed to improve the flow of goods into and out of the Southern Region. While it is not necessary physically associated with the types of commercial centers described in Section 8-2-6, it is definitely associated with the four hierarchical orders. The distribution center is a unique facility, the needs for which include the following:

1. The need for an orderly and efficient transfer of goods between hierarchical orders. For example, the large inter-city trucks (Regional or Sub-regional level) would transfer their cargoes to smaller intra-city trucks (community level).
2. The need for specialized facilities and equipment, for handling of bulk cargoes for example.
3. The need for specialized transport facilities. Most often this will mean a road system capable of handling large trucks, but in some cases it may include an intermodal exchange facility, such as connections with the seaport in Jizan.

4. The need for supporting facilities, possibly including warehouses, cold storage plants, and even factories.
5. The need to minimize the impact on other types of land uses. This impact can take many forms such as (a) direct intrusion, (b) generation of traffic, especially if large trucks travel on the old, narrow commercial streets, and (c) generation of dust and exhaust pollution. It is important to note that the distribution center should be kept distinct, not only from the residential areas but also from most other types of commercial areas.

The particular location of the distribution center should be determined by the city plans, but in general the policies are as follows:

1. The distribution centers should be at the regional center (abha-Khamis-Mushayt) and the Sub-regional centers (Jizan, Najran and Bishah).
2. There should be sufficient land available, generally 1-5 ha, of appropriate quality.
3. The distribution center should be outside of the densely populated parts of the city and also should be outside the existing commercial and shopping centers. It is acceptable for it to be associated with the new industrial parks if the other criteria are met.
4. Transport routes must be available. The most critical needs are for roads which will accommodate large numbers of heavy trucks operating at high speeds, but in cases like Jizan, interchange with the port facilities are also necessary. Generally this means that the best location is on the Ring Road or the highest hierarchical order of road around the periphery of the city.
5. The impact on other types of land use should be minimized.
6. The planning and site selection should be done in such a way that other development goals are supported rather than contradicted. In the relocation of Jizan, for example, it would be desirable that the distribution center be placed so as to support activities both in the old city (which will be dedicated mostly to oil storage, the port and port related industries) and in the new city (all other functions).

Table 8-2-6
THE INTENSITY OF TERTIARY EMPLOYMENT BY SUBSECTOR AND CITY
(Employment/100 Persons)

	Abha	Bishah	Jizan	Mushayt	Najran	5 Cities Together
Wholesale & Retail Trade	1.8	5.0	4.0	1.9	3.4	2.9
Finance & Insurance	0.3	-	0.1	0.3	0.4	0.3
Real Estate	0.3	-	-	0.5	0.1	0.2
Transport & Communication	1.0	-	1.4	1.4	1.0	1.1
Electricity, Gas & Water	0.2	-	-	0.5	0.1	0.2
Services	0.2	0.5	0.7	0.1	0.1	0.3
Tertiary Total	3.7	5.5	6.2	4.7	5.1	5.0
Tertiary Total as Percentage of All Employment	17.2	31.5	31.6	22.2	33.4	25.8

Source: URTEC 5% Sample Survey of Employment, 1975

Table 8-2-7
DATA AND ESTIMATE FOR POPULATION
AND COMMERCIAL FACILITY

	A(B+C)	B	E	Other Permanent Shops	C	F	Other Temporal Shops	D(E+F)
BISHAH	289	189	68	121	100	30	70	98
ABHA	298	300	78	222	198	111	87	189
JIZAN	451	263	40	223	188	138	50	178
NAJRAN	649	273	60	213	376	158	218	218
KHAMIS MUSHAYT	999	557	103	454	442	149	293	252

	Popula- tion	A Popu.	Popu. A	C Popu.	C B	D Popu.	Popu. D	D A
BISHAH	7,940	0.036	37.4	0.0130	0.53	0.0120	81	0.34
ABHA	21,980	0.023	48.7	0.0090	0.66	0.0086	116	0.37
JIZAN	22,240	0.020	49.3	0.0084	0.71	0.0080	124	0.39
NAJRAN	27,440	0.024	41.8	0.0137	1.38	0.0080	126	0.33
KHAMIS MUSHAYT	29,440	0.034	29.4	0.0160	0.79	0.0085	116	0.25

SOURCE: URTEC 5% survey, 1975

NOTE: A: Total number of commercial facility
B: Number of permanent shop
C: Number of temporal shop and stall
D: Total number of foodstuffs shop and stall
E: Number of permanent foodstuffs shop
F: Number of temporal foodstuffs shop and stall

8-2-8 OPPORTUNITIES FOR
COMMERCIAL DEVELOP-
MENT

Some likely possibilities for commercial develop-
ment and expansion exist in the following:
1. The region will benefit by the establishment of
local poultry broiler factory.

2. Jizan can play a dominant commercial role as a port, to provide commodities that are easier to transport directly to the town instead from Jeddah and Riyadh; e.g. cement which is imported from Egypt, Kenya (Mombasso), and Ethiopia, and agricultural imports and exports.
3. The harbor of Jizan has the potential for development so that it can function as a port of call, a port of distress, and a port of loading and unloading.
4. The Khamis Mushayt area has the potential to play an important role as a growth center for manufacturing in the region. Manufacturing, therefore, should carefully be considered as the major component of Khamis Mushayt in planning the spatial structure of the region.
5. Activities which promote further merger and assimilation between Abha and Khamis Mushayt, particularly in the commercial sector, should be encouraged and considered a major objective in planning for the region. In light of the proposal by the Ministry of Housing to establish 5000 housing units in the Abha--Khamis Mushayt corridor, commercial growth of the twin cities to meet the needs of the new population is expected to develop and flourish.

8-3 TOURISM

8-3-1 EXISTING CONDITIONS

The tourism industry in general is still far behind other sectors in terms of development in the region and there seems to be at present no strong desire on the part of most Saudi Arabians and other foreign workers in this region for having well-developed recreational facilities. However, some Saudis and other foreigners feel a strong need for such facilities. In this connection, the unique topography, including the escarpment, climate and historical background of the various points in the region provide a fair potential for the development of regional, national and (though very limited at least for a while) international tourism.

Running north-south at around 2,500 m above sea level are the Asir mountains. Here lie Sauda, Qarrah and Mohalah, close to the cities of Abha and Khamis Mushayt, which have a good potential as tourist areas. These areas are surrounded by natural forests and springs. They are cool even during the dry summer season, with the temperature never exceeding 30° centigrade and an annual average rainfall at a level of 300-400 mm.

The highway system linking Jeddah, Abha, Khamis Mushayt and Najran has been completed, and Sauda and Qarrah are also connected to it. This highway system makes it quite convenient for the residents of Abha, Khamis Mushayt and Najran to make use of Sauda and Qarrah as recreation areas. Najran has a number of historical monuments. For instance, there exist "the city of Al-Ukhdoud," Jabal Al-Hamra and various ancient engravings in nearby mountains. The special geological features of these mountains are an additional attraction. It is strongly recommended that these historic sites be protected by authorities to avoid further deterioration.

As in Najran, there are numerous historical sites in Jizan area, especially in Al-Hodouf, Sharja, Alia, Athar, Mnarah and Jabal Adrah. More significantly, Jizan is blessed with possible maritime tourism resources. There are the Farasan Kabir Islands about 40 km west of Jizan. These islands have unique tropical plants, coral reefs, and excellent fishing grounds with many species. The architectural style of the local homes give these islands special potential to be developed as a marine-oriented tourism center.

Tourism's development potential in the region is highest in the vicinity of Asir, especially, in Sauda, Qarrah and Mohalah, all of which are near the growing administrative and commercial centers of Abha and Khamis-Mushayt. These centers would provide most of the intra-regional recreational attraction. One means of utilizing the favorable climate for tourist opportunities is in "recreational farming." This is a concept which has been popular in Japan and the United States whereby high quality crops of a popular variety are cultivated on sites easily accessible by tourists. For a fee, they are permitted to pick a quantity of the crop for their own use, thus being provided with both food and recreation. Crops that lend themselves to such development include most fruits and nuts and many types of vegetables.

8-3-2 DEVELOPMENT POLICY

In formulating development policies for tourism in the region, the characteristics of tourism to be developed should clearly be defined. Main efforts should be directed toward promoting domestic tourism including both recreation within the region and resort development for people outside of the region. It is important that local recreational needs not be overshadowed by possibilities for tourism on a large scale, and the coherency and privacy of local areas should be respected. On the other hand,

there are other situations where tourism opportunities can initially be developed on a small or local scale, and later expanded to a regional or national level.

Strong consideration should be given to the establishment of a national park in the vicinity of the escarpment. It would serve several objectives, including:

1. An outlet for a variety of domestic tourism activities on both a regional and national level (although not international at the present time). These activities may range from simple tourism to the construction of second homes by persons whose regular residence is elsewhere in the Kingdom.
2. Conservation of existing natural, historical, and man-made resources.
3. Development of an activity which will eventually make an economic contribution to the region. Admittedly, it is likely to be years or even decades before such a point is reached.

In order to promote such objectives, several steps must be taken, the most immediate of which should be conservation. The region has seen examples of spoiling of resources, such as unattractive development around scenic views, pollution of the air, water, and soil, and replacement of traditional stone buildings with unattractive (and sometimes unfunctional) pre-fabricated or Western style structures. Fortunately this has not yet occurred on a large-scale basis and is capable of being reversed. A system of incentives, such as underwriting of upkeep costs, appears to be necessary, with outright governmental acquisition in some instances.

Among the specific steps that should be taken are the following:

1. Designation of the national park
2. Development of general policies to protect existing resources, such as having separate routes for heavy inter-city traffic (away from scenic sites or villages) and for local or sightseeing travel when possible; or the limiting of access to fragile land areas to foot traffic and restricting automobiles.
3. Careful planning for the physical layout of different types of development--for example the "pairing" of diverse elements like villages, resorts and recreational farming sites.
4. Development of an agency at the regional and national levels to plan and develop activities of this sort.

8-3-3 OPPORTUNITIES FOR DEVELOPMENT IN SUB-REGIONS

1. Asir
With its pleasant climate and spectacular views Asir has many opportunities. It is possible that the entire edge of the escarpment may be used as a national park, or at least subject to national regulation, since almost any spot along it has recreational and tourist values.
2. Wadi Quadrangle and 3. Najran
The climate and scenic features are less attractive here than in other areas, but there are historical, archeological, and geological sites of potential interest.
4. Tihama
Tihama offers an attractive and unspoiled coastline, another pleasant opportunity for tourism and water sports. Thus far its accessibility from the major population centers farther north has been a problem, but the coastal highway and Route 54 will assist in removing this difficulty. It is hoped that ferry service to the Farasan Islands will become available. Among the specific opportunities are:
 - a. recreational fishing (Sharks have been popular for sport fishing.)
 - b. observation of interesting natural formations or coral and possible collection of samples as souvenirs;
 - c. establishment of an aquatic recreational zone with beaches, open water (with commercial boat traffic excluded) and other opportunities;
 - d. beautification projects, such as the planting of palm trees around the peninsula;
 - e. construction of facilities to accommodate tourist and recreational activities, such as hotels and marinas.

In general it must be remembered that

1. tourism will require development of an improved transportation system, hotels, and similar facilities, and
2. it is unlikely to be a major producer of revenue in the near future but has possibilities on a long-term basis.

8-3-4 AREAS WITH SPECIAL
FEATURES FOR TOUR-
IST AND RECREATION
DEVELOPMENT

This section discusses in detail some of the sites which have already begun development informally and which have potential for additional development. The activity associated with them thus far demonstrates that they meet most of the general requirements for development as a tourist or recreation site, including:

1. Some attractive natural feature or scenic view which causes people to visit the site.
2. Availability of sufficient land for tourist and recreation and related facilities
3. Proximity to population centers
4. Accessibility usually by motor vehicle

Among the most important elements to be addressed in planning for further development are:

1. Construction of buildings and other physical facilities for use by visitors; these include restaurants, picnic sheds resting places, and so on.
2. Development of natural features by constructing or improving hiking trails, playing fields, scenic overlooks, and so on.
3. Providing for motor vehicle roads in a way that allows for good access to the sites but protects them from mis-use. There are many environmental concerns which must be respected including (a) protection of topsoil and surface vegetation from vehicles driving on them (b) protection from excessive generation of dust and noise, and (c) protection of trees and other greenery from exhaust pollution.
4. Similarly, protection from mis-use by people on foot, such as (a) protection of delicate ground from excessive pedestrian traffic, which can cause damage as serious as that by vehicles, (b) establishment and enforcement of regulations requiring proper disposal of trash and preventing littering, (c) protection against improper use of trees and vegetation, such as picking flowers from public gardens or chopping of trees for firewood.
5. Establishment of means of access for people without cars, such as chartered or scheduled busses.
6. Protection from forest or brush fires by controlling the location and size of campfires.
7. Protection of adjacent lands from unwanted intrusion by tourists.

The following sites have begun development as tourist or recreation centers and show promise for continuation:

1. Mohalah
Location: About 15 km east of Abha and 20 km west of Khamis Mushayt, just north of a line connecting the two cities

Size:	Approximately 1 km ²
Access:	Via newly completed highway between Abha and Khamis-Mushayt
Assets:	Permanent water (Wadi which is filled with water all year); thick vegetation associated with water; juniper trees; pleasant climate
Present Use:	Picnicing by up to 50 family or neighborhood groups on holiday; small-scale informal sports activities by picnickers; hiking, no formal facilities
Conservation Needs:	Protection of topsoil and water edge from heavy pedestrian use; prevention of burning of trees as firewood; protection against fire
Development Potential:	Great, due to rapidly expanding population of Abha and Khamis-Mushayt and easy access
Development Needs:	Construction of picnic sheds, sports fields, marked walking areas, rest facilities
Special Considerations:	Because of the existing agricultural activities, it may be possible and desirable to associate it with tourism activities. For example recreational farming (in which people pay a fee and are allowed to pick fruit or other crops from the fields) has proven very successful in many other countries like Japan and the United States.
2. Sawdah Location:	Approximately 20 km northwest of Abha on the upper branch of Wadi Abha
Size:	Approximately 5 km ² (smaller area for actual development)
Access:	Via newly completed 2-lane road from Abha
Assets:	Vegetation and trees (mostly juniper); small permanent stream and vegetation associated with water; view of escarpment; pleasant climate

Present Uses: Hiking, camping, driving, viewing escarpment

Conservation Needs: Protection of vegetation, topsoil, and water edge from vehicular and pedestrian traffic; prevention of burning trees for firewood, development in accord with topographic conditions.

Development Potential: Good, due to access from Abha

Development Needs: Improvement of scenic drive; addition of parking facilities; establishment of recreation and playing fields; construction of hotel; construction of restaurant and rest facilities for tourists; hiking trails.

3. Quarrah
Location: Approximately 20 km Southeast of Abha and 30 km southeast of Khamis-Mushayt, along the escarpment

Size: Approximately 10 km²

Access: From Abha via the Abha-Jizan Road to a point near the escarpment; then via a smaller two-lane paved road. From Khamis Mushayt via paved two-lane road.

Assets: Acacia forest; extensive open grassy meadows; scenic view of escarpment; attractive local agriculture fields; interesting topography, pleasant climate.

Present Uses: Picnicing, driving; viewing the escarpment

Conservation Needs: Similar to Sawdah, but at a lower level because of larger land area available. greatest problem at present is uncontrolled driving and parking on the land, since it is relatively level.

Development Potential: Good, particularly for larger scale organized sports.

Development Needs: Extensive Construction of facilities for organized sports: playing fields, dormitories, a stadium.

Special Considerations: Quarrah has the greatest potential of any of the sites for recreation on a sub-regional or regional level. It is well suited both by location and by type of land for a regional sports center which could be used for competition, outings by schools, and so on.

4. Tanuma-Nimas

Location: Nimas is slightly more than 100 km north of Abha along Route 54 and Tanuma is just to the south of Nimas, along the escarpment.

Size: As much land can be made available as necessary and appropriate. In general, the desirable features extend along the edge of the escarpment a long distance.

Access: Route 54, a newly-completed major north-south route passes through the Nimas-Tanuma area. Access to the escarpment itself is via a local unpaved road.

Assets: Nimas has view from the escarpment toward Tihama and a variety of different types of vegetation including pleasant grassy meadows from which to enjoy the view. Tanuma has an even more spectacular view with many exposed areas of granite and a long vista toward Tihama. There is also a large amount of greenery and a small permanent stream of water due to the substantial rainfall and high runoff coefficient due to the large area of exposed granite hills.

Present Uses: Recreation at present is largely a local activity, with hiking, picnicing, informal sports, and school outings. In order to go to the edge of the escarpment, it is necessary to walk the last short distance because of the rocky and irregular terrain.

Conservation Needs: Protection of topsoil and vegetation from pedestrian traffic. Prevention of use of trees for

firewood. Prevention of pollution of the stream (it is too small to tolerate refuse, dish-washing, etc. now taking place) prevention of dumping of garbage (the scenic point is practically a solid waste dump.) Control of vehicular traffic via preparation of paved driving and parking areas.

Development Potential: Excellent, due to good conditions central location, and good access via Route 54.

Development Needs: Construction of tourist hotels and vacation homes. Development of recreational farming facilities. Construction of picnic sheds, playing fields, and other tourist and recreational facilities.

Special Considerations: (1) Because of its excellent advantages and accessibility, the Nimas-Tanuma area has the possibility of developing a significant tourist industry which could make a major contribution to the local economy, jobs in tourist service, construction, and other sectors could be provided.

(2) There is also an excellent opportunity for "pairing" to take place recreational farming of apple, and apricot trees could be paired with existing agriculture; playing fields for tourists could be built in conjunction with those for the local schools, and so on.

(3) Because it is impossible to drive along the escarpment edge due to the terrain, and because it would be undesirable to do so anyway because of damage to the topsoil and vegetation, attention must be paid to planning for vehicular access to scenic points. This can best be done with a road parallel to but well away from the escarpment edge, and a series of culs-de-sac to parking areas at scenic points.

5. Najran

Location: At the southern end of the escarpment road from Taif and Abha.
Location:

Size: City of Najran (see city plan)

Access: Via Highway 54.

Assets: Beauty of the setting in the Najran Valley near the mountains and the date palms along the Wadi. Historical and architectural significance of old settlements and remains such as "The City of Al-Ukhdoud."

Present Uses: Urban functions (as described in City Plan). at present, most tourist and recreational activities are local.

Conservation Needs: Protection of sites of historic and architectural significance. Protection of dates farms and agriculture along the Wadi.

Development Potential: Good, particularly since completion of Route 54 links Najran with other major cities in the Southern Region and the Kingdom, such as Abha and Jeddah.

Development Needs: Development of historic and architectural features. Construction of a museum using the historical architecture (see the city report)

Special Considerations: Since Najran has thus far been relatively isolated, it has not experienced much in the way of tourism and other traffic, however, with the completion of Route 54, the volume of traffic is clearly increasing, as is the tourist potential.

6. Jizan

Location: Along Red Sea Coast, about 80km north of the Yemen Border.

Size: City of Jizan (See City Plan)

Access: Via modern road from more northerly parts of the Region and Kingdom (Tihama Route).

Assets: Proximity to Red Sea, for various water-oriented tourist and recreational activities.

Present Uses: Urban Functions, including fishing, boating, and local recreational activities.

Conservation Needs: Protection of water from pollution making certain that potential recreation sites (beaches, etc.) are not encroached upon by Industrial and Port functions.

Development Potential: The greatest potential for water sports along the Red Sea Coast.

Development Needs: Construction of tourist and recreation facilities near beaches, recreational fishing facilities, construction of provision of boats and docks. Salt dome museums. Hotels for tourists.

Special Considerations: Development of Jizan should be linked with that of the Farasan Islands; Ferry service should be provided so that it will be possible for tourists to take advantage of both.

7. Farasan Islands

Location: In the Red Sea, about 50 km off the coast, in the vicinity of Jizan; 600 km from Jeddah.

Size: Approximately 30 km by 70 km at widest and longest points.

Access: Water sports; attractive coral Islands.

Present Uses: Lightly populated at present (about 3300 in 1000 houses). Desalination, cement, and electric power plants in planning stage.

Conservation Needs: Protection against water pollution and encroachment on recreational sites by industrial facilities under planning.

Development Potential: With Jizan, the best potential for water oriented recreation along Lower Red Sea Coast.

Development Needs: Construction of Hotels, boat docks ferry terminal, and other tourist facilities. Provision of access to coral islands.

Special Considerations: Fishing, particularly for shark and barracuda, has always been popular and has excellent potential for expansion.

8-4 PORTS AND AIRPORTS

8-4-1 PORTS

Jizan is the only seaport of importance in the region. Shugayq, Qunfidhah, and Al Lith also have ports, but they are all small and insignificant. Jizan port has at present two berths with a depth of six meters, where ships of the 2,000-ton class can be docked. Behind the port, construction of a warehouse and government office buildings, including a customs office, are in progress. They are scheduled to be completed soon.

There has been a decline in recent years in the number of ships docking at Jizan. Among the reasons are:

1. Construction of port facilities is still underway and there are no cranes in the seaport.
2. Access canals and turn-round areas are shallow due to incomplete dredging work.
3. There is a severe problem of sinkage in the foundation at Jizan which hinders harbor operations.
4. The Abha-Jizan asphalt road has not been completed yet. When completed, the road is expected to increase substantially the flow of traffic to and from Jizan.

Though the initial project of port improvement is now over, the effect of the additional port facilities has not yet been felt very much. But the value of the port should not be appraised from the short-sighted economic point of view. It is still possible that these port facilities will assist the development of its hinterland, especially the development of agricultural activities around Wadi Jizan through the construction of the Malakai Dam, and the expansion of the irrigation network under the Wadi Jizan Area Development Project assisted by UNDP-FAO.

Among other possibilities for Jizan are:

1. A distribution and shipping center for agricultural products harvested in its hinterland as the Wadi Jizan Area Development Project brings about development.
2. An important junction point for the Farasan Islands, as large-scale industries (such as tourism, cement and cotton farming) develop on

the islands.

3. A supply dock for vessels sailing long distance as a substitution of the port of Aden in South Yemen and the port of Al-Hudaydah in Yemen if they continue to deteriorate as presently observed. This possibility hinges upon the future development of docking facilities at Jizan.

8-4-2 AIRPORTS

Each of the five major cities has access to airport services and the demand for airport services will continue to increase in accord with the rapid increases in social and economic activities in these cities. Especially at Jizan airport and Khamis Mushayt airport (also called Abha Airport), the number of passengers is expected to rise at a high rate. The increasing demand for Jizan airport services can be explained by the economic development of the area and a large population around the city. The airport at Khamis Mushayt is acting as the regional airport.

8-5 DEVELOPMENT AND CONSERVATION POLICY

8-5-1 SUMMARY OF BASIC OBJECTIVES

Reference has been made to the general policies affecting the development of the southern region. These include:

1. Establishing and maintaining an optimal level of development and modernization.
2. Development of a supportive infrastructure, particularly inter- and intra-regional transportation.
3. Development of tourism and recreation based upon:
 - a. The pleasant climatological conditions, particularly in Asir.
 - b. The attractive scenery, including the mountains, the escarpment, and the Red Sea coast.
 - c. Sites of historical interest.
 - d. Sites of geological interest.
 - e. Spectator sports, including soccer, horse racing, and others that may prove popular.

- f. Participatory sports, including team games such as soccer and individual activities such as fishing and skindiving.
- g. "Recreational farming"--picking of fruit for personal consumption for a fee from farms convenient to roads.
- h. General vacationing and relaxing such as driving through pleasant areas, visiting beaches, and simply being in a different environment from that to which one is accustomed.

8-5-2 POTENTIAL PROBLEMS AND RECOMMENDATIONS ON CONSERVATION

In meeting these basic objectives and conservation objectives, it should be noted that there are potential problems associated with each. For example:

1. In modernizing, it is desirable to establish as high and rapid a level of development as possible. But if the level is too high, it may have an undesirable effect on traditional and social structure. It is thus important in planning to achieve an appropriate balance between the two.
2. One of the most important aids to development is a rapid transportation system of high capacity. Yet it is also important not to harm traditional means of travel.
3. Tourism is likely to grow substantially, since the southern region has many attractive features not found elsewhere in the Kingdom. But it is important that tourism not overshadow the small-scale recreational needs of the local areas.

8-5-3 RECOMMENDATIONS

It will be necessary to monitor development closely, to ensure that the problems discussed in above or others, do not occur. Among the specific steps that can be taken are:

1. Use caution in planning and implementation, respecting traditions, customs, and social structure. Seek the maximum long-term benefit to the largest volume of people.
2. Develop a hierarchical system of roads, ensuring general uniformity of users and separating rapid, long-distance traffic from slower, localized traffic. High capacity highways should not necessarily follow traditional caravan and walking routes; on the contrary, it is probably preferable that they be left essentially in their existing form with some minor improvements but no substantial enlargements. New

highways of large size should by-pass population centers.

3. While it is possible that certain tourist attractions may initially serve local populations and then expand to a regional or national clientele, certain other recreational facilities must be restricted permanently to local use. Parks and playing fields, perhaps associated with schools or other facilities, should be provided on a population basis to all sections of the region, and their access guaranteed to all residents.

The two main concerns are:

1. Paying attention to problems of an environmental and ecological nature and avoiding the severely deteriorative consequences that have been shown to occur elsewhere.
2. Paying attention to resources of a historical or traditional significance and ensuring that future generations are not deprived of a part of the national heritage. "Modern" or "western" styles should not be developed in architecture or other areas unless they serve a specific goal.

CHAPTER 8 NOTES:

1. Kingdom of Saudi Arabia, Ministry of Planning, Second Development Plan, 1395-1400 AH/1975-1980 AD.
2. ILACO Study.

1. The first part of the report is a general introduction to the subject of the study. It discusses the importance of the study and the objectives of the research. It also provides a brief overview of the methodology used in the study.

2. The second part of the report is a detailed description of the methodology used in the study. It discusses the data collection methods, the sample size, and the statistical methods used to analyze the data.

3. The third part of the report is a discussion of the results of the study. It discusses the findings of the study and their implications for the field of study.

9. population projections and demography

9-1 EVALUATION OF EXISTING CONDITIONS

9-1-1 EVALUATION OF EXISTING CONDITIONS

Recent economic development and accompanying social change have had a profound impact on the distribution of population within the Kingdom and within the southern region. There has been an unmistakable trend of nomadic people settling in rural and urban centers in the region during the last decade, and rural population has been declining due to migration into urban centers. Yet, urban centers in the southern region are not necessarily their final destinations. As educational and earning opportunities are more abundant in such national centers as Riyadh and Jeddah, urban population and urban migrants from rural areas in the region often continue their migration to those national centers. More widespread provision of elementary schooling within the region would also accelerate these population movements.

Unless powerful measures are taken by the Government to alter these trends, the net effect will be a population decrease in rural areas in the southern region and substantial population increase in national urban centers such as Riyadh and Jeddah. The net effect for major urban centers such as Abha and Jizan is less clear. They would be absorbing migrants from rural areas, but would be losing out-migrants to national centers at the same time. One thing is, however, clear with them: these centers would be experiencing rapid changes in the residents.

At the time of the beginning of this study, there were no census figures in existence for the Southern Region. For the purpose of establishing some type of data base, population estimates were made by several of the consultants who have done work in the region: ITALCONSULT, ILACO, and others. These estimates have been made over a period in excess of ten years, have been inconsistent with regard to the geographical areas covered, and have varied significantly in their determinations of both volume and distribution of population. Nonetheless, they have comprised the best data available and have necessarily been used extensively in this study.

As of 1976, preliminary census materials have become available and the final figures in this study have been modified to conform with them.

From this information, the following specific trends may be derived:

1. High fertility
2. Relatively low mean life expectancy
3. Increasing out-migration, primarily to other regions of the Kingdom
4. A somewhat lower increase in the rate of in-migration, primarily from Arabic nations to the south
5. Rapid urbanization within the region.

A more detailed discussion follows:

1. High fertility.
The fertility rate, defined as the annual number of births per female population aged 15-49, is 20.7%, a high figure in comparison with western nations. This is in large part an element of traditional life in Saudi Arabia, as well as a response to a perceived need for more people.
2. Mean life expectancy.
Traditionally, life expectancy has been only about two-thirds of that in western countries. However, the increase in the health care standards now underway will produce an increase in mean life expectancy. If the fertility rate remains the same, the population will increase.
3. Increasing out-migration.
A variety of conditions have affected this trend, such as:
 - a. An increasing tendency by nomadic peoples to settle.
 - b. A relative lack of services and amenities in the southern region.
 - c. A heavy demand for workers in the hydrocarbon industry in other parts of the Kingdom.
 - d. Relatively depressed salaries. The average salary in the five cities of the southern region is about half that of urban industrial areas of the eastern region, and that rural salaries in the southern region are half those of urban areas.
 - e. Military service requirements. Out-migration is largely undertaken by males aged 15-35; the out-migration rate of the population aged 15-25 is estimated at 75%. Further, the volume of out-migration has been doubling once every five to six years. This will have a severe impact on the regional labor force (which is only about 20% of the total population), which may be alleviated somewhat by in-migration and the entrance of female workers into certain parts of the labor force.

Tables 9-1-1 - 9-1-3 indicate certain elements of the in- and out-migration trends.

4. Immigration.

Immigrants are of two basic types:

- a. Civil servants such as teachers or government workers assigned to the region.
- b. Migrants from other Arabic nations, mostly Yemens and mostly unskilled.

Table 9-1-3 shows approximate volume of migrants.

5. Rapid urbanization.

The entire nation is presently undergoing rapid urbanization; this is so in the southern region, although at a slower rate. Several distinctive features affect the region's urbanization:

- a. Mechanization of agriculture and a reduction in the need for rural labor.
- b. Social goals which can best be met in cities.
- c. Settling of nomads.
- d. Increase in general level of urban activity

Table 9-1-4 indicates approximately the origin of migrants to the cities.

Table 9-1-1
MIGRATION TRENDS:
REASONS FOR OUT-MIGRATION

Military Service	7.4%
Marriage	19.0
School	20.0
Taking Job/Job Transfer	15.7
Seeking Job	17.9
Other	20.0
Total	100.0%

Source: KTU Survey on five cities in the region (1975).

Table 9-1-2
MIGRATION TRENDS:
DESTINATION OF OUT-MIGRATION

Other Town/City in Region	21.0%
Other Village in Region	03.1
Outside Southern Region	75.9
Total	100.0%

Source: Ibid

Table 9-1-3
MIGRATION TRENDS:
NET ANNUAL FLOW OF
MIGRANTS (1975)

Population Group	Net Yearly Migrants	
	Low Estimate	High Estimate
Saudi Arabians		
-Urban	- 800	- 900
-Rural	-4800	-6900
-Nomadic	-1000	-1200
Yemenis	+ 80	+ 90
Others*	+ 150	+ 200

*This group is treated as a migration vector only.

Source: Ibid

Table 9-1-4
MIGRATION TRENDS:
SOURCE OF MIGRANTS
TO URBAN AREAS

Rural Sector in Same Province	49%
Rural Sector in Different Province	25%
Other Cities/Towns in Same Province	16%
Other Cities/Towns in Different Provinces	3%
Settling of Nomads	7%
Total	100%

Source: Ibid

9-1-2 EXISTING
POPULATION

It has been pointed out that there was no official census data available until 1976, while the study has been underway since 1974. Thus it was necessary for the consultant to establish certain standards, boundaries, and so on, to permit a logical undertaking of the study. Not surprisingly, there is a difference between those and the standards and boundaries which were determined by the government census.

There does not appear to be a major discrepancy between the conclusions of the respective surveys. There is some confusion in coordinating and reconciling the respective figures, however, and the purpose of this section is to explain the relationship between the two.

1. The government census makes reference to two basic geographical units: the "urban" area (city or village) and the "rural" area. Together these compose the "settled population" for a given sub-region.
2. The URTEC survey covered an area which, in every instance, was smaller in geographic size and in population than that which was defined by the census.
3. There are thus three areas which exist and are defined as follows:
Zone I: The URTEC study area
Zone II: The urban area as defined by the census, which incorporates Zone I.
Zone III: The rural area as defined by the census, which is independent and does not incorporate either Zone I or Zone II.
4. In some instances (Abha for example), there is very little difference between Zones I and II. In other words, the URTEC study and government census urban areas correspond quite closely. The similarity of the results of such figures helps to substantiate the accuracy of both studies.
5. In instances where there was a significant difference between the definitions of areas, it has been possible to extrapolate data in a logical and accurate fashion.
6. In some instances, there has been a difference between regional and sub-regional boundaries. For example, the villages of Sabt al Alayah and Shararah (which are under the jurisdiction of the Emirs of Asir and Najran respectively) are not within the boundary of the Southern Region project. It has been a fairly simple matter to

compensate for variations of this type.

7. The government census has been published only by village name, and conformity between those figures and those of the URTEC study has not existed in every case. It must be pointed out that such differences exist at all levels-- "Asir Province" as defined by the Government, and "Asir Sub-Region" as defined in the KTU study are not the same thing, for example. But differences of these sorts do not suggest that there is actual error in either the census or the KTU study.
8. Nomadic population (also referred to as "non-settled" population) is given by the census in association with the nearest village. There is no discrepancy in the counting method of nomads between the two studies.

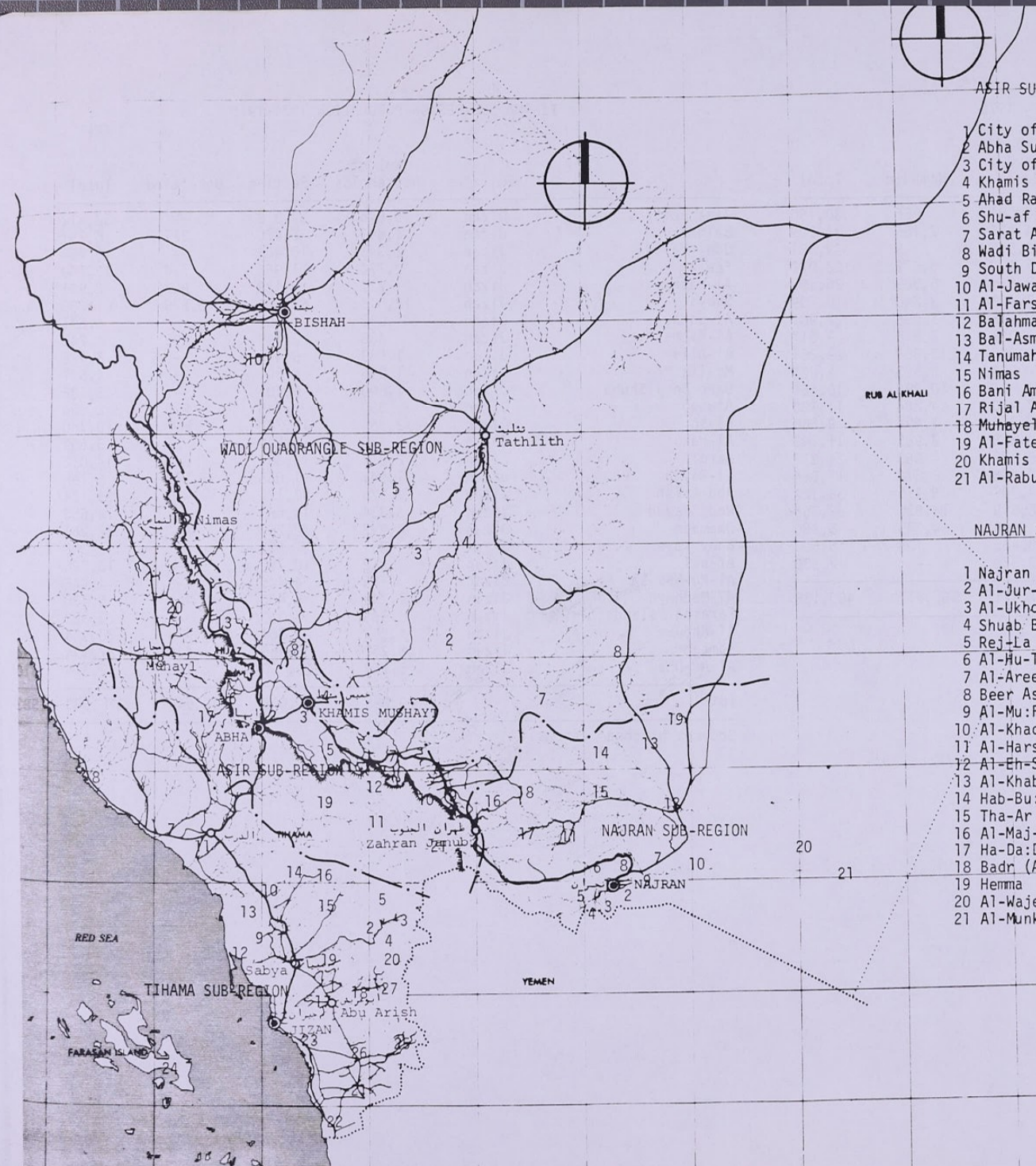
9-2 SUMMARY OF EXISTING
CONDITIONS IN CITIES

9-2-1 EXISTING CONDITIONS.

A number of generalizations can be made about the urban population in the southern region [1], [2].

1. There is a very small percentage of males in the 15-35 year old age group.
2. The male population aged 15-35 is the most mobile and makes up a majority of those involved in any migration.
3. There is a large percentage of the population under 10 years of age, due to the high birth rate. (See Table 9-2-1)
4. The Yemeni and other Arabic population groups are generally under 40, with the male group predominantly in the 30-39 group and the female group predominantly in the 20-29 group.
5. The non-Arabic population is very small, almost entirely male, and generally in the 30-59 age group.
6. The Abha/Khamis Mushayt urban area is the city most profoundly affected by population shifts, and the most rapidly growing.
7. Jizan is least affected.

It is evident that the Abha/Khamis Mushayt urban area is the predominant city of the region, due to its central location, good climate, and selection as the regional administrative center. Jizan, due to the remoteness and transportation difficulties, is least affected (and may even have lost population recently); however, these conditions are likely to improve.



ASIR SUB-REGION TIHAMA SUB-REGION

- | | |
|----------------------------|--------------------|
| 1 City of Abha | 1 Jizan City |
| 2 Abha Suburbs | 2 Balghazy |
| 3 City of Khamis Mushayt | 3 Bany Malik |
| 4 Khamis Suburbs | 4 Feefa |
| 5 Ahad Rafeeda | 5 Al-Hashr |
| 6 Shu-af Shahran | 6 Sabia |
| 7 Sarat Abeeda | 7 Al-Shkayk |
| 8 Wadi Bin Hsahbal | 8 Al-Kahma |
| 9 South Dhahran (Al Janub) | 9 Al-Allia |
| 10 Al-Jawa | 10 Msalia |
| 11 Al-Farshah | 11 Darb Bany Shuba |
| 12 Balahmar | 12 Itu:d |
| 13 Bal-Asmar | 13 Baysh |
| 14 Tanumah | 14 Al-Haku |
| 15 Nimas | 15 Haru:b |
| 16 Bani Amro | 16 Al-Rayth |
| 17 Rijal Al-Ma' | 17 Abu Arish |
| 18 Muhayel | 18 Wadi Jazan |
| 19 Al-Fateeha | 19 Dhamadh |
| 20 Khamis Mutair | 20 Bany Kays |
| 21 Al-Rabu:a | 21 At-Wal |
| | 22 Al-Mu-Was-Sam |
| | 23 Al-Madhaya |
| | 24 Firssan |
| | 25 Al-Khouya |
| | 26 Samtah |
| | 27 Al-Ar-Dha |

NAJRAN SUB-REGION

- 1 Najran City
- 2 Al-Jur-Fiya
- 3 Al-Ukhdu:d
- 4 Shuab Barran
- 5 Rej-La
- 6 Al-Hu-Thon
- 7 Al-Areesa
- 8 Beer Askar
- 9 Al-Mu:Faja
- 10 Al-Khadh-Ra
- 11 Al-Harshaf
- 12 Al-Eh-Say-Niya
- 13 Al-Khab-Bash
- 14 Hab-Bu:Na
- 15 Tha-Ar
- 16 Al-Maj-Ma'
- 17 Ha-Da:Da
- 18 Badr (Al-Medhmar)
- 19 Hemma
- 20 Al-Wajeed
- 21 Al-Munkhu-Li

WADI QUADRANGLE SUB-REGION

- 1 Ya'ara
- 2 Al-Areen and Turaib
- 3 Al-Madhah
- 4 Al-Amwah
- 5 Al-Ayn
- 6 Tathleeth
- 7 Al-Ma-Ayen
- 8 Yadama
- 9 Bishah and surrounding villages
- 10
- 11 Hazmi

FIGURE 9-1-1
VILLAGE GROUP
BY SUB-REGION
scale 1:2,000,000

DHARAN - SAUDI ARABIA

Table 9-1-5
ASIR SUB-REGION POPULATION 1974-1975

	Emirate	No. of Households	Urban and Rural	Nomadic	Total
City of Abha	Abha	5,413	30,084	66	30,150
Abha Suburbs	Abha	5,487	24,054	7,155	31,209
City of Khamis Mushayt	Abha	8,142	49,572	9	49,581
Khamis Suburbs	Abha	3,874	15,400	6,672	22,072
Ahad Rafeeda	Abha	4,396	19,516	5,589	25,105
Shu-af Shahrān	Abha	1,931	7,499	3,240	10,739
Sarat Abeeda	Abha	3,900	18,905	3,996	22,901
Wadi Bin Hsahbal	Abha	1,689	3,041	6,876	9,917
Zahrān Janub	Abha	5,417	18,893	10,368	29,261
Al-Jawa	Abha	951	280	5,523	5,803
Al-Farshah	Abha	1,928	66	10,098	10,164
Balahmar	Abha	2,119	7,436	4,284	11,720
Bal-Asmar	Abha	1,923	8,366	1,494	9,860
Tanumah	Abha	1,972	8,258	2,985	11,243
Nimas	Abha	4,427	20,129	4,083	24,212
Bani Amro	Abha	3,142	10,986	6,678	17,664
Rijal Al-Ma'	Abha	6,444	24,707	8,415	33,122
Muhayel	Abha	6,722	18,529	13,836	32,365
Al-Fateeha	Abha	1,048	935	4,245	5,180
Khamis Mutair	Abha	2,039	8,485	105	8,590
Al-Rabu:a	Jizan	407	2,330	--	2,330
Total		73,371	297,471	105,717	403,188

Source: National Census.

Table 9-1-6
TIHAMA SUB-REGION POPULATION 1974-1975

	Emirate	No. of Households	Settled	Unsettled	Total
Jizan City	Jizan	5,648	32,812	--	32,812
Balghazy	Jizan	1,893	8,470	321	8,791
Bani Malik	Jizan	2,341	10,464	--	10,464
Feefa	Jizan	2,770	11,966	774	12,740
Al-Hashr	Jizan	727	2,129	822	2,951
Sabya	Jizan	13,516	58,006	3,279	61,285
Al-Shkayk	Jizan	1,048	4,801	--	4,801
Al-Kahma	Jizan	488	2,149	99	2,248
Al-Alia	Jizan	1,539	6,425	--	6,425
Msalia	Jizan	1,096	4,601	--	4,601
Darb Bany Shuba	Jizan	1,600	6,401	--	8,138
Atwood	Jizan	380	1,740	510	2,250
Baysh	Jizan	2,354	10,780	--	10,780
Al-Haku	Jizan	752	3,529	30	3,559
Haru:b	Jizan	2,817	13,367	645	14,012
Al-Rayth	Jizan	1,541	1,085	7,110	8,195
Abu Arish	Jizan	7,275	33,126	--	33,126
Wadi Jazan	Jizan	3,334	14,653	--	14,653
Dhamadh	Jizan	4,993	22,261	--	22,261
Bany Kays	Jizan	201	805	--	805
At-Wal	Jizan	2,263	10,790	--	10,790
Al-Mu-Was-Sam	Jizan	796	4,446	--	4,446
Al-Madhaya	Jizan	1,242	5,430	--	5,430
Farasan Islands	Jizan	969	3,352	--	3,352
Al-Khouya	Jizan	4,297	20,964	--	20,964
Samtah	Jizan	8,252	36,956	438	37,394
Al-Ar-Dha	Jizan	5,763	29,130	180	29,310
Total		79,895	360,638	15,945	376,583

Source: National Census.

Table 9-1-7
NAJRAN SUB-REGION POPULATION 1974-1975

	Emirate	No. of Households	Urban and Rural	Nomadic	Total
Najran City	Najran	9,149	47,501	--	47,501
Al-Jur-Fiya	Najran	785	3,570	261	3,831
Al-Ukhdu	Najran	954	4,620	498	5,118
Shuab Barran	Najran	409	1,646	594	2,240
Rej-La	Najran	627	3,112	339	3,451
Al-Hu-Thon	Najran	967	5,017	--	5,017
Al-Arisa	Najran	719	2,812	1,395	4,207
Beer Askar	Najran	307	14	1,638	1,652
Al-Mu:Faja	Najran	709	3,558	24	3,582
Al-Khadra	Najran	732	1,146	3,237	4,383
Al-Harshaf	Najran	292	562	924	1,486
Al-Eh-Say-Niya	Najran	1,115	60	6,387	6,447
Al-Khab-Bash	Najran	1,718	74	10,173	10,247
Hab-Bu:Na	Najran	847	2,411	1,668	4,079
Tha-Ar	Najran	1,258	224	6,324	6,548
Al-Maj-Ma'	Najran	310	1,001	453	1,454
Ha-Da:Da	Najran	302	604	942	1,546
Badr (Al-Medhmar)	Najran	1,019	1,867	3,228	5,095
Hemma	Najran	346	156	1,467	1,623
Al-Wajid	Najran	261	11	1,431	1,442
Al-Munkhu-Li	Najran	235	44	1,137	1,181
Total		23,059	80,010	42,120	122,130

Source: National Census.

Table 9-1-8
WADI QUADRANGLE SUB-REGION POPULATION 1974-1975

	Emirate	No. of Households	Urban and Rural	Nomadic	Total
Ya'ara	Asir	1,903	3,301	6,957	10,258
Al-Arin and Turaib	Asir	1,674	4,099	4,665	8,764
Al-Madhah	Asir	1,957	1,872	9,135	11,007
Al-Amwah	Asir	2,635	41	15,333	15,374
Al-Ayn	Asir	1,190	138	6,549	6,687
Tathlith	Asir	4,790	3,551	21,237	24,788
Al-Ma-Ayen	Najran	555	52	2,901	2,953
Yadama	Najran	1,623	470	8,442	8,912
Bishah and surrounding villages	Asir	6,961	29,267	12,273	41,540
Hajimi	Asir	3,702	6,490	10,827	17,317
Total		26,990	49,281	98,319	147,600

Table 9-1-9
SOUTHERN REGION POPULATION 1974-1975

Sub-Region	No. of Households	Urban and Rural	Nomadic	Total
Asir	73,371	297,471	105,717	403,188
Tihama	79,895	360,638	15,945	376,583
Najran	23,061	80,010	42,120	122,130
Wadi Quadrangle	26,990	49,281	98,319	147,600
TOTAL	203,317	787,400	262,101	1,049,501

Source: National Census.

Table 9-2-2 indicates the distribution of the urban population.

Table 9-2-1
SOUTHERN REGION
ESTIMATED 1975 NATURAL INCREASE

Annual Rates Per Thousand Population In Each Group			
	Birth Rate	Death Rate	Natural Increase
Nomadic	42	34	8
Rural	42	24	18
Urban			
Saudi	43	19	24
Yemenis	42	24	18

Source: KTU Existing Conditions Study, 1975.

9-2-2 CHARACTERISTICS BY CITY

Table 9-2-3(a) lists the main demographic features of each city. The following general statements may be made for each:

1. Abha.

This is the region's administrative center, with 62% of the work force in the government sector. The high rate of in-migration means that the work force is a relatively high percentage of the total population. Somewhat surprisingly, however, the out-migration rate is high as well; this indicates a "flow" of migrants from other areas of the southern region or Yemen, to Abha, and then on to the urbanized area of the eastern region. It is likely that growth will continue to be strong in both public and private sectors. The population projections reflect this and are thus

Table 9-2-2
SOUTHERN REGION
URBAN POPULATION AGE DISTRIBUTION

Age Group	Saudi Arabian		Yemeni		Other Arabian		Non-Arabian	
	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)
0-4	18.8	20.7	12.3	17.8	18.4	21.4	13.3	42.9
5-9	18.7	18.7	10.8	18.8	19.0	16.2	6.7	7.2
10-14	14.8	12.4	9.0	12.4	5.3	10.4	-	-
15-19	11.5	10.1	6.7	7.7	3.2	6.5	-	-
20-24	5.2	7.4	9.8	10.4	4.7	11.0	-	14.3
25-29	5.3	6.7	11.3	8.1	6.8	22.7	-	14.3
30-34	4.3	5.4	9.8	6.7	19.5	5.2	13.3	7.1
35-39	5.2	4.4	9.5	5.0	13.7	4.6	-	-
40-44	3.8	4.1	4.4	3.7	4.2	.7	-	7.1
45-49	2.7	2.1	4.1	3.0	2.1	-	-	7.1
50-54	2.8	3.0	3.6	2.4	1.6	-	-	-
55-59	1.7	1.1	2.3	.3	.5	-	-	-
60-64	2.3	1.9	2.6	2.4	1.0	1.3	-	-
65-69	1.0	.4	.2	-	-	-	-	-
70-74	.8	.8	.5	1.0	-	-	-	-
75 & Over	.6	.7	-	.3	-	-	-	-
Not Known	.1	.1	3.1	-	-	-	-	-
	100%	100%	100%	100%	100%	100%	100%	100%

(Source: URTEC Survey of Households)

Table 9-2-3 (a)
MAJOR DEMOGRAPHIC FEATURES OF THE FIVE CITIES AS THEY AFFECT PROJECTED POPULATION GROWTH

City	1975 Population in 5% Survey Area	Demographic Rates: 1 Birth Rate 2 Death Rate 3 In-migration Rate 4 Out-migration Rate 5 Aggregate	Percentage of Males in: 1 Age Group 15-59 (Comparison with 5-city average) 2 Age Group 15-39 (Comparison with 5-city average)	Maximum Theoretical Annual Water Resources in 1995(m ³ x 10 ⁶) of Sub-region in which city is located	Annual agricultural Product Value in 1995 (SRx10 ⁶) of Sub-Region in which city is located	Effect on Population Growth by Industry	Effect on Population Growth by Construction	Effect on Population Growth by Tourism	Effect on Population Growth by Administrative Activities
Abha	21,900	1 4.3 2 1.0 3 3.8 4 2.2 5 4.9	1 26.6 (+11.1%)	418.1 (to be shared with Khamis-Mushayt)	228,370 (to be shared with Khamis Mushayt)	1975 0 1985 0 1995 0	1975 + 1985 ++ 1995 +	1975 0 1985 + 1995 ++	1975 + 1985 ++ 1995 ++
Khamis Mushayt	29,260	1 4.6 2 0.8 3 1.6 4 0.7 5 4.7	1 24.6 (+2.8%)	418.1 (to be shared with Abha)	228,370 (to be shared with Abha)	1975 0 1985 + 1995 ++	1975 + 1985 ++ 1995 +	1975 - 1985 - 1995 0	1975 0 1985 0 1995 +
Jizan	22,160	1 3.2 2 0.8 3 3.4 4 3.2 5 2.6	1 26.7 (+11.6%) 2 20.1 (+11.8%)	1306.9	496,292	1975 0 1985 + 1995 ++	1975 + 1985 ++ 1995 ++	1975 - 1985 - 1995 0	1975 + 1985 + 1995 ++
Najran	27,180	1 4.4 2 0.7 3 0.7 4 0.2 5 4.6	1 19.6 (-18.2%) 2 14.2 (-21.2%)	78.9	30,570	1975 - 1985 - 1995 -	1975 + 1985 + 1995 0	1975 - 1985 0 1995 +	1975 + 1985 + 1995 +
Bishah	7,920	1 4.0 2 0.6 3 3.8 4 0.1 5 7.1	1 21.5 (-10.3%) 2 15.1 (-15.9%)	170.0	55,960	1975 - 1985 - 1995 0	1975 + 1985 0 1995 -	1975 - 1985 - 1995 -	1975 + 1985 + 1995 +

Note: for symbols (0,+,,+,-), see the text.

relatively high. Another noteworthy demographic element will be the continued interdependence between Abha and Khamis Mushayt.

2. Khamis Mushayt.
This is, and is likely to continue to be the largest city of the region, and the most actively involved with traditional activities. Except for the military, it is less a center of government functions and more of a focal point of commercial and social activities. The overall rates of in- and out-migration are not as high as those for Abha, although it has received a larger number of settled nomads. Manufacturing and trading will continue to be the main functions of the city.
3. Jizan is different in several respects from the other cities, as well as being somewhat isolated from them. Its potential as a port has not yet been fully realized. However, port development and other construction activities as well as the agricultural development that will be taking place in Tihama cause Jizan to be highly promising.
4. Najran.
This city is more directly related to agricultural activities than the other cities, and consequently has been less impacted by the dramatic population shifts. Its isolation has also caused it to be less affected thus far, and to be generally more stable in the future.
5. Bisha.
This city is undergoing a major transition. Formerly it was an oasis and a stopping point for caravans, but this function is declining. The decision of the government to construct a new administrative center has infused new life into the city; government-related work makes up most of the employment.

9-3 POPULATION PROJECTIONS

It is appropriate to point out some of the methodology of making such projections. In the past five years, there has been rapid growth in all of the cities except Jizan. In some instances it appears that this growth rate will continue; in others, it would be unlikely that such a high rate would be maintained. Thus a range of projections has been prepared. Table 9-3-1 indicates the result of this methodology.

The projections presented in this report were computed by a cohort survival method based on age-specific fertility and mortality rates and alternative migration assumptions, utilizing the computerized model developed by Professor Frederic C. Shorter for the Population Council.

The magnitude of the migration component predicated the use of age-specific rates to reflect best the changing characteristics of the population. Because migration is an age-sex selective phenomenon, it results in shifts in the age-sex structure of the population which may lead to temporary fluctuations in birth and death rates that do not represent secular trends. It is also precisely for this reason that the total regional population has been disaggregated into five component groups for projections purposes:

1. Nomadic.
2. Rural.
3. Urban Saudi Arabian.
4. Yemeni.
5. Other.

For each of the first four groups age-specific fertility, mortality, and migration rates were developed. The fifth group, which does not include a permanently resident population, was treated as a migration vector only.

Although the schedules of fertility and mortality rates, derived by indirect procedures, no matter how sophisticated, can never claim to be exact, it should be remembered that the chief source of error in the projections will be the unreliability of the base population estimates, the errors and omissions in the household survey data, particularly as regards age reporting, because the accuracy of all computational procedures, direct and indirect, is still dependent on the quality of the available data.

As noted earlier, fertility in Saudi Arabia is very high indeed, and even more so if an allowance is made for under-reporting of live births. It is also uniformly high among the various population groups. The factors affecting fertility are conditioned by socio-cultural values which require a significant time-lag to adjust to changing conditions, such as demographic pressure in the rural sector, new social patterns in the urban areas, etc. It can be safely assumed, therefore, that fertility will remain almost unchanged over the next 20 to 30 years.

In contrast, continued improvements in health services are expected to produce marked declines in mortality, particularly infant mortality. Consequently, the mortality schedules were projected to decline in accordance with the patterns of other countries, for which data is available and which experienced similar mortality levels in the past few decades.

Migration is the most significant element of the

population projection and the most subject to error, because estimates rely on reported age which is of highly questionable accuracy. The greater the degree to which population growth is influenced by migration, the more difficult it is to estimate future population characteristics. For, whereas changes in fertility and mortality will take at least a decade to be reflected in the population structure, changes in migration rapidly alter both present and future demographic characteristics.

Each of the four components of migration is affected by socio-economic forces and government policies. It is therefore necessary to spell out the assumptions underlying estimates of the future characteristics of migration. The projections presented in this report are based on the assumptions that:

1. National objectives will bring increased attention to the development of the Southern Region.
2. Saudi Arabia will continue to rely heavily on foreign labor to fill its manpower shortages.
3. There will be no significant change in current public policy regarding the employment and status of Yemenis.
4. Government policy of sedentarization of nomads will continue to be actively pursued.
5. Modernization of the agricultural sector will proceed as planned.

In light of these assumptions, migration vectors were projected as follows:

1. Out-migration from the nomadic sector will gradually increase.
2. Out-migration from the rural sector will continue at its present rate.
Therefore, for both of these sectors high and low population projections reflect the range in the estimate of the base 1975 population.
3. Interregional migration.
 - a. Development projects and social overhead investment in the region will lead to a gradual decline in out-migration from the urban sector: high projection.
 - b. Should the region continue lagging far behind the other provinces in economic activity and social amenities, then out-migration from its urban areas can be expected to continue at the present rate: low projection.
4. International migration.
 - a. Yemeni in-migration could either continue at its present rate--high projection--or start declining within a couple of decades due to shifts in government policy, or to competition from an over-supply of unskilled labor released from the rural sector, or to the

combination of both factors--low projection.

- b. To meet the demands for skilled manpower, the migratory movement (in and out) of foreign technicians on contract terms cannot be dispensed with. It is forecasted to continue at a rate related to total population growth, which directly determines the need for government services and indirectly reflects the rate of expansion of the economy.

Since the number of trained Saudis is expected to increase substantially as a result of forceful, governmental, educational policies, the rate of hiring of foreigners, which is projected first to increase at an accelerated rate in response to the demands of the developmental plans, is assumed to start decelerating after 1990 in both high and low projections which reflect the range in the resident urban population.

Table 9-2-3 (a) illustrates the primary parameters which establish the projections of future population. These parameters are as follows:

1. 1975 population of each city (in the URTEC study area).
2. Essential demographic rates per thousand population per year - the birth rate, the death rate, the rate of in-migration, the rate of out-migration, and the aggregate, which is (birth-death) + (in-migration - out migration). This latter figure is the net annual growth rate per thousand population.
3. The proportion of males in the working-age group, defined as ages 15 to 59, and further broken down into the group aged 15 to 39. The significance of the latter figure is that men of ages 15-34 are most likely to have growing families and thus the number in this group helps to indicate the birth rate and population growth. In each case, the upper figure is the percentage of the city population in the respective age groups and the lower figure is the percentage by which that city varies from the mean level of all five cities.
4. The fourth parameter is the maximum theoretical amount of water available annually for the sub-region in which the city is located. Because water is such an essential commodity for expansion of agriculture, industry, and commerce (as well as the population itself) this figure is a highly significant indicator of the potential for future population growth. It is taken from table 4-3-1 in Chapter 4, Water Resources and Development Potential. It should be noted that Abha and Khamis-Mushayt are both in the Asir Sub-Region.

5. The fifth parameter is the projected value of products grown or otherwise produced in the sub-region in 1995 in thousands of Saudi Rials. This is an indication of the economic viability of the area surrounding each city, which has an obvious bearing on the growth potential.
- 6,7,8 and 9. Parameters six through nine are evaluations of the significance of the Secondary and tertiary sectors on population growth as of 1975, 1985, and 1995. Indications are given for industry, construction, tourism, and administration. The explanation of the symbols is as follows:
- means that the amount and type of activity in the respective area will detract from the rate of growth that would otherwise be expected for that city.
 - + means that the amount and type of activity in the respective area will have a positive effect on the rate of growth that would otherwise be expected for that city.
 - ++ means that the amount and type of activity in the respective area will have a highly positive effect on the rate of growth that would otherwise be expected for that city.

After evaluating the large volume of information contained in Table 9-2-3 (a), it is possible to compact it into the figures given in Table 9-2-3 (b). The latter table is used for the actual calculation of population growth rates. A brief discussion of the methodology as applied to each city follows:

1. Abha has one of the highest birth rates as well as one of the highest rates of in-migration. It has the highest percentage of men in the 15-39 age group, when they are most likely to be having children. The effect of secondary and tertiary areas is the best of any cities, since it has no ratings lower than "0" and four which are "it". It is therefore likely that Abha will have one of the highest maximum rates of growth, up to 1.5 percentage points faster than the trend of the last five years, and at least as fast as it has been.
2. Khamis Mushayt shares several of the favorable aspects possessed by Abha. Except for tourism (which is probably not going to be a highly profitable activity in any city in the immediate future), it has no "minus" ratings. As has been discussed, it is the traditional retail commercial center in the Region. Thus it is logical that Khamis-Mushayt will also continue at least as fast a rate of growth as it has sustained in the past, and possibly 1.5 percentage points faster.

3. Jizan has one of the lowest aggregate growth rates of the five cities, due to a decline in certain economic activities associated with high soil salinity and soil problems. However, the Tihama sub-region has the largest potential maximum water resources and is likely to see considerable new investment in the port, oil storage facilities, and relocation of the city. It also has a relatively high number of men of family age. Therefore, it should continue at least as rapid a growth rate as has occurred recently, and may expand as rapidly as one percentage point faster. It is possible that this growth may occur later in the 20-year period, since by 1995 all but the tourism areas will be rated "+".
4. Although Najran has had a high birth rate in recent years, it has currently fewer than four-fifths as many young men as the 5-city average. It also has a low in-migration rate. Therefore the fastest projected rate is a continuation of the present level, with the possibility that it may grow no more rapidly than the natural rate of increase. Its low water resources are a contributing factor.
5. Bishah shares Najran's problem of relatively fewer men of family-producing age. In addition it does not have the potential to sustain long-term, high-level activity in the construction and tourism areas. Therefore it is unlikely to expand faster than it has in recent years, and may lessen its growth to the rate of natural increase.

The resultant population projections are given in the Tables.

As stated earlier, the importance of migration as a determinant of population growth and its changing structure leads to shifts in age-sex characteristics, which in turn cause temporary fluctuations in rates of natural increase and migration. Furthermore, because of the unreliability of the basic age-sex structure reported in the household survey, the age characteristics of the projected population should be regarded only as suggestive of the most probable age structure of the regional population. The sex ratio lies between 1.0 and 0.9, tending to slowly decline, as lower rates in the rural and nomadic sectors are not entirely offset by the higher rates prevailing in the urban areas. Should current patterns shift towards the migration of young families within the coming decades, these sex ratios would tend to equilibrate with a concomitant decline in females in the working age groups in the rural and

nomadic sectors. Unfortunately, available statistics are too incomplete to allow the determination of emerging trends in the migratory movements [3].

The overall changes shown in the projections are clearly dominated by the characteristics of the rural sector which encompasses over 70 percent of the regional population. They reflect the basic migration assumptions and are consistent with national trends.

1. Methodology for urban areas.

For Abha, Khamis Mushayt, and Jizan, it is expected that the rate of growth in the future will be at least as high as the past five years, and possibly as much as one and one-half percentage points more. For Najran and Bishah, it is anticipated that future growth will be no greater than the past five years, and possibly less.

Table 9-3-5 indicates the projections by region.

2. Methodology for the region.

The methods of estimating the population of the region are described in URTEC's Existing Conditions Report for the region. Among it, the population of each of the five cities is based on the 5% sample survey undertaken by URTEC in the early part of 1975.

One important modification was made, however. For instance to the population of the City of Bishah, for which the estimated population is set at 7,900 in the Existing Conditions Report. Upon reviewing the survey, it has been found that substantial urbanized areas were left out of the survey areas in the southwest and north. By estimating the population in those areas through aerial photographs, it has been estimated that the population of Bishah in 1975 should be increased by approximately 40% to 11,000. Similar adjustments were done to the other cities and adjusted result is shown in "planning area population" in the Tables 9-3-1 through 9-3-5.

Subregions for the purpose of population projections are defined on the basis of provincial boundaries, the zone of influence of the provincial capital, the water shed and accessibility which subsumes physical distance and topography. Subdivision of population into subregions were made on the basis of census population figures.

Two alternative rates of growth were used for projections. The first is the Low Projections

based on moderate increases in economic activities. The second is the High Projections based on faster rates of in-migration into the cities and declining rates of death rates for rural and nomadic populations.

Specific assumptions made for the Low Projections for the region are:

- a. The rates of birth and death estimated for rural and nomadic populations as presented in Table 3-1-3f in the Existing Conditions Report for the region will prevail in the future up to 1995.
- b. All in-migrants projected for the five cities originate from the rural part of the population in the region.
- c. All emigrants projected for the five cities go out of the region.
- d. 20% of the nomadic population settles in the rural areas within the region for every 5 years.

Specific assumptions made for the High Projections for the region are:

- a. The birth rates of rural and nomadic population will remain as currently estimated, but the death rate will decline for the rural population by 0.5 percentage points from 1975 to 1980, 0.3 percentage points from 1980 to 1985, 0.2 percentage points from 1985 to 1990, and 0.1 percentage points from 1990 to 1995. The figures for the nomadic population will decrease also, but at a somewhat slower rate.
- b. The same as b. in the Low Projections.
- c. The same as c. in the Low Projections.
- d. 30% of the nomadic population settles in the rural areas in the region for every 5 years, i.e., most of the increased migrants to the cities from rural areas is composed of the migrants from the nomadic population.

In general, subregions are assumed as self-contained regions for rural-urban migration, i.e., in-migrants from a city is drawn from the rural and nomadic populations within the same subregion.

Table 9-3-6 indicates the population projections for the region as a whole. The urban projections were done independently. The rural projections assume:

1. A continuation of the present natural rate of increase.
2. An adjustment based upon known figures for rural-urban migration.
3. A likelihood that nomads will settle in the rural areas.

Table 9-2-3 (b)
METHODOLOGY OF ESTABLISHING
MINIMUM AND MAXIMUM PROJECTIONS
OF FUTURE POPULATION

	Minimum	Maximum
Abha	Trend (4.9%)	Trend + 1.5 Percentage Points
Khamis Mushayt	Trend (4.7%)	Trend + 1.5 Percentage Points
Jizan	Trend (2.6%)	Trend + 1.0 Percentage Points
Najran	Natural Rate of Increase (3.7%)	Trend (4.6%)
Bisha	Natural Rate of Increase (3.4%)	Trend (7.1%)
"Trend" - A simple mathematical extension of rate of growth for past five years.		
"Natural Increase" - A calculation of the number of births minus the number of deaths, with no inclusion of migration (i.e. net migration = 0).		

Table 9-3-1
PROJECTIONS OF POPULATION
ASIR SUB-REGION

	1975	1980	1985	1990	1995
Survey Area ^a					
High	51,200	69,500	94,200	127,700	173,300
Low		64,700	81,700	103,300	130,400
Urban ^b					
High	79,800	105,300	138,700	182,700	240,000
Low		99,100	122,300	150,900	185,000
Rural					
High	217,700	262,900	311,600	363,400	417,400
Low		255,400	292,100	327,800	362,100
Nomadic					
High	105,700	77,000	56,400	40,200	26,000
Low		88,000	73,300	61,000	50,800
Sub-Region ^c					
High	403,200	445,200	506,700	586,300	685,200
Low		442,500	487,700	539,700	598,000

NOTES:

- From URTEC 5% sample survey of population, 1974-1975, Abha and Khamis Mushayt.
- Cities of Abha and Khamis Mushayt. (National Census).
- From Department of Statistics, 1974 National Census.
(Sub-Region) = (Urban) + (Rural) + (Nomadic)

Table 9-3-2
PROJECTIONS OF POPULATION
TIHAMA SUB-REGION

	1975	1980	1985	1990	1995
Survey Area ^a					
High	22,200	26,500	31,600	37,700	45,000
Low		25,200	28,700	32,600	37,100
Urban					
High	32,800	38,300	45,100	53,300	63,100
Low		37,000	41,800	47,100	53,200
Rural					
High	327,800	366,200	417,200	481,100	558,700
Low		365,100	405,500	449,700	497,700
Nomadic					
High	16,000	11,600	8,600	6,000	4,000
Low		13,300	11,100	9,200	7,700
Sub-Regional ^b					
High	376,600	416,100	470,900	540,400	625,800
Low		415,400	458,400	506,000	558,600

NOTES:

- a. From URTEC 5% sample survey of population, 1974-1975, Jizan.
b. From Department of Statistics, 1974 National Census.
(Sub-Region) = (Urban) + (Rural) + (Nomadic)

Table 9-3-3
PROJECTIONS OF POPULATION
NAJRAN SUB-REGION

	1975	1980	1985	1990	1995
Survey Area ^a					
High	27,200	33,400	41,000	50,400	61,900
Low		32,600	39,100	46,900	56,200
Urban					
High	47,500	60,700	76,000	94,000	115,100
Low		58,400	70,400	83,800	98,900
Rural					
High	32,500	43,800	56,100	69,800	85,300
Low		41,300	50,100	59,100	68,400
Nomadic					
High	42,100	30,600	22,300	15,800	10,400
Low		35,000	29,100	24,200	20,100
Sub-Region ^b					
High	122,100	135,100	154,400	179,600	210,800
Low		134,700	149,600	167,100	187,400

NOTES:

- a. From URTEC 5% sample survey of population, 1974-1975, Najran.
b. From Department of Statistics, 1974 National Census.
(Sub-Region) = (Urban) + (Rural) + (Nomadic)

Table 9-3-4
PROJECTIONS OF POPULATION
WADI QUADRANGLE SUB-REGION

	1975	1980	1985	1990	1995
Survey Area ^a					
High		11,100	15,700	22,100	31,100
Low	7,900	9,300	11,000	13,000	15,400
Urban ^b					
High	11,000	14,700	19,800	26,800	26,600
Low		12,800	14,900	17,400	20,300
Rural					
High	38,300	71,800	105,300	140,400	177,900
Low		62,300	85,500	108,500	131,600
Nomadic					
High	98,300	71,500	52,400	37,400	25,000
Low		81,800	68,200	56,800	47,300
Sub-Region ^c					
High	147,600	158,000	177,500	204,600	239,500
Low		156,900	168,600	182,700	199,200

NOTES:

- a. From URTEC 5% sample survey of population, 1974-1975, Bishah (Al Rawshan).
- b. Al Rawshan plus surrounding agricultural communities. See Bishah, Alternative Strategies, Sec. 4-1.
- c. From Department of Statistics, 1974 National Census.
(Sub-Region) = (Urban) + (Rural) + (Nomadic)

Table 9-3-5
PROJECTIONS OF POPULATION
SOUTHERN REGION

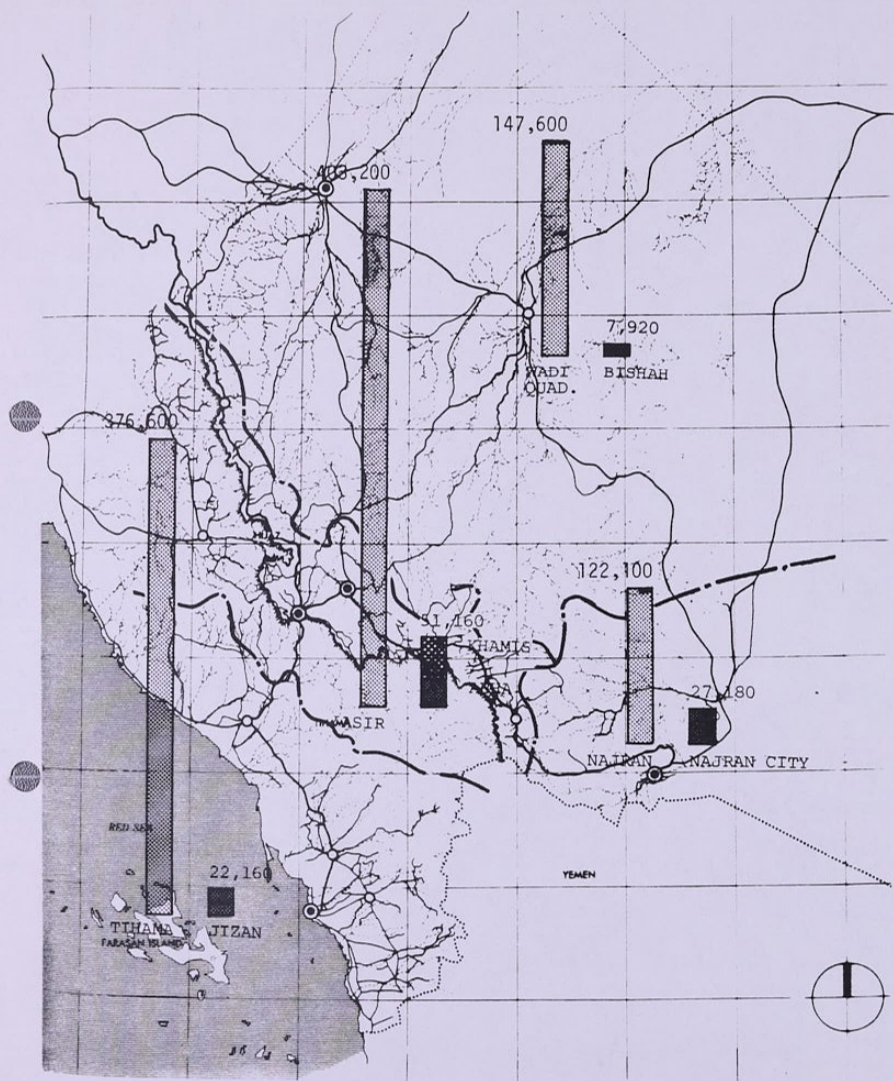
	1975	1980	1985	1990	1995
Survey Area ^a					
High	108,500	140,500	182,500	237,900	311,300
Low		131,800	160,500	195,800	239,100
Urban					
High	171,100	221,000	283,700	363,000	463,900
Low		208,700	252,200	303,200	363,500
Rural					
High	616,300	742,700	886,100	1,048,500	1,231,100
Low		722,700	830,400	941,100	1,054,500
Nomadic					
High	262,100	190,700	139,700	99,400	66,300
Low		218,100	181,700	151,200	125,900
Southern Region Total					
High	1,049,500 ^b	1,154,400	1,309,500	1,510,900	1,761,300
Low		1,149,500	1,264,300	1,395,500	1,543,900

NOTES:

- a. From URTEC 5% sample survey of population, 1974-1975.
- b. From Department of Statistics, 1974 National Census.
(Sub-Region) = (Urban) + (Rural) + (Nomadic)

CHAPTER 9 NOTES:

1. URTEC Study.
2. Census by Saudi Arabian Government. For information on the differences between these two surveys, see Section 9-1-2.
3. URTEC Study.





 population in sub-region
 population in city (5% survey area)

FIGURE 9-2-1
POPULATION
IN CITY AND
SUB-REGION 1975

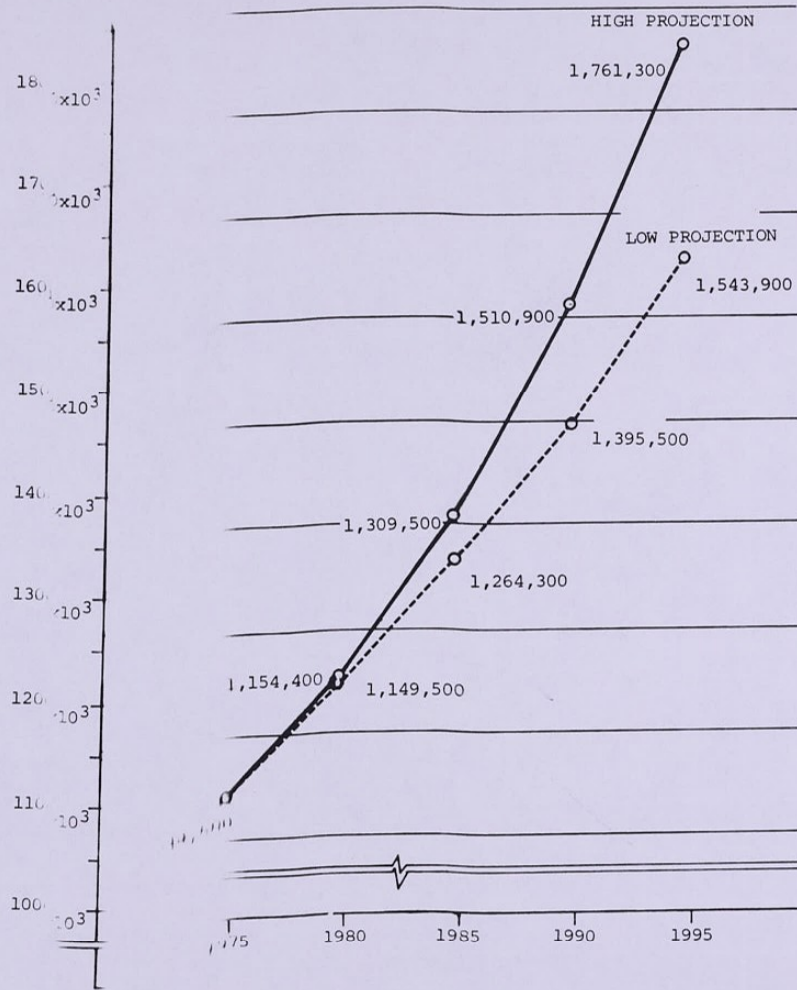
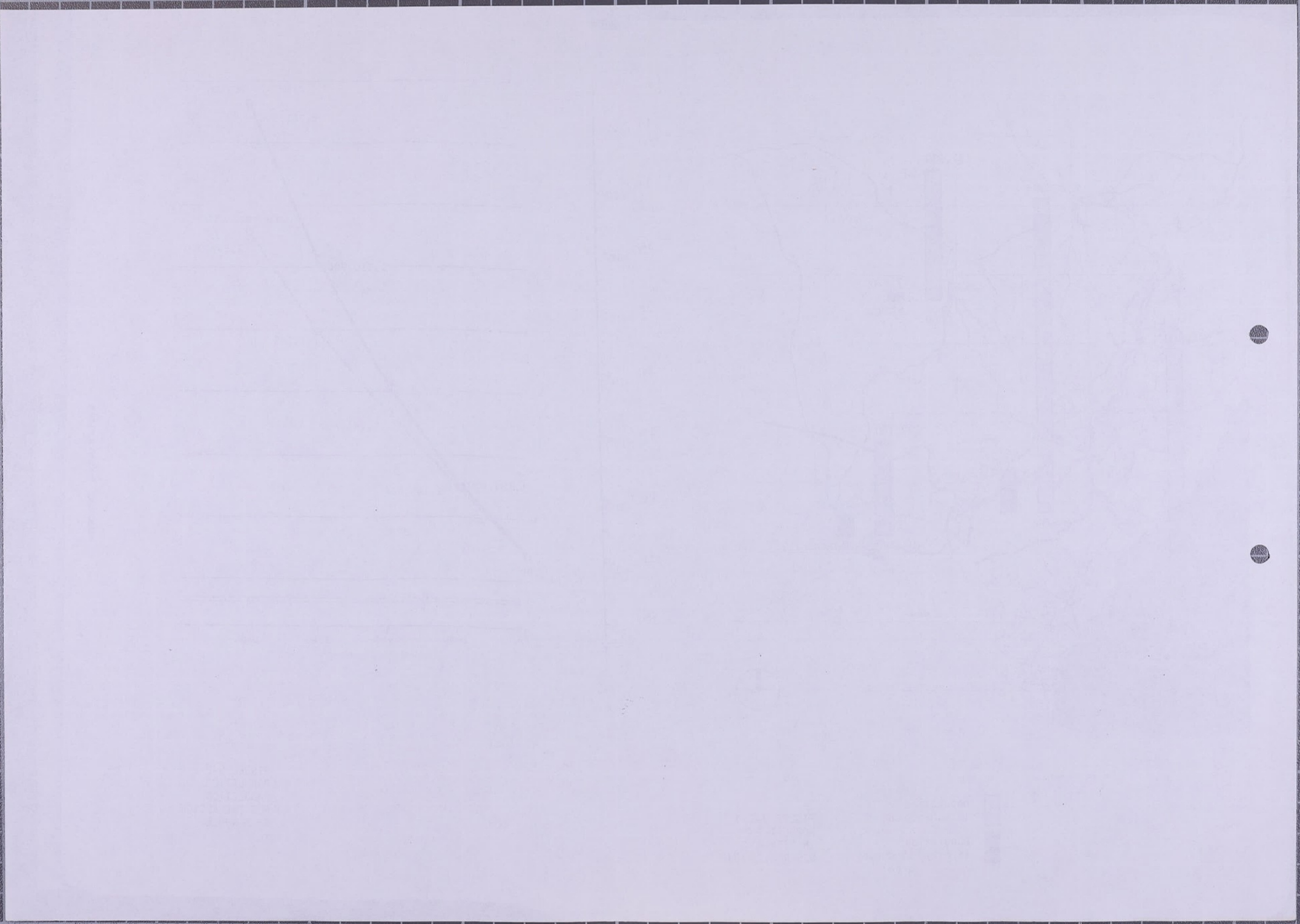


FIGURE 9-2-2
POPULATION
PROJECTION
FOR THE REGION
AS A WHOLE



10. policy for manpower and social development

10-1 MANPOWER DEVELOPMENT

10-1-1 SUMMARY OF EXISTING CONDITIONS

Despite any wealth of physical resources, the ultimate success of national development depends upon human resources. At present, there is an odd imbalance in the pattern of employment. On the one hand, there is a tendency for Saudis to move out of the lowest paying jobs, due to:

1. The availability of better jobs, generally associated with the hydrocarbon industry.
2. Improving educational and training facilities and systems.
3. Availability of immigrants, mostly from Arabic countries to the south, to do lower-level jobs.

On the other hand, there is a shortage of Saudis who are trained and educated in certain technical fields. The effect is that many high-level jobs are held by foreigners.

The imbalance can have a negative effect on the long-term economic development, for example, self-sufficiency in food is a major national goal; yet the salaries that are available in the oil fields may be five or ten times those obtained by farmers. The nation is thus dependent either upon foreign food imports, or upon foreign labor for working its own farms. It is necessary that constant monitoring and evaluation of the labor market take place to avoid such imbalances.

10-1-2 NATIONAL OBJECTIVES FOR MANPOWER DEVELOPMENT

Among the objectives for labor-related development are:

1. To increase the mean productivity of labor.
2. To increase the participation of Saudis in the labor force.
3. To supplement the labor force with foreign workers only as necessary, attracting labor from abroad but not allowing wholesale takeover of any sector by them.
4. To provide job-related education and training and the pre-career and in-service levels.

The key policies of these objectives are:

1. To increase productivity by training and educational programs.
2. To increase the number of Saudis in the labor force by improving working and remuneration standards.
3. To adopt whatever measures are necessary to attract and retain appropriate outside labor.
4. To develop further the system of job-related training programs.
5. To continue and expand training abroad.

The following issues are among those that must be taken into account in the regional physical plan.

1. Foreigners make up nearly one-third of the city workers in the southern region (21% Yemenis, 11.6% other, 32.6% total non-Saudi); this is in comparison with an average of 20% in other regions of the country.
2. It is estimated that more than half of the potential indigenous labor force now moves out of the southern region, largely to obtain better educational opportunities or better jobs.
3. It is important that the job training system include agricultural training, both pre-service and in-service. This will be difficult due to the low population densities and remoteness of the rural agricultural areas.
4. Due to the rapid rate of growth it is expected that the government sector will be the most rapidly growing (15.9% annually, compared with 7.9% for the entire labor force). Already 50.8% of the total personal income in the area comes from the Government. This is acceptable for the present, but private sector growth must be established for the long-term economic health of the region.

10-2 EDUCATIONAL DEVELOPMENT POLICY

10-2-1 SUMMARY OF EXISTING CONDITIONS

In 1926, the Directorate General of Education was formed, initiating the involvement of the Government in educational matters. In 1954, the system was reorganized into the Ministry of Education and within fifteen years had assumed most of the national responsibility for education. As of the present, there are Government schools in all but the most remote and unpopulated areas of the Kingdom. A major domestic element of Government spending of its hydrocarbon export funds has been in the area of education [1].

10-2-2 NATIONAL OBJECTIVES FOR EDUCATIONAL DEVELOPMENT

The following are top priorities in educational development:

1. Boys' education: To ensure the availability of a high quality education, at least through elementary and intermediate level, and beyond if the individuals' wishes and abilities and national need so indicate.
2. Girls' education: To ensure a high quality program at all levels of education, with at least 100% enrollment at the elementary level, 100% enrollment at the intermediate level.

10-2-3 RE
TI

3. Higher education: To establish internationally distinguished programs at the University of Riyadh, King Abdul Aziz University, and the University of Petroleum and Mining; to emphasize technical training that will assist in meeting national needs; to provide a series of Regional Polytechnical Institutes.
4. Religious education: To make Islamic University into an international center for Islamic studies; to develop Imam Mohammed Ibn Saud Islamic University into a National Institute for Islamic Studies.
5. General. To engage in a vigorous program to meet the Kingdom's educational needs, emphasizing teacher training, industrial education (with at least 1600 graduates per year by 1980), agricultural education, and programs for the blind, deaf, and mentally retarded; to establish a network of adult education and in-service training centers.

10-2-3 REGIONAL IMPLICATIONS

The following are among the implications of the national objectives in the formulation of the Regional Physical Plan:

1. The initial problem that must be overcome is reaching the school age population. This is difficult in the southern region because of the remoteness of the area, the highly dispersed population with relatively few areas of substantial density, and the nomadic habits. No single action can overcome this, although it is clear that the school system must be sufficiently flexible and mobile to reach their clients.
2. Education plays a major part in other aspects of regional development. For example:
 - a. Seeking of better education by an individual or for his family is a major cause of out-migration.
 - b. Education is a fundamental part of a variety of social services that are to be developed, such as health care.
 - c. Education will be necessary for the operation of various high-level industrial, commercial, and agricultural activities.
3. Educational investment must take the form of both human and physical resources, and care must be exercised in development. It may be important in some instances, for example, that teacher be of the same tribe or from the same area as their constituents, to assist in popular acceptance of the system. It may be necessary to have mobile school facilities which can be transported along with nomadic peoples until settlement takes place. Other innovations may

10-3 OBJECTIVES IN THE AREA OF HEALTH CARE

10-3-1 NATIONAL OBJECTIVES

4. Educational policy will have a profound effect in stabilizing the population, stemming the flow of out-migration of skilled workers, and attracting skilled labor from outside the region. Careful attention must be paid in planning to maximize these objectives.

The national objectives in health care field are to provide the Kingdom with a comprehensive system of preventive health services through the following steps:

1. To increase the number of modern hospital beds so that by 1980 the standard of 2.5 beds per 100 population will be met.
2. To increase the number of clinics, dispensaries, and other subordinate facilities so that such services are convenient to all sectors of the population.
3. To increase the number of supportive facilities so that it is not necessary for patients to be hospitalized unless there is a real need.
4. To strengthen the system of on-going primary health care and preventive services.
5. To establish a program of nutritional education, with governmental provision of supplements as necessary.
6. To improve public health supportive systems, such as sanitation, inoculation, and other means of disease control.
7. To increase the number of physicians to a ratio of 1 per 2000 population by 1980. To establish health education programs.
8. To establish a health administrative system with primary responsibility at the local level.
- 9.

10-3-2 FACILITIES

- The facilities necessary to accomplish the objectives include the following:
1. General hospitals of varying sizes, located in urban communities and offering both preventive and curative health services.
 2. Specialized hospitals, located in the major cities of the Kingdom.
 3. Dispensaries, staffed by physicians and providing both preventive and curative services, which communities of 10,000-15,000 (type 'A') and 5,000-10,000 (type 'B'), and 40,000 (district dispensaries).
 4. Health centers providing, under the jurisdiction of a dispensary, both preventive and curative services, and serving the smallest communities.
 5. District dispensaries (polyclinics), located in

major towns and each providing both preventive and curative services to a population of 40,000.

6. Specialized facilities, providing services such as bilharzia and malaria control, chest disease clinics, and mother and child health centers.
7. Support services, including regional laboratories, equipment and supply warehouses, and engineering departments (one proposed at Abha).
8. Health offices, responsible for organizing the collection of vital statistics and providing guidance on preventive health services.
9. Mobile health services, to cover nomadic and other persons scattered in small villages.

10-3-3 POLICIES FOR HEALTH SYSTEMS DEVELOPMENT

1. It is important that the system of health care be integrated with other social systems, and that facilities of each type be associated at each level of the hierarchy of grouping.
2. It is important that the health system reach the constituents, and that health care be provided to areas of remoteness, low density, and mobile population.
3. Health planning must be undertaken at an early stage so that sites can be obtained and facilities be developed in appropriate locations.

For further detail of health service system, please refer to the Planning Standards attached to this report.

10-4 BEDOUIN SETTLEMENT POLICY

10-4-1 EXISTING CONDITIONS

The following summarize the conditions of nomadic life at the present time.

1. It is estimated that there are approximately 635,000 nomadic persons in the Kingdom, about 10% of the population. In the southern region, there are some 262,100 nomads, a mean of about 25% of the population. This figure is higher in Asir, Wadi Quadrangle, and Najran subregion, and lower in Tihama.
2. The economic life of nomadic people is tenuous, with little more than subsistence likely to be attained. Food is provided on an ongoing basis, with no ability to provide for the future. In times of drought, as has occurred during the past decade, land is often over-grazed and permanently damaged.

10-4-2 NATIONAL POLICIES FOR NOMADIC PEOPLE

While settlement is seen as inevitable, the Government should undertake to improve the living conditions in the meantime. Such steps include:

1. Grazing and rangeland control program.
2. Agricultural support programs such as:
 - a. Livestock improvement
 - b. Animal health protection
 - c. Training
3. Access to improved or irrigated land for final livestock fattening.
4. Assistance information of production and marketing cooperatives.
5. Support in provision of supplies (such as fuel to alleviate the need to cut trees and deteriorate rangelands).

The following have been identified as priority projects:

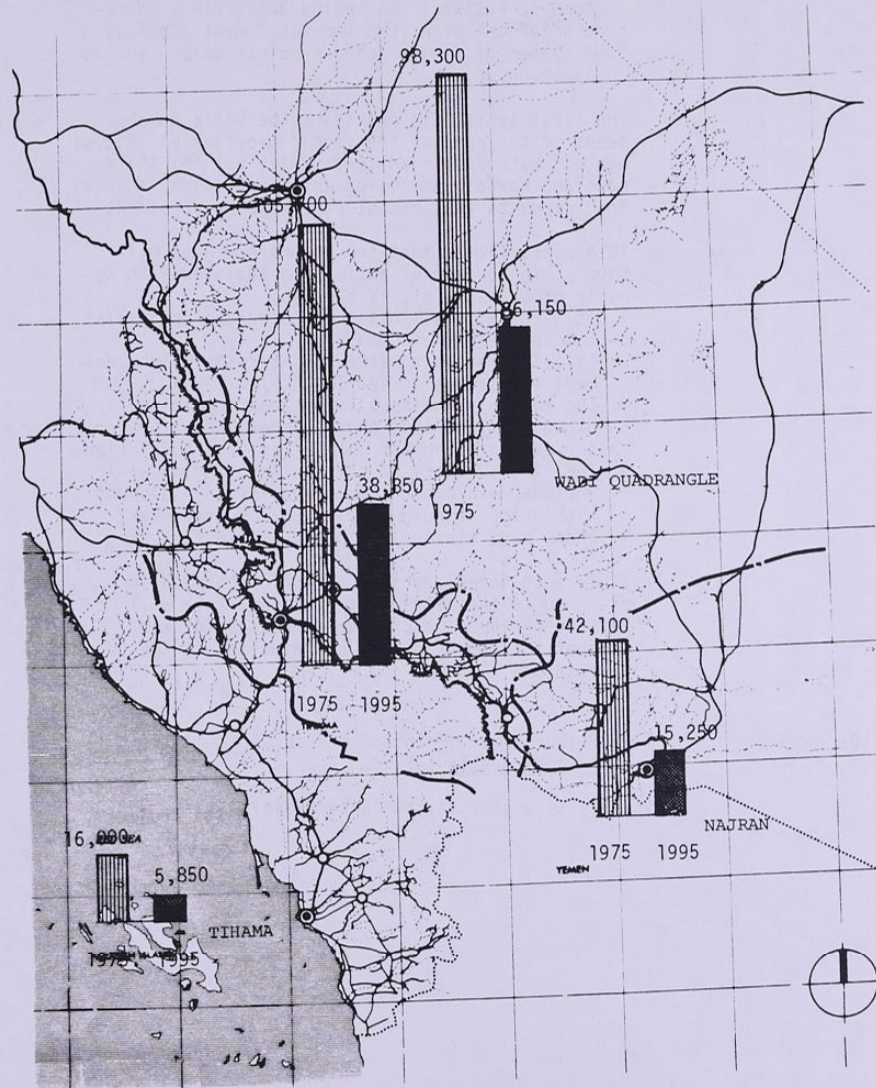
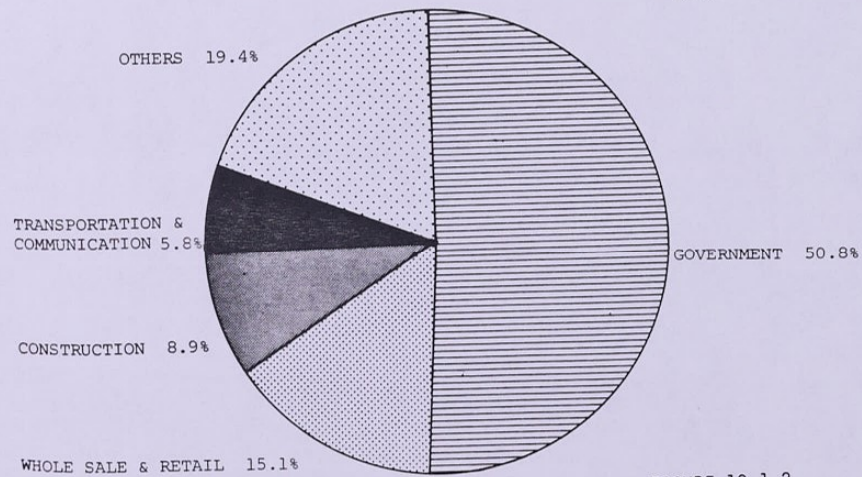
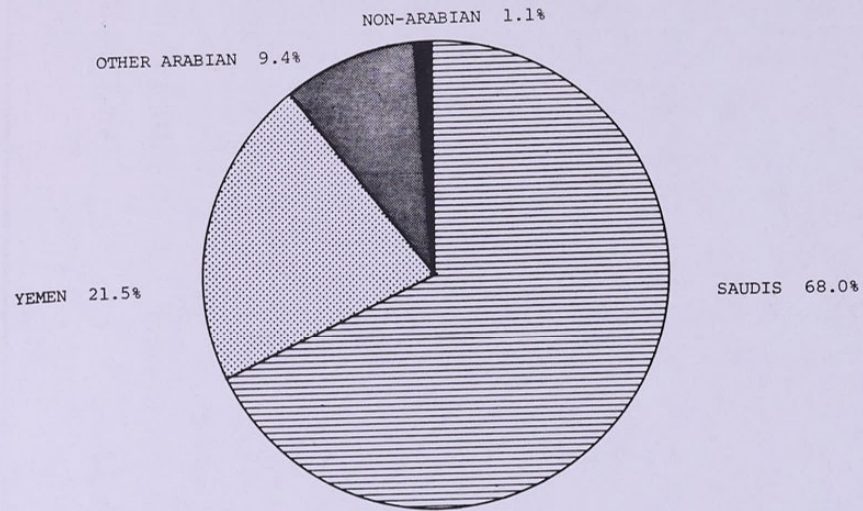
1. Provision of health centers.
2. Mobile health and hospital facilities.
3. Schools, such as boarding schools around population or marketing centers.
4. Special in-service training programs, including radio programs, in-service training, and other activities oriented toward adults.
5. Systematic assurance of Bedouin participation in social and welfare programs.
6. Media and information services to provide data relevant to pasture conditions, market prices, and related items, and to alleviate the isolation [2].

10-4-3 SETTLEMENT AND SERVICE PROGRAMS

It is a natural phenomenon that nomadic people should take advantage of opportunities to settle. It is difficult for them to participate fully in the national benefits without an essentially permanent location. Yet, the traditions, customs, and social structure of the Bedouin people that have developed over the centuries must be treated with sensitivity and respect. Particular attention must be paid to the special needs of the nomads as they are settled.

A system of Bedouin welfare services can be developed around the following concepts:

1. Education, health and welfare extension service (or "caravan").
2. A port of entry establishment in villages and



- town to assist in marketing activities, education of children, and the settlement process.
3. A system of remote contact points at convenient locations.

The first assists in providing the basic human needs of the nomads; the second provides an initial contact with a settled form of living; the third provides certain amenities and necessities, such as food products that cannot otherwise be obtained.

It appears likely that the southern region will have a high degree of activity associated with nomadic programs. This is because:

1. It is a national policy to encourage and assist the settlement of nomads.
2. It is in the best material interests of the nomads themselves to settle.
3. The region contains a large area traditionally occupied by nomads, and a higher-than-average percentage of nomads in the regional population.
4. The likely future of the southern region will include development of agriculture, an element with which nomadic people are more familiar than, say, mining, refining, or manufacturing.

It is thus necessary that attention be paid in planning to the settlement process. This will determine whether the program is successful and whether the nomads make a contribution in the future to the Kingdom.

CHAPTER 10: NOTES

1. U.S. Government Printing Office, Area Handbook For Saudi Arabia (1973).
2. This is a part of the "King Faisal Project".

11. development of infrastructure

11-1 DESCRIPTION OF INFRASTRUCTURE

11-1-1 GENERAL

Infrastructure refers to those permanent, fixed facilities that support the living environment and provide amenities and necessities. In this instance, the infrastructure includes transportation, communication, housing, public utilities, and similar facilities. Traditionally, these functions have been handled at the lowest administrative level. For the most part, these items have been the responsibility of the individual or family. In some instances, a higher level has been involved - there is a set of regulations of grazing and water use that has been worked out at the tribal level.

Provision of infrastructure is essential to support development of modern agricultural, industrial, and commercial systems. It is particularly necessary to accommodate the large numbers of people who must live together in high concentration on limited areas of land in the cities. Thus, the development of urban infrastructure comprises a major part of what must be done. That subject is discussed in the reports for the respective cities; this study discusses development of a regional infrastructure.

11-1-2 THE ELEMENT OF INFRASTRUCTURE

The elements of the infrastructure that relate to regional development include the following:

1. Transportation of passengers
 - a. Intra-regional transportation
 - b. Inter-regional transportation
 - c. International transportation
 - d. Terminals, ports, airports, and related facilities.
2. Transportation of Freight
 - a. Intra-regional transportation
 - b. Inter-regional transportation
 - c. International transportation
 - d. Terminals, ports, airports, and related facilities.
3. Personal and Business Communication
 - a. Postal Service
 - b. Telephone Service
 - c. Two-way Radio service
4. Mass Media
 - a. Newspapers
 - b. Broadcasting
 - c. Television
5. Housing
 - a. Public housing facilities
 - b. Publicly-assisted housing
6. Utilities and Public Service Facilities
 - a. Electricity
 - b. Water
 - c. Sewage disposal
 - d. Solid waste disposal
 - e. Storm drainage

11-1-3 TRANSPORTATION

A more detailed discussion of these elements follows:

1. Passenger transportation

Traditionally, the Southern Region has been generally isolated. It has been the route of caravans for thousands of years, but such a means of travel is too slow for modern activities. Thus a newer system has been decided upon. It is the policy of the kingdom to utilize highways as a main means of short-to-medium distance within the country, due to several things:

- a. Highways can be most easily and quickly prepared. (There were severe engineering and technical problems with the construction of the Dammam-Riyadh Railroad in 1947-1951) [1].
- b. Bituminous and concrete are readily available, while steel rails would have to be imported.
- c. There is a plentiful supply of fuel for vehicles.
- d. There is more flexibility by highway vehicles than by railroads.

Thus buses are to be the main method of inter-region passenger transport. Construction of highways and paving of existing roads, is presently underway. There are about thirty points in the region where fuel and service are available (1975 Existing Conditions). Aircraft are to be used for longer distances. Flights are available on a regular basis from airports in Jizan, Najran, Abha/Khamis Mushayt, and Bisha by Saudia Airlines. They are also the primary means of passenger travel at the national and international level.

2. Transportation of freight.

The same general conditions exist for freight transportation as for passengers. Trucks, using highways, are the predominant form. Of particular concern is the construction of terminals, distribution points and warehouses, which should generally be located at the nodes formed by the interface of the high-speed, long-distance roads with the local roads. The Red Sea port at Jizan will assume an increasingly greater role for inter-regional and international shipping. Its development is discussed in chapter 8.

11-1-4 COMMUNICATION AND MASS MEDIA

1. Communication

Communication facilities have been expanding in recent years. The postal and telephone services are largely dependent upon actions by the government to support improvement of operations and physical facilities. Attention must be paid

to the proper allocation of new expenditures, to provide the best support for commercial, industrial, and human development. Two-way radio service may prove more flexible and less expensive than the telephone in some remote applications.

2. Mass media

It is and is likely to remain a government function. It is important to note the importance of media, particularly broadcasting, as a source of news, entertainment, and education. If out-migration is to be reduced, more of such amenities should be provided to the residents of the Southern Region.

High-powered television transmitting stations operating on the VHF frequencies (30-300 MHz) have a maximum continuous range of about 100 km although this range may be extended depending on geological and climatological conditions. At present there is only one television station in the Southern Region, in Abha. It began regular transmissions in 1977 and covers Khamis-Mushayt as well. A site study for a station in Najran is under way.

11-1-5 HOUSING

Housing is a function in which the government will generally not become directly involved, except in special circumstances. These include:

- a. Places of high residential concentration, such as rapidly-growing cities, where the private sector is unable to meet the demand.
- b. Places where the government wishes to encourage or support residences, such as "ports-of-entry" for nomads or new towns.
- c. Demonstrations of new styles or techniques of housing.

There are other circumstances in which the government may wish to offer support to essentially private housing; this would likely consist of subsidies or interest-free loans.

11-1-6 UTILITIES

There are four basic categories of utility services:

1. Water, sewage, and other services for residences, and small commercial and industrial facilities. These are typically handled on the city or local level. (see city plans)
2. Large-volume water supply facilities for use in irrigation or by large industrial plants. This is generally a function to be handled at the sub-regional level.

11-1-7 INFRASTRUCTURE AND GROUPING OF CITIES AND VILLAGES

3. Special projects, such as desalination plants. Because of the national-level significance of this function, a cabinet-level ministry of desalination has been established by the Government of the Kingdom. (See Chapter 4 Water Resources, and development potential).
4. Electric Power. Although the actual generation of power is to be done at the local level, it is necessary to engage in planning at higher levels to achieve standardization. As of 1971, the Council of Ministers established that the national standard for electricity would be alternating current at a frequency of 60 Hz and at 127/220 volts. There are some remaining lines at other frequencies and voltages but these are being phased out or reconstructed. As of 1979, it is planned to have a total generating capacity in the Southern Region of over 75 million watts with 1400 km of new distribution lines installed and interconnected with other systems throughout the Kingdom.

In preparing an infrastructure development plan, it is appropriate to act in accord with the uniform system of grouping by hierarchical order, which has already been described and which has been used in the preparation of other elements of the plan. Refer, for example to Section 8-2-6, establishment and improvement of commercial facilities, to see how the hierarchical order was applied to set up a planning framework for commercial activities. While the composition and distribution of functions is not precisely the same, the concept applies equally well to the setting up of a framework for infrastructure development. Table 11-1-1 demonstrates the structure of the system and outlines some of the functions that would be carried out at each level.

Table 11-1-1
REPRESENTATION OF HIERARCHICAL ORDER OF INFRASTRUCTURE

		FIRST ORDER (REGIONAL LEVEL)	SECOND ORDER (SUB-REGIONAL LEVEL)	THIRD ORDER (COMMUNITY LEVEL)	FOURTH ORDER (NEIGHBORHOOD LEVEL)	FIFTH ORDER (SMALL VILLAGE LEVEL)
APPROXIMATE MAGNITUDE OF POPULATION IN INFLUENCE AREA		10 ⁶	10 ⁵	10 ⁴	10 ³	10 ²
REPRESENTATIVE CITY OR VILLAGE (EXAMPLE)		Abha - Khamis Mushayt Conurbation zone	Abha	Al Ubayd Tarfah Al Matraq Nimas etc., and communities in Abha.	Village groups or vil- lages of population size of 10 ³ or neigh- borhoods in the city area.	Small villages with population size of 10 ² of sub-neigh- borhoods in the city area.
			Khamis Mushayt	Ahad Rufaydah Butah Zaharan Janub etc., and communities in Khamis Mushayt.		
			Najran	communities in Najran		
			Jizan	Sabya Abu Arish Samtah etc., and communities in Jizan.		
			Bisha	communities in Bishah		
INFRASTRUCTURE	TRANSPORTATION OF PASSENGERS AND FREIGHT	NODES OF V1, V2, AND V3 ROADS		NODES OF V3, V4 ROADS	NODES OF V4, V5 ROADS	NODES OF V5, V6 ROADS
		Regional and Sub-regional distribution centers at peripheral zones		Small scale distribu- tion centers at the peripheral zone	Group parking at peripheral areas	
		Terminal of nation-wide and region wide mass transportation (airport, seaport, long haul bus system		Terminals of inter- settlement mass trans- portation (small air- ports for isolated areas, medium distance bus system	Terminals of intra-ettlement mass transport ation (local bus) of inter-settlement mass transportation for isolated areas	

Note: *1 for definitions Vi through V7, see the Table A-2-9 (a) in the Appendix Chapter.

Table 11-1-1
 REPRESENTATION OF HEIRARCHICAL ORDER OF INFRASTRUCTURE (Continued)

		FIRST ORDER (REGIONAL LEVEL)	SECOND ORDER (SUB-REGIONAL LEVEL)	THIRD ORDER (COMMUNITY LEVEL)	FOURTH ORDER (NEIGHBORHOOD LEVEL)	FIFTH ORDER (SMALL VILLAGE LEVEL)	
INFRASTRUCTURE	PERSONAL AND BUSINESS COMMUNICATIONS	POSTAL SERVICE	Regional central post office and major city post offices	Branch post offices	Post delivery and collection services from the nearest branch offices		
		TELEPHONE SERVICE	Regional central telephone office and major city telephone offices. Nodes for local lines (wire-connected) and receiving and transmitting air borne waves	Branch telephone offices to serve as public local telephone service. For remote areas they function as mini-scale telephone offices described in left column	Public telephone booths at nodes.		
	MASS MEDIA	NEWSPAPER	Publication of Regional and sub-regional papers and receiving and distribution of international and national newspapers	Distribution center for local readers. Sometimes mini-news is added	Branch distribution centers		
		BROADCASTING	Regional, sub-regional TV and radio station receiving and transmitting national programs. Sometimes prepare region-wide or sub-region-wide programs	CATV (Community TV Antena TV) system can be introduced to promote local mass media system	Mini CATV can be introduced for remote settlements		
	HOUSING	Regional and/or sub-regional housing policy is programed (with coordination of upper level decision making mechanism) New community of number of housing units with magnitude of 10^4 is prepared and constructed at this level	New housing with population magnitude of 10^3 is prepared and constructed at this level. Conservation area, beautification area and new community area are defined	Small scale housing conservation, in-fill and small scale government financed housing is planned and implemented at this level	Government guidance of conservation or traditional housing and introduction of new material and method by indirect incentive planning, and small scale proto-type demonstration method		
	UTILITIES	ELECTRICITY	Generation and interconnection of power for the regional and sub-regional need. Node of inter- and intra-regional high voltage brunk lines with 10^5 to 10^4 V.		Transmitting regional high power lines into local lower power lines with magnitude of 10^4 to 10^3 V.	Transmitting to even lower voltages with the magnitude of 10^2 V. For remote villages, mini generators are constructed. Later, interconnected to the higher hierarchical systems wherever possible	
			Peak load in the magnitude of 10^8 V.	10^7 W	10^6 W	$10^5 - 10^4$ W	

Table 11-1-1
REPRESENTATION OF HIERARCHICAL ORDER OF INFRASTRUCTURE (Continued)

INFRASTRUCTURE		UTILITIES	FIRST ORDER (REGIONAL LEVEL)	SECOND ORDER (SUB-REGIONAL LEVEL)	THIRD ORDER (COMMUNITY LEVEL)	FOURTH ORDER (NEIGHBORHOOD LEVEL)	FIFTH ORDER (SMALL VILLAGE LEVEL)
		WATER	Inter/intra regional water supply/consumption policy set by the regional government.	Permanent water supply system is constructed and maintained at urban areas. Major irrigation projects are planned and constructed at sub-regional level	Small scale dams, wells, and local supply systems, to be later integrated to larger scale system whenever feasible		
			Annual domestic and industrial need in the magnitude of: 10^8-10^7 m ³	10^7-10^6 m ³	10^6-10^5 m ³	10^5-10^4 m ³	10^4-10^3 m ³
			Annual agricultural use in the magnitude of: 10^3-10^8 m ³	10^8-10^7 m ³	10^7-10^6 m ³	10^6-10^5 m ³	10^5-10^4 m ³
		SEWAGE DISPOSAL	Basic policy at Regional level	Sewage system and treatment plant at each city	Sewage system and treatment plant for each of village clusters or village centers if needed, unless density and population is low enough for individual systems to cope	With exception of cases of extremely low densities, urban neighborhoods should be served by the sewerage system. Local villages with low population density can depend on individual systems	
		SOLID WASTE DISPOSAL	Basic policy at regional level	For urban area, one incinerator for each city	Solid waste collection team at each of community level groupings in urban areas. In rural areas organized garbage dump or incinerator plant at village cluster level	Sub-station of solid waste collection team at temporary dump in neighborhood or sub-neighborhood in village level of grouping	
			Annual vol. of solid waste in the magnitude of:	10^4-10^3 ton/yr.	10^3-10^2 ton/yr.		10^2-10^0 ton/yr.
		STORM WATER DRAINAGE	Storm water should be separated and discharged at the earliest point to the nearest wadi basin. The matter is solved locally (see city reports), but the following should be done: (1) Street and carparking areas should be sloped for smooth flow of surface water. (2) Natural path of flood water should not be blocked off by urban development.				

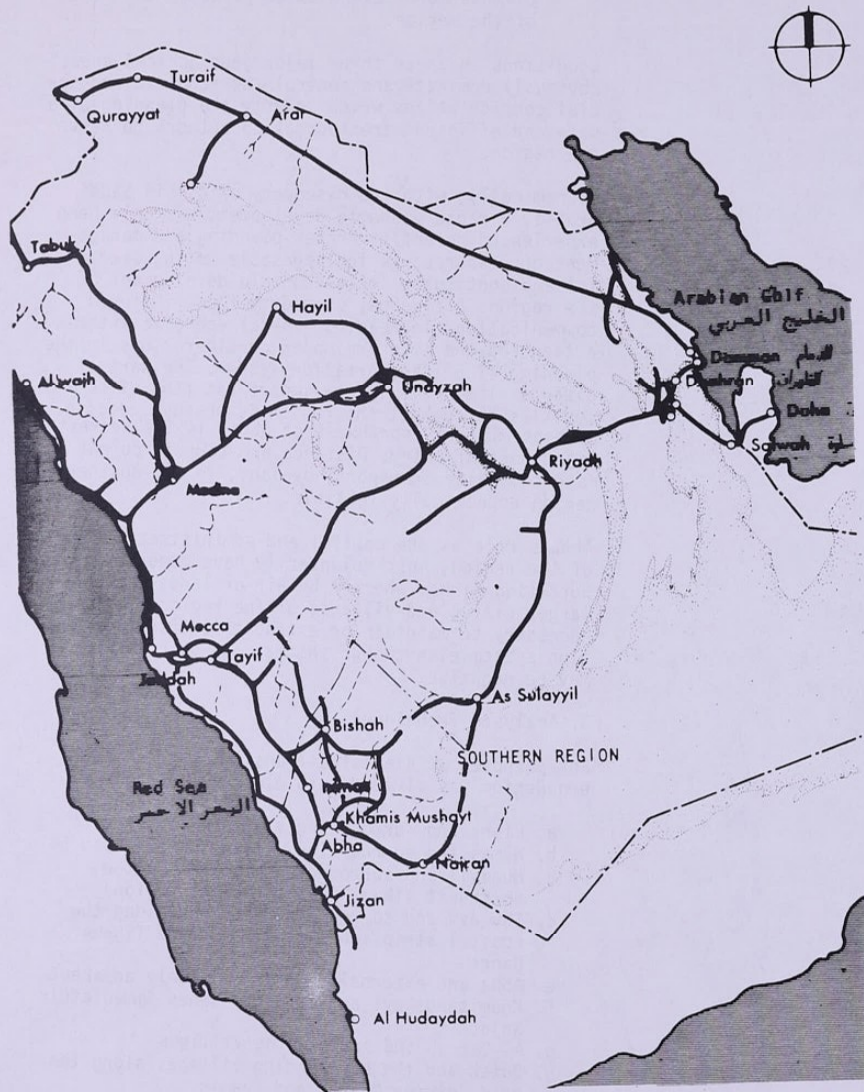


FIGURE 11-1-1
NATIONAL ROAD
NETWORK

scale 1:10,000,000



FIGURE 11-1-2
REGIONAL ROAD
NETWORK

scale 1:2,500,000

11-2-1 GENERAL

1. Transportation planning

To provide safe and efficient movement of people and goods in the near or far future, planning is an essential prerequisite to proper design, operation, and maintenance and administration directed to achieving these goals. Planning involves anticipating transportation needs, developing economical and otherwise acceptable methods of satisfying them, developing investment programs to provide necessary plant and, lastly monitoring developments to either confirm the adequacy of past planning or to point up plan modifications as conditions change.

Regional transportation planning, as part of the Master Plan, is not limited to one or two modes of transportation with attendant criterion of performance. Rather, transportation planning for the Southern Region is concerned with a variety of modes to achieve improvements in meeting several objectives of concern to both the public and private sectors. Additional elements are use of the tools of pricing, salutary regulations, sound management and a serious concern with policies of population location and land development in the Southern Region, an area of tens of thousands of square kilometers.

Regional transportation planning must be concerned with all transportation including its urban areas. Separate transportation studies (Master Plans) are prepared for these, therefore urban areas are not dealt with specifically in this Regional Master Plan.

2. Geographical, Economic and Social Consideration

Geographically, the Southern Region is located and may be divided into three basic areas:

- a. The western slope of the Asir Mountain Range, also known as the Tihamah Range which varies in character from a coastal strip to rolling foothills inland.
- b. Easterly the highland plateau area, cool and rich in rainfall and agriculture - climatically the most desirable area of the Southern Region.
- c. The Wadi Quadrangle, east of the plateau and Asir Range with vast arid Wadi basins and low lying plateaus - this area is hotter and the

climate more severe as compared to the rest of the region.

Conditions in these three major geographical areas obviously dominate and control the economic and social considerations which underly the planning of a safe and efficient transportation network to serve the region.

Economically, with the discovery of oil in Saudi Arabia, a rapid economic development has only been experienced recently. Proper planning and management of resources is indispensable to the successful and continuing socio-economic development of the region. Affluence, commodity flow, improved communication, increasing general economic interaction and the like are major considerations in the planning of a transportation system. The part of Jizan's vital role in the import and flow of commodities throughout the region is obvious. Jeddah, perhaps 650 km northwest of Abha, is the nearest major port of entry. Distance and terrain do not make commodity transport, by land, to the Southern Region economically feasible.

Abha's role as the capitol and administrative hub of the region, must voluntarily have good transportation links, whether by air or land, between larger cities and villages of the region. It is necessary to maintain or extend this transportation system even though initial economic returns may be negative.

3. Analysis Techniques

For purposes of statistical analysis, the Southern Region was divided into eleven study zones.

- a. Bisha and surrounding villages
- b. Nimas and surrounding villages along Road 54
- c. Muhayil and surrounding villages in the northwest Tihamah Range (upland region)
- d. Shuqayq and surrounding villages along the coastal strip and foothills of the Tihama Range
- e. Abha and external zones immediately adjacent
- f. Khamis-Mushayt and external zones immediately adjacent
- g. Al Qarrah and surrounding villages
- h. Butah and the surrounding villages along the road joining Najran and Khamis
- i. Jizan and surrounding villages covering the southwestern sector of the Tihama Range
- j. Najran and the surrounding villages
- k. Wadi Quadrangle including all of the eastern lowland plateau sector of the Region.

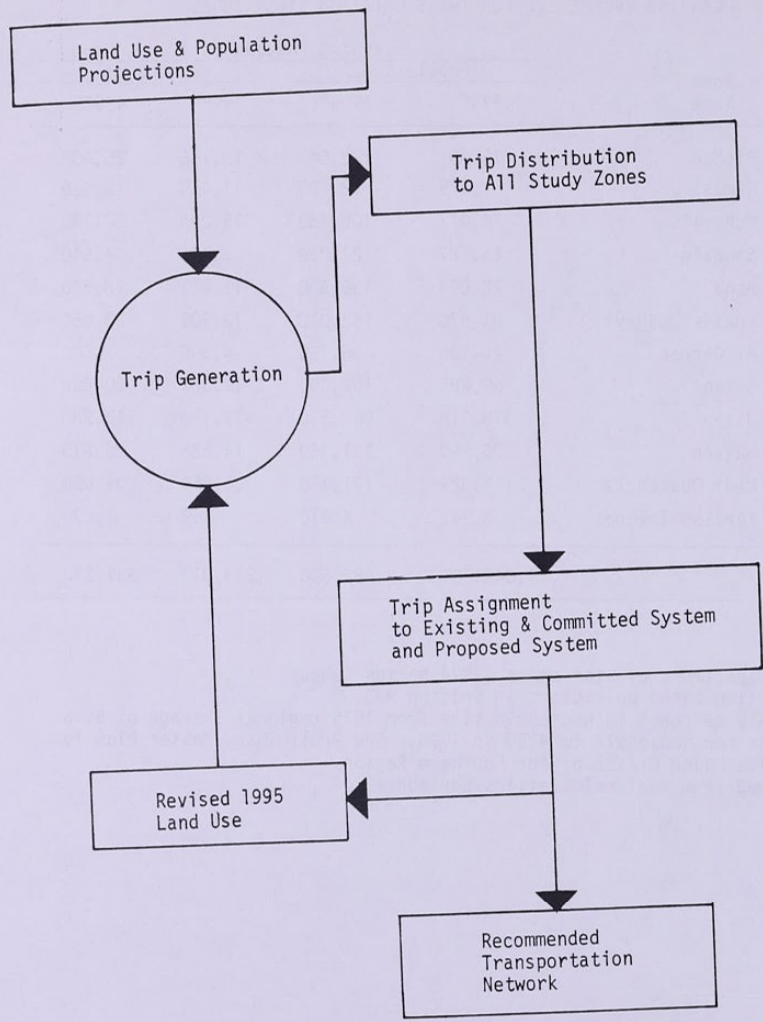


FIGURE 11-2-1
DEVELOPMENT OF
A TRANSPORTATION
NETWORK

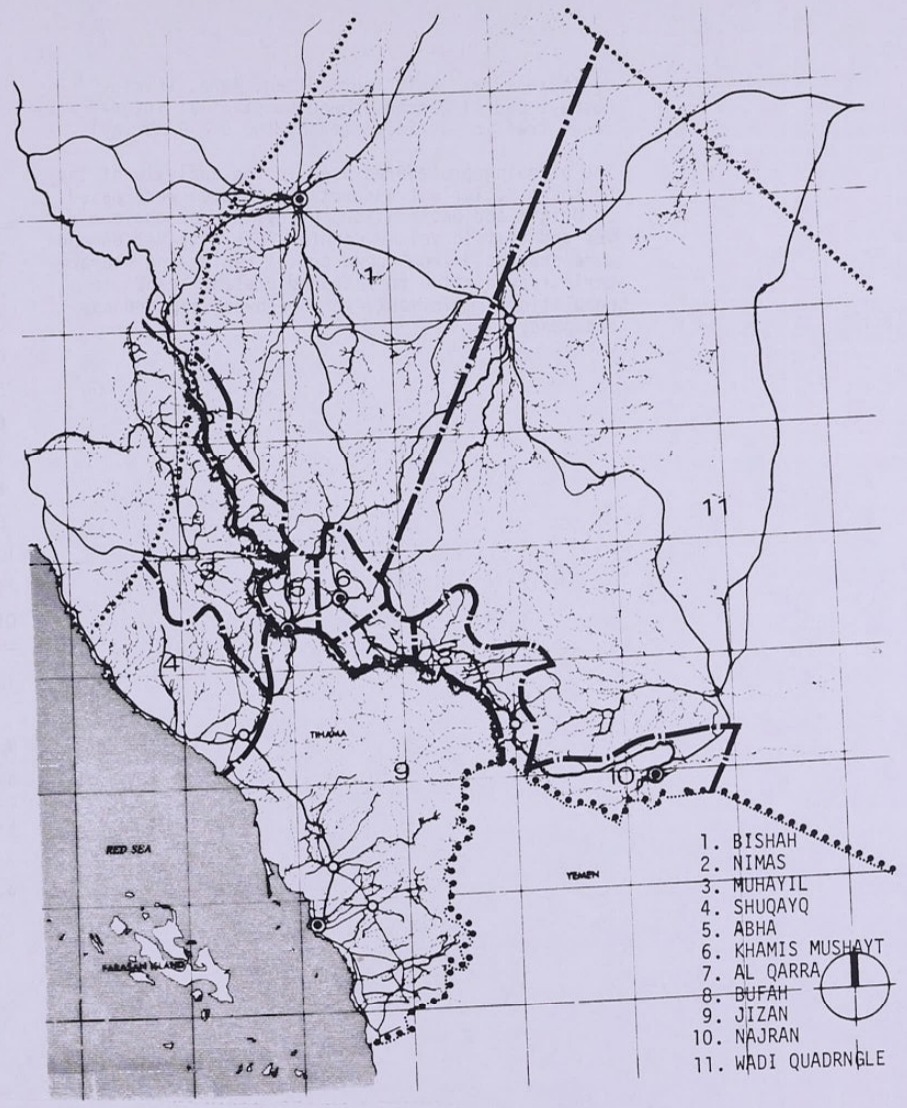


FIGURE 11-2-2
STUDY ZONES FOR
SOUTHERN REGION
scale 1:2,500,000

Of these zones, only four, Jizan, Abha, Khamis-Mushayt and Al Qarrah showed substantial inter-zonal traffic (as indicated by the O & D Survey).

The planning procedures used in the analysis of the Southern Region's transportation system were based on Origin and Destination Survey, 5% Household Survey and traffic volume counts. Future travel demands were projected from known travel habits and characteristics relative to past and present trends in population, employment, vehicle ownership and car occupancy.

Table 11-2-1
PLANNING PARAMETERS FOR TRANSPORTATION STUDY ZONES

Zone No.	Zone Name	Planning Parameters			
		Population		Households	
		1975 ^a	1995 ^b	1975 ^a	1995 ^c
1	Bishah	75,802	122,640	13,756	25,030
2	Nimas	62,979	92,190	11,464	18,810
3	Muhayil	74,077	108,430	15,205	22,130
4	Shuqaiq	15,187	22,230	3,136	4,540
5	Abha	72,098	139,830	12,831	28,540
6	Khamis Mushayt	81,570	162,010	13,705	33,060
7	Al Qarrah	25,105	36,750	4,396	7,500
8	Butah	69,685	102,000	12,387	20,820
9	Jizan	375,718	558,510	79,173	113,980
10	Najran	76,599	131,350	14,626	26,810
11	Wadi Qudrangle	117,329	171,750	21,669	35,050
Other ^d	Farasan Islands	3,352	4,910	969	1,000
Total		1,049,501	1,652,600	203,317	337,270

Notes:

- a. From Department of Statistics, 1974 Nation Census.
- b. Estimation based on factors in Section 9-3.
- c. Assume a decrease in household size from 1975 regional average of 5.16 persons per household to 4.90 in 1995. See Preliminary Master Plan for the Five Major Cities of the Southern Region.
- d. Excluded from regional traffic study zones.

The trips were distributed using the gravity method and transportation planning techniques. This method uses distance as an inverse function of trip volume. Distance is stated in terms of travel time which is raised to exponential power to account for its restraining effect. The model can be stated as follows:

$$T_{ij} = \frac{T_i S_j / D_{ij}^n}{(S_x / D_{ix}^n)}$$

Where S_j = "attraction" factor at j .

S_x = "attraction" factor at any zone x .

D_{ij} = distance or travel time from i to j .

D_{ix} = distance or travel time from i to any zone x .

n = friction exponent or restraining influence.

The "attraction" factor may be expressed in any meaningful way. For example, the logical measure of attraction for work trips would be the number of jobs in the zone.

When the number of trips between pairs of zones have been calculated they were assigned to routes of the appropriate transportation network using minimum friction path method. Resistance to travel was measured in units of time.

11-2-2 LAND USE
TRANSPORTATION
STUDY

1. Summary of Changing Demands

Improvements of its own human resources is a major part of the Southern Region's development plan. Projected expenditures on health, education, welfare and communication are in the multi-billion dollar range. Among the objectives of the plan is the construction of new residential dwelling units, expansion of the school and university system, an improved communication system, as well as construction of new modern hospitals and industrial establishments. As a result, the entire area will require improvements in ground transportation, airborne transportation and waterborne transportation, including transportation of commodities. A clear indication of increasing and changing demands is evidenced by the increased rate of population growth, employment, earnings and a dwelling-unit forecast for 1995.

Prosperity and welfare in the Southern Region is

on the upswing and, along with these changes, specific improvements in the transportation network are mandatory.

As a result of the shift of population from less desirable living areas to urban areas of higher income and better accommodations, vehicular volumes are increasing rapidly. To accommodate future transit volumes and provide for safe and efficient and fluid flow, roadway vertical and horizontal alignment need to be reviewed and lane width increased. The tracks and unpaved roads must be upgraded to shorten travel time and to provide desirable travel comfort between villages and larger cities. Air and water transportation may require new advanced modes of transportation for its short and long haul, as helicopters and hovercraft with efficient terminals and transfer facilities. The future industrial and commercial developments should be mandatory. To neglect any of these needs or considerations will not only result in deficient transportation, but will tend to waste expenditures, endanger man and the environment and will have a negative influence on the economy.

2. Locational Policies and Main Traffic Generators

A primary objective is to ensure high environmental standards in the developing areas throughout the Southern Region in the course of creating an efficient transportation system. A policy therefore is founded on three important considerations:

- a. To establish an integrated land/use transportation plan.
- b. To establish an attractive public transportation system.
- c. To establish an efficient commodity distribution network.

As the heart of the region Abha-Khamis-Mushayt generates a larger traffic demand than any other area. Considering also the location of the new international airport in relation to these cities, it is evident that this area needs to be treated with particular care. The Al Qarrah area is a large single traffic generator with only one connection to Abha. The military bases in the vicinity of Abha and Khamis also contribute.

The coastal strip of the Tihama Range near the village of Shuqayq is ideally suited to be developed as a recreational area, inviting tourism and providing a social amenity for the Southern Region. As prosperity increases and more leisure time is available, demands for good transport links to this area will in-

crease.

Early establishment of an attractive public transportation system with efficient and convenient transfer terminals is essential, especially between Abha and Khamis. This fact is discussed in more detail in Section 11-2-4 of this study.

A need for a network of airports, located just outside the urbanized areas, exists due to geographical and physical restraints to surface travel in the region. This network will be a vital aid in the stimulation of social and commercial interaction within the region and provide for alternate modes to public transport. Jizan, the only port handling mostly import commodities, can be expected to prosper enormously as imports of construction materials and industrial cargo increases. Future intra-regional import and export of agricultural goods is also foreseen, requiring an efficient secondary system of distribution to the rest of the region.

3. Airports and Ports

The completion of the Abha-Khamis Mushayt International Airport, strategically located between the two urban centers, is possibly the one most significant factor affecting the development of the Southern Region. Serving as the hub of the region, it will stimulate unprecedented social and commercial interaction with the other regions of Saudi Arabia and of the world.

It is estimated that the Abha International Airport will handle as many as 1,200,00 enplaning and deplaning passengers annually by 1995 and will greatly facilitate industrial and commercial activity. Historically, an airport of this size and importance attracts labor intensive industries and businesses relying on rapid shipment of their high value products.

The ground access to the airport itself and the surrounding industrial development should effectively link with direct connections to the city of Abha and Khamis-Mushayt.

A grade separation at the intersection of the airport access road and the main road between Abha and Khamis-Mushayt is recommended.

Airports will continue to service all other major cities such as Bishah, Najran and Jizan, and the increase in enplaning and deplaning passengers will be in proportion to the increase of population and activities in each city, as described in the Master Plan for each city.

Some locations with predicted future population growths, as village clusters around Nimas, Muhayil, Abu Arish, Al Imair, Al Khawbah, Butah

and Tathlith and the proposed recreational area along the coast, should have airports to satisfy future transportation needs as a supplement to ground transportation.

The only large commercial port is in the City of Jizan. Presently, the port handles mostly import commodities, these mainly construction materials for the southern and western part of the region. It is expected that an increased volume of commodities handled in the future will be paced by completion of improvements to the port facility.

The agricultural activity in the lower Tihama region may require changes in the Jizan port development to accommodate the needs for an export facility as production increases.

From the regional point of view, it would be beneficial to study the possibility of developing a new port in the vicinity of Shugayg to serve the area of Abha, Khamis-Mushayt, Muhayil, Al Qara and the villages north of Abha and south of Khamis-Mushayt. At present, these areas are served by the Port of Jizan, coupled with ground transport. A new port would substantially reduce delivery times and overland transportation costs.

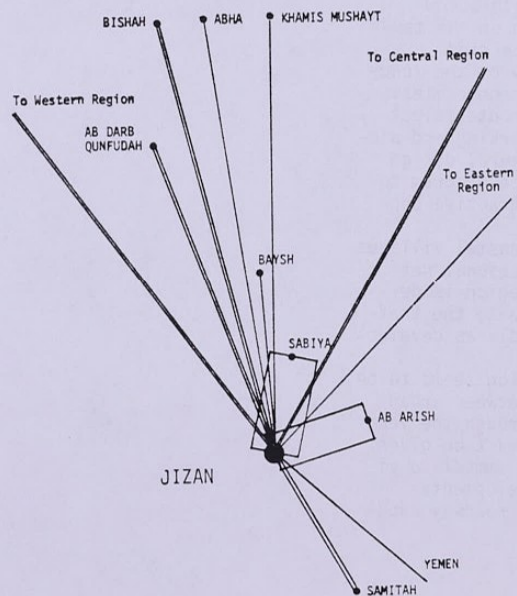
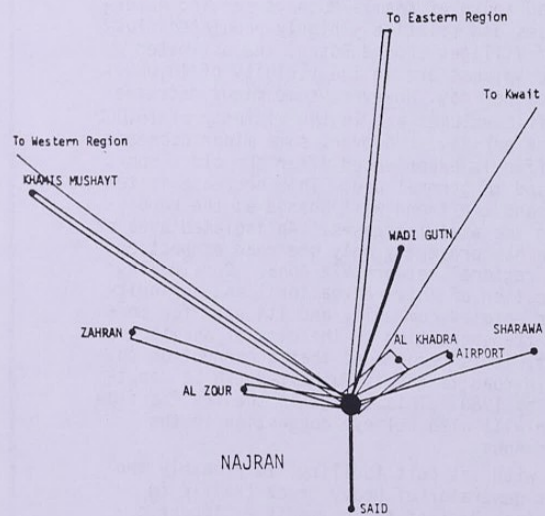
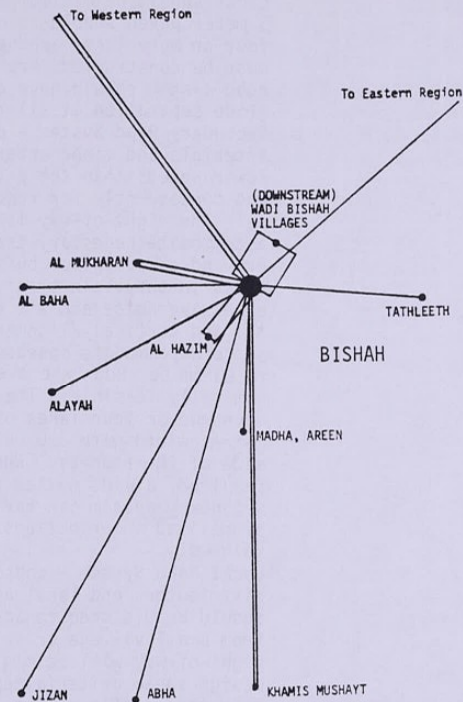
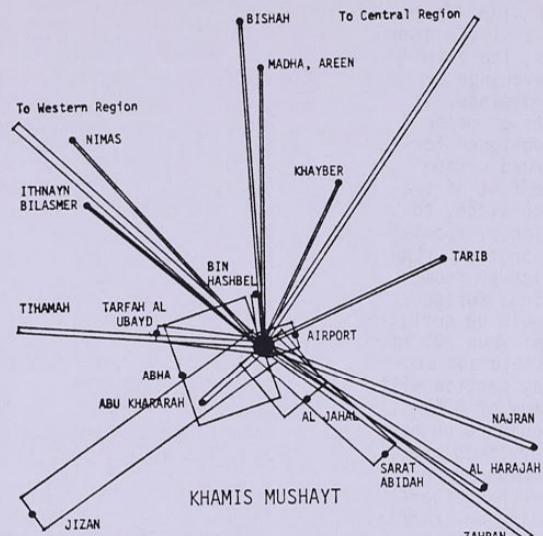
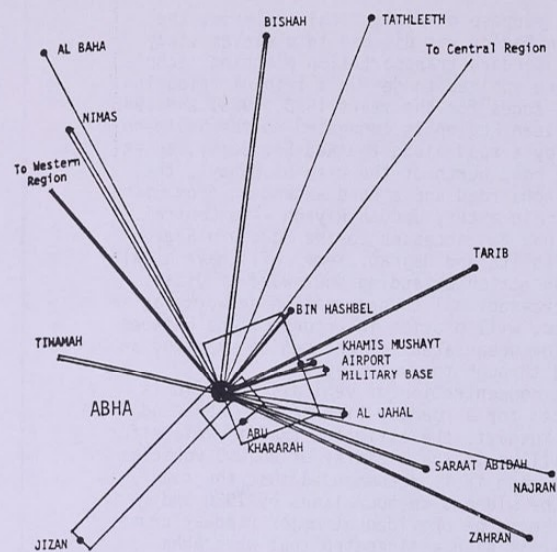
11-2-3 ROAD NETWORK

1. Road Classification and Design Criteria

Each region has its own region designated system, made up principally of primary and secondary routes of regionwide importance. The major highway systems of neighboring regions must be connected and matched with the Southern Region highway network to achieve traffic flow continuity throughout the entire country.

The Southern Region rural roadway network is divided into three classification categories: primary, secondary and local, in addition to these, scenic route can also be listed as a separate category. Each of these categories has different regional or nationwide socio-economic values and will be useful in ranking priorities for financing of construction and maintenance. Additionally, the classifications: inter-regional and regional highways, major arterial, arterial and collectors.

a. Primary Road System - consists of inter-regional highways, regional highways and major arterials designed for high speed and maximum travel comfort. A wide right-of-way should be maintained throughout the entire system to provide for pullouts and rest areas, to isolate traffic flow from urban areas and accommodate possible additional traffic or transit lanes in the future. Horizontal and vertical alignments should correspond to a design speed of 120 km to 100 km per hour minimum wherever possible and economically feasible. The roadway section will have four or six lanes,



Vehicles/12 hours

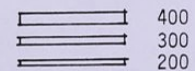


FIGURE 11-2-3
TRAFFIC FLOW
DIAGRAMS

Lanes should be minimum 3.75 meters wide with 3 meter paved shoulders on each side. Where four or more lanes are needed, a wide median must be constructed. Preferably, the primary road system should have an interchange or grade separation at all road crossings.

- b. Secondary Road System - consists of major arterials and minor arterials designed for lower speeds than the primary road system and consequently for reduced comfort of travel. The right-of-way is of such width, to accommodate necessary traffic lanes, shoulders and as a minimum buffer to protect urban areas in the vicinity of the highway from excessive noise and air pollution. Horizontal and vertical alignments should be designed to accommodate speeds of a minimum 100 km to 80 km per hour wherever possible and economically feasible. The roadway section will have two or four lanes of minimum of 3.50 meters width with 3.0 meter shoulders on each side of the roadway. Where four lanes are required, a wide median is recommended. The secondary system can have interchanges or signalized intersections depending on traffic volumes.
- c. Local Road System - consists of collectors, distributors and local access road. They should be designed to accommodate traffic from small village or settlements. The right-of-way will be minimum with a low design speed criteria depending on the terrain and traffic volume to be carried.
- d. Scenic Routes - consists of any or the functional classifications with design criteria oriented toward aesthetics of route selection, design of lookouts with parking and picnic facilities, pleasing structural design and a very efficient maintenance program to keep facilities in the most attractive condition.
The coastal road joining the coastal villages is a vital link in the inter-regional network and if this part of the region is developed as a recreational retreat, the traffic volumes will increase rapidly as development and prosperity continues.
The roadway network in the region seems to be underutilized in the section between urban developments even projected through the year 1995. A special consideration must be given to the regional network in the immediate vicinity of the larger urban developments where substantial increases in roadway capacity may be needed.

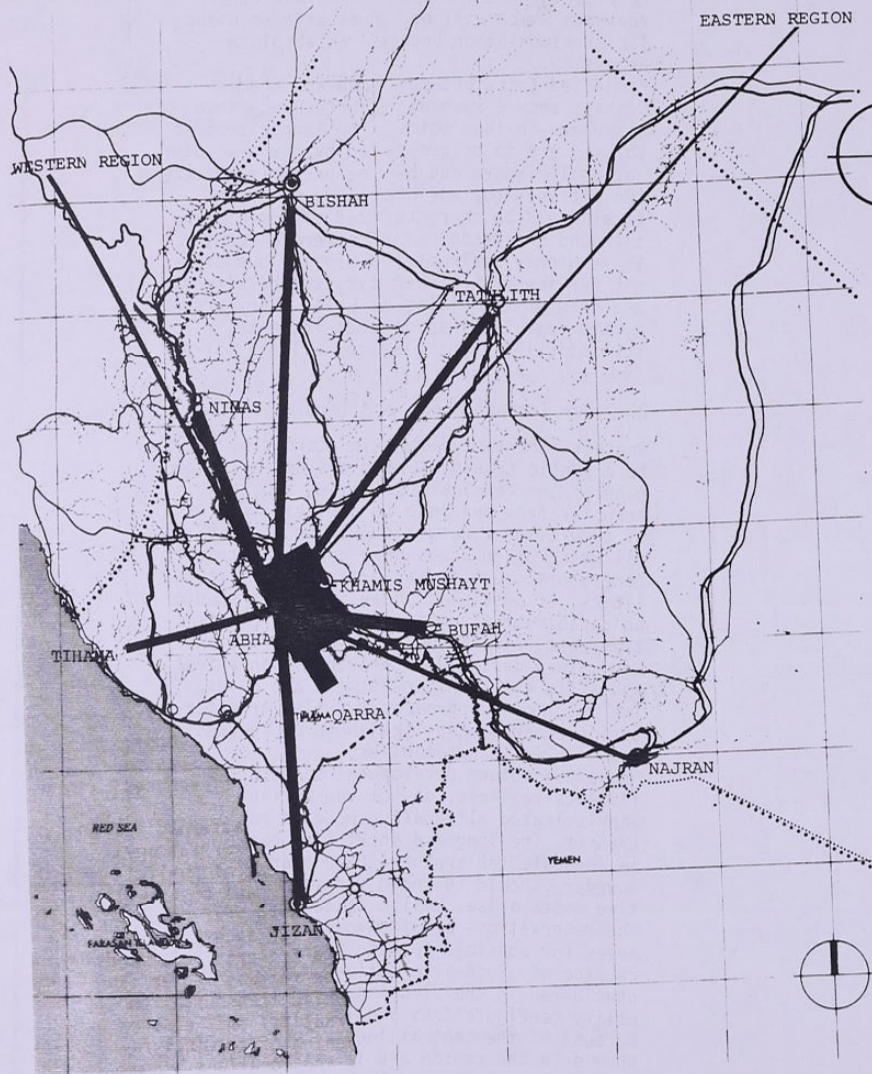
2. Principal Road Network

For the purpose of statistical analysis, the Southern Region was divided into eleven study zones. Standard transportation planning techniques were applied to derive a trip distribution between zones for the years 1980, 1985, and 1995. The Western Region is connected to the Southern Region by a road along the Red Sea Coast, an extension road north of the city of Muhayl, the Jeddah-Abha road and a road extending from Bishah to the main artery Jeddah-Riyadh. The Central Region has two accesses to the Southern Region via Thithlith and Najran. Yemen will have a main road connection extending southward of Jizan. The intra-regional transportation network, as proposed, will provide interconnections between all major urban areas of the region existing or planned through the year 1995.

A major concentration of vehicular traffic is projected for a roadway link between Abha and Khamis-Mushayt. The estimated traffic volume for 1995 will be in the vicinity of 25,000 vehicles per day, and it is recommended that the road should be widened to four lanes by 1980 and interchanges be provided at major roadway crossings. It is also anticipated that when Abha International Airport is operational, the desirability of public transportation will be manifest.

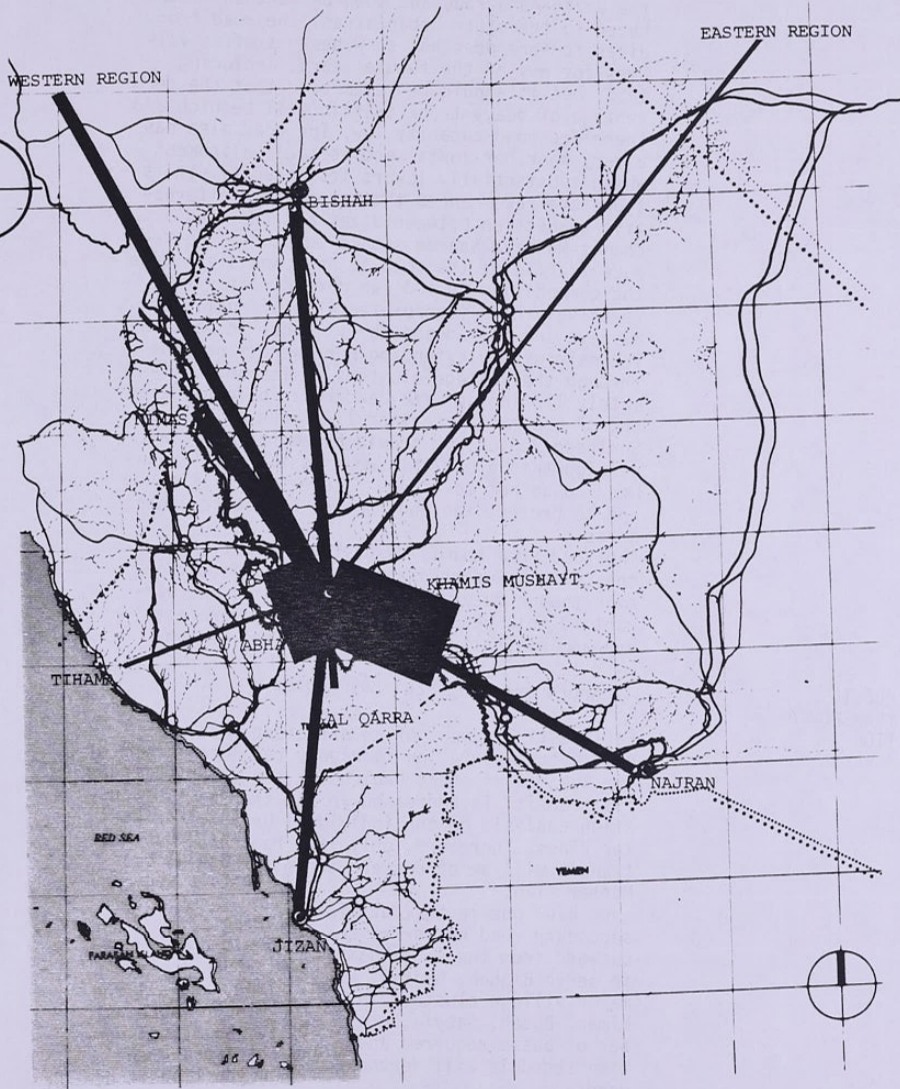
Large traffic volumes are also anticipated on the road south of Khamis-Mushayt serving numerous bases and relatively highly-populated clusters of villages around Butah. The estimated traffic volumes are in the vicinity of 18,000 vehicles per day. However, some minor decrease in traffic volumes are in the vicinity of 18,000 vehicles per day. However, some minor decrease in traffic is experienced after the old airport is closed to general use. This decrease is temporary and the trend will change as the population in the area increases. An isolated area of Al Qara has presently only one road connection to the regional network via Abha. Considering the location of this recreational and agricultural-orientated community and its need for more direct transportation to the city of Khamis Mushayt, it is recommended that a connection to the main road to Khamis Mushayt-Butah be constructed by 1980. This change in the traffic flow pattern will also relieve congestion in the city of Abha.

Jizan, with its port facility, is probably the largest generator of heavy truck traffic in the region. Most of the commodities imported via the Port of Jizan have to be carried on



50000
25000
10000
5000
trips/day (1995)

FIGURE 11-2-4
DESIRE LINES
FOR ABHA AREA
scale 1:2,500,000



50000
25000
10000
5000
trips/day (1995) scale 1:2,500,000

FIGURE 11-2-5
DESIRE LINES FOR
KHAMIS MUSHAYT AREA

the Jizan-Abha road and then be further distributed to the other urban areas. The road from Jizan to Abha does not show heavy traffic volumes for any of the future years, including 1995, but it should be remembered that the percentage of heavy truck traffic will be high and therefore road capacity low. The road also has a very poor horizontal and vertical alignment which substantially lowers its capacity. It is therefore recommended that a possible alternative connection between Jizan and the road Khamis-Mushayt-Najran should be studied to reduce traffic on the road to Abha and distribute the commodities from Jizan more directly to a relatively highly populated area of Khamis-Mushayt and Najran and the villages in between. The main artery extending northward from Abha through the village clusters, Nimas and ultimately linking up with Jeddah can be considered one of the most important lifelines of the Southern Region. It should be emphasized that developments along this road must be well regulated so as not to impede future traffic flow and to protect the environment of future urban areas.

The road from Khamis-Mushayt via Tathlith to the Central Region deserves careful attention even though future traffic volumes do not warrant it this because of its vital governmental and administrative importance to the region.

1. Short and Long Haul Bus Routes

Early establishment of an efficient mode of public transportation is highly recommended. The subject of short haul buses, or urban bus transit, is addressed in the transportation analysis of the individual Urban Master Plans. Therefore, only long haul bus transit will be of concern to this Regional Master Plan.

Long haul bus routes, utilizing primary and secondary road networks, should be extended outward from the Abha-Khamis-Mushayt area to serve Bishah, Najran, Jizan, and all the major village clusters in between (such as Nimas, Butah, Sabyia, etc.). The actual number of buses required and the procurement time schedule will depend on the transit demand.

Operation of a typical bus should be environmentally acceptable and, most importantly, should be comfortable to the rider. The success of attracting potential users hinges on a combination of the size of bus, riding comfort, operating schedules, station locations, transfer point locations and loca-

tions of terminals. An early beginning development of public transportation will be helpful in establishing routes and other features which will be valuable when public transportation becomes an absolute necessity.

Projected trips between Abha and Khamis-Mushayt show a much higher frequency than elsewhere in the region. The larger traffic volumes are to be generated by the new International Airport and by the proximity of the two cities, Abha and Khamis-Mushayt. The first would be characterized as administrative and the second as a commercial center. It is highly desirable to provide bus transit service from either city to the airport and between the cities as well. Very probably by the year 1995, as demands increase, a sophisticated transit system will be warranted.

2. Other Transit Modes and Terminals

Another important factor in attracting users to a public transportation system is the design of the terminal facilities and the transfer from one mode to another. Terminals of a multimodal nature should be planned in all major urban areas near the large traffic generators, such as airports and port facilities. If possible, these terminals should be capable of accommodating all forms of transport, air, ground, or waterborne, and adequately designed to provide a convenient and efficient transfer between all modes. The multimodal approach to public transportation enhances the likelihood of reduced use of private automobiles.

Projected future development patterns, i.e., 1995 desire lines, do not now warrant any sophisticated alternative mode of public transit. The long and short haul buses will be adequate for another 10-20 year period. However, should the need for such alternative modes arise, Design Criteria recommends the reservations of wide roadway median areas for possible "public transportation corridors". Such alternatives must also be considered in the planning of terminal facility configurations and locations.

Because of the central location of Abha and Khamis in the region and important interactions expected between those two cities, some type of connecting mass transit may be both socially and economically beneficial to the Southern Region. A flow between these two major cities should be continuous with a separate link accommodating Abha International Airport.

11-2-4 PUBLIC
TRANSPORTATION

1. General

Achievement of the fundamental transportation planning and environmental management objectives set forth in the Master Plan necessitates, among other things, the establishment of a clearly defined hierarchy of roads; the strict control of important design parameters and the establishment of a well planned training program directed to extending and maintaining the transportation systems. Satisfying these goals will ultimately encourage drivers to make their journeys along the most appropriate roads. The hierarchy of the road network has been defined previously. Control of certain design parameters is established below.

Design speed, along the network, must be established to achieve a safe and efficient network. On the primary system in rural areas, design speed of 120 km/hour to 100 km/hour should be maintained. However, where the system traverses heavily populated urban center, these speeds should be reduced to 80 km/hour.

On the secondary system, speeds should vary to a maximum of 100 to 90 km/hour, but generally be restricted to lower speeds. Adjustments to fit the conditions are necessary and have to be evaluated on an individual basis. The collector system should be restricted to a maximum of 80 km/hour in rural areas, but generally it can be designed for a much lower speed. Prevailing geographical, physical, human and climatic conditions dictate all final speed limits.

Access to the primary and the secondary systems must be controlled by setting minimum spacings between junctions for primary roads 400-1000 m and for secondary roads 250-400 m.

Restriction of utility services beneath the roadway is necessary. Outright prohibition of such services beneath the primary system is strongly suggested to avoid interference with traffic during installation and maintenance or repair of the services.

An adequate training program will be needed to maintain the transportation network and to avoid heavy reconstruction work in the future. Deterioration, if permitted, would have a seriously adverse affect with respect to safety, capacity and the environment resulting in an overall negative benefit to the Southern Region. Pedestrian, as well as vehicular traffic, is affected by traffic control policies. On a regional scale, however, pedestrian traffic is less a problem than it presents in the highly populated areas. Around village clusters closely

bordering the primary or secondary system, pedestrian regulatory signs and signals may be warranted to insure safety and sidewalks should be provided along the roadways through urban areas.

In the following paragraphs, specific traffic control devices, requirements and considerations relating to them will be discussed.

2. Requirements and Consideration

Traffic control devices should meet five basic requirements:

- a. Fulfill warrants
- b. Command attention
- c. Convey a clear meaning
- d. Command respect of the road users
- e. Give adequate time for proper response

To meet the above mentioned requirements, there are five major considerations as follows:

- a. Design - traffic control device should convey a clear meaning and draw attention by design features such as size, shape, color, or reflectivity. Minor modifications of certain conditions (i.e., scenic route designations)
- b. Placement - the placement of the device should be such that it is seen by the user, yet does not present a hazard to him.
- c. Operation - the application of a device should meet the particular traffic demands at a given location.
- d. Maintenance - not only should control devices be kept in good working condition to command respect of the motorist or pedestrian, but also they should be functionally maintained or adjusted to future needs of constantly changing conditions.
- e. Uniformity - Treating similar traffic situations in the same manner throughout the network aids the motorist in recognition and understanding of control devices.

3. Capacity and Safety

Observed traffic volumes, together with the results of speed-volume relationship studies, have been used in establishing the capacity of different types of roadways under average conditions. The capacity of any individual section of roadway varies depending on roadway characteristics. For the purpose of analysis, the average conditions were established based on uninterrupted flow, passenger car flow with minimal truck traffic, 3.75 meters wide traffic lanes with shoulders and average speed of 80 km/hour. It is apparent that a few roadway sections will have all of these conditions of

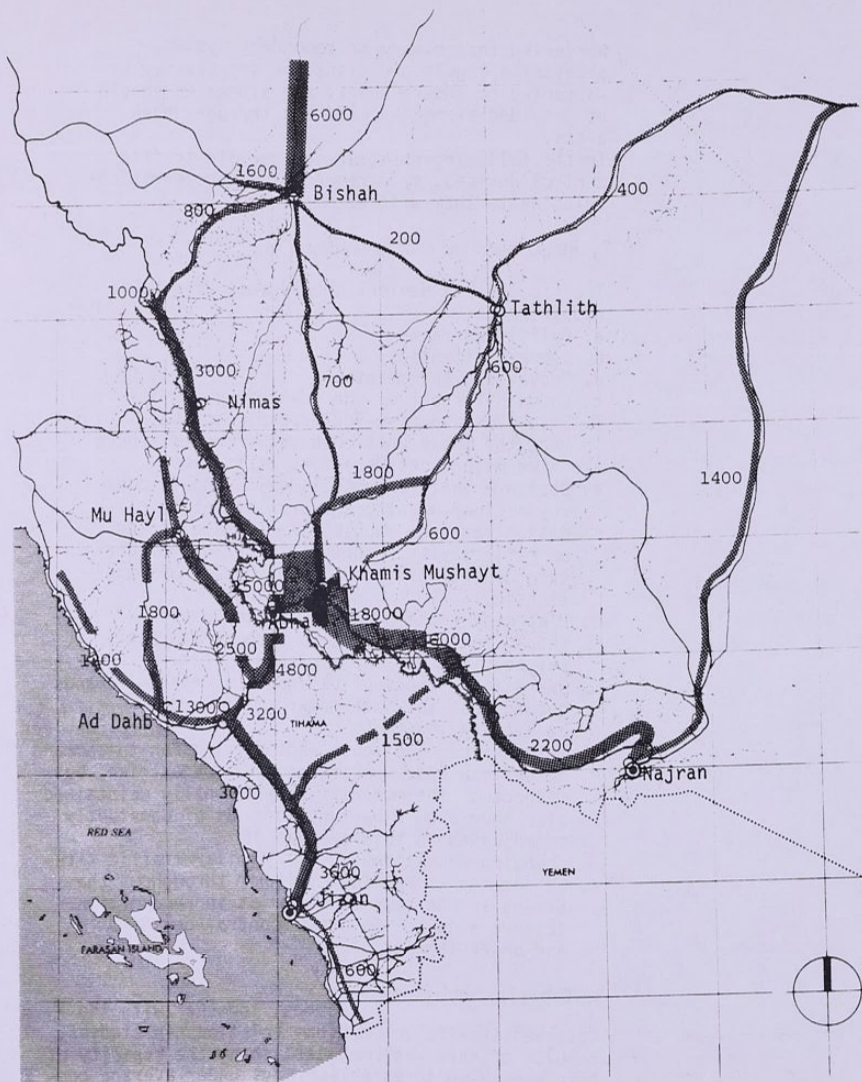


FIGURE 11-2-6
PROJECTED
TRAFFIC VOLUMES
(trips/day, 1995)

scale 1:2,500,000

11-2-6 ENVIRONMENTAL POLICY

1. Factors and Impacts

Design of any transportation links or terminals should be done concurrently with environmental impact assessments to minimize

operation, but also many of the sections will not. For a section of roadway with poor horizontal or low speed vertical alignments and a high percentage of heavy truck traffic, or a combination of both, the capacity is reduced accordingly.

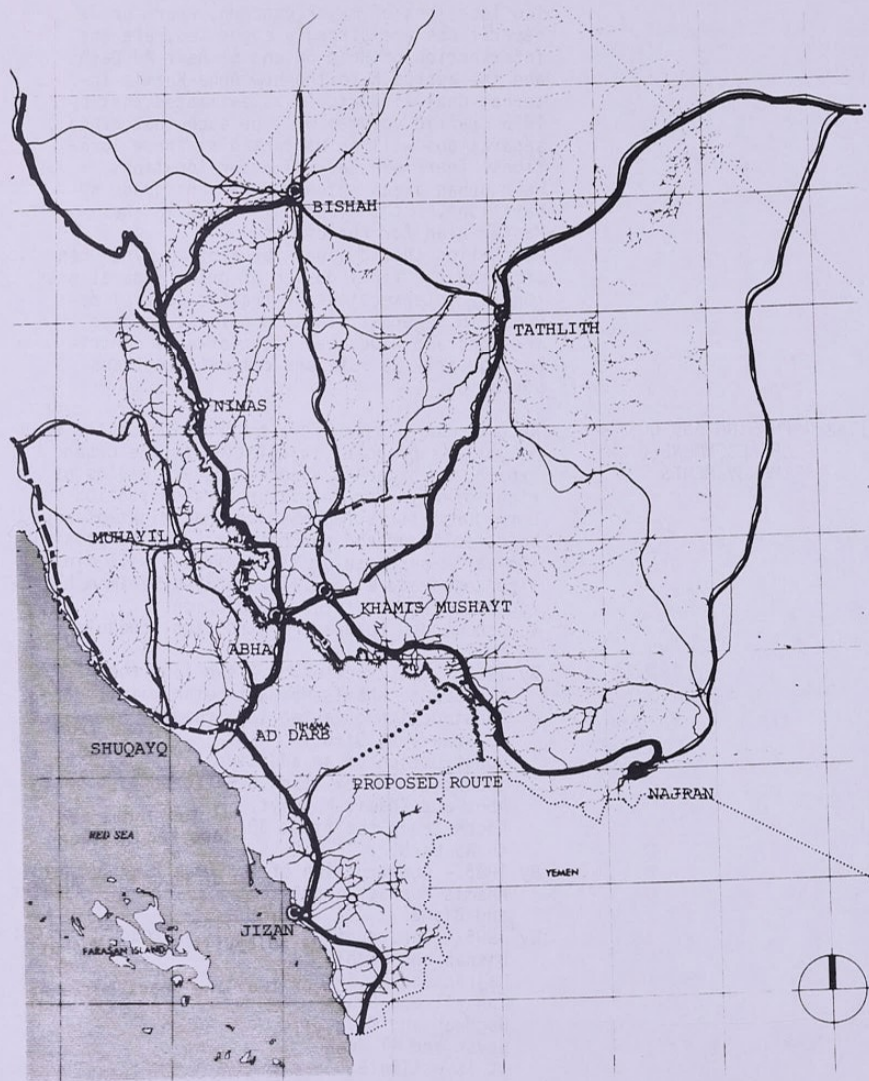
Most of the roads on the western side of the Tihama Range have conditions similar to the average conditions introduced earlier as well as the road between Abha and Khamis-Mushayt. The capacity will be relatively low in the section of the first 30 km from Abha to Jizan due to extremely steep gradients and a high percentage of heavy truck traffic. The remaining road network follows hilly or mountainous terrain with lower roadway capacity.

The use of guardrail (aluminum or steel) on all high speed primary or secondary arteries at all warranted hazard locations is imperative. In the foothills, the Tihama region, the use of guardrails may have to be extensive due to mountainous terrain. Some locations will warrant the use of impact-attenuating devices such as hydrocells or sand filled barrels. The use of these "crash barriers" is almost mandatory for all structures near the roadway and abutments. The use of breakaway lighting and signing poles installed with bolted triangular frangible bases that release upon impact, should be required. These poles are safer and more economical since vehicular damage is held to a minimum and replacement cost is low.

Traffic lights and pedestrian control devices shall be placed on the network only where warranted and are not recommended in rural areas where speed is in excess of 80 km/hour.

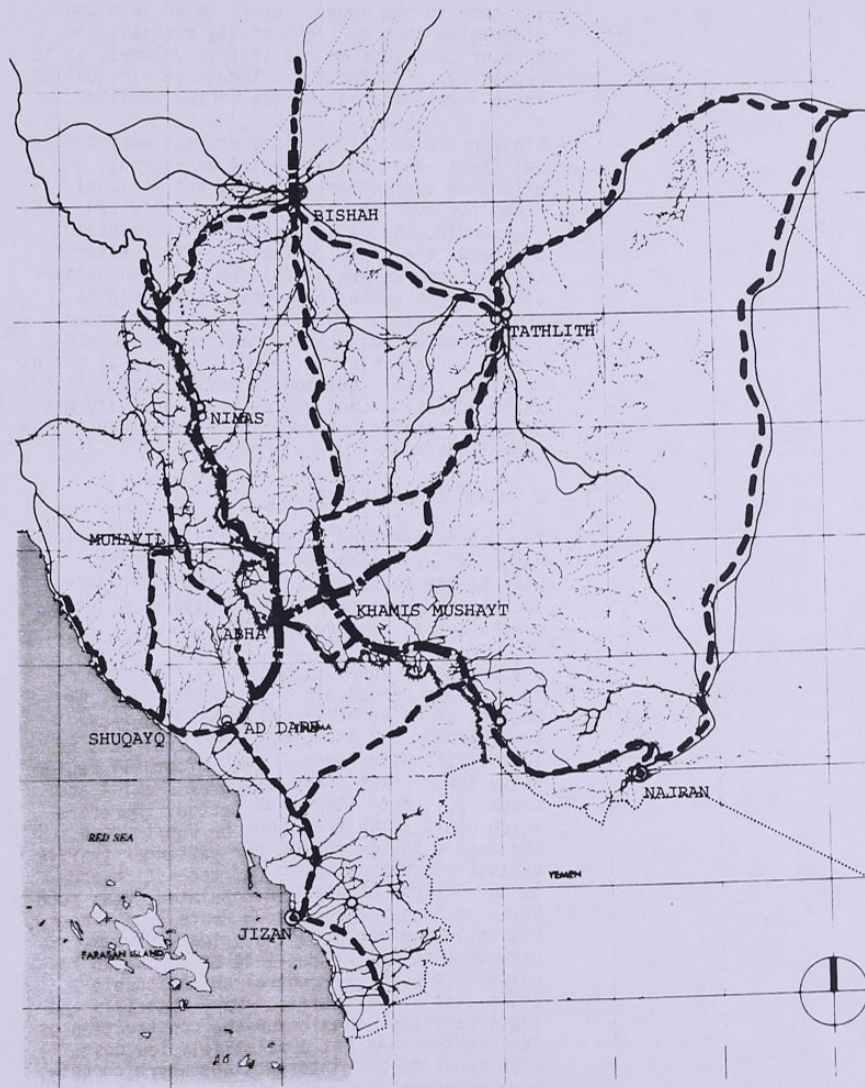
The regional network should have no "on street parking" except for emergency and for the rest area or rest parking at proper intervals (30 minutes driving distance for instance). It is recommended that the primary and secondary roads throughout the entire regional network should have an emergency lane on either side of the road, i.e., shoulders.

Local regulation of "on street parking" in urban areas is dealt with in the Cities Master Plan. Car parking area locations will depend on the environmental, functional and economic requirements of the roadway.



- primary
- secondary
- - - local
- · - · scenic route

FIGURE 11-2-7
RECOMMENDED
ROADWAY
CLASSIFICATION
1995
scale 1:2,500,000



- · — 4 lanes
- - - 2 lanes

FIGURE 11-2-8
ROADWAY
NETWORK
1995
scale 1:2,500,000

adverse consequences to surrounding areas. In addition to the usual factors taken into consideration such as right-of-way acquisition, type of construction and traffic volumes, it is necessary to evaluate the impact on air quality, noise levels and aesthetics of the facility.

Since noise and air quality are the most critical items in an environmental assessment, an effective Environmental Policy and National Standards must be established and enforced. As an example, the United States Environmental Standards are shown in Table 11-2-2. After these standards are established, design parameters such as number of lanes, median widths, shoulder widths, grade percentages and speed limits can be adjusted to meet them. Governmental and administrative policies can be set as to the allowable automobile pollutant emissions to be accepted. Land use or urban activity must be controlled in the vicinity of any transportation facility.

2. Methods and Control

The Southern Region is presently fortunate to have a clear, clean and quiet environment. It will be the responsibility of the Administrators and Planners not to permit conditions to deteriorate, but to improve instead.

Due to the steepness and general roughness of the terrain in certain areas of the Southern Region, an alternative design criterion must be considered. For example, in the foothill region west of the Asir Range, steep grades exist and heavy truck traffic can be expected, therefore truck "pull-out" lanes should be constructed which would allow free flow of passenger traffic and result in the reduction of congestion and exhaust concentrations. In populated areas such as the village clusters along Route 54 in the Nimas to Abha section of the primary system, vegetative, earth, or man-made barriers can be used aesthetically to control objectionable noises produced by traffic. Many materials and techniques are available for the construction of these barriers, and at a relatively low cost. The right-of-way at intersections where congestion tends to build up should be ample to provide a separation between traffic flow and surrounding developments to reduce the effect of noise and air pollution.

Grade separated interchanges not only increases safety, but reduces congestion,

11-2-7 PHASING AND COST OF RECOMMENDED IMPROVEMENTS

shortens travel time and efficiently transfers traffic from one roadway to another. Two locations of major concern, where grade separations are strongly suggested, are the intersection of Road 54 and 61 near Ad Darb and the approach to the new Abha-Khamis International Airport. It is estimated that by 1995 traffic volumes will be such that grade separations will be warranted at these locations. There are several other locations near urban areas which may warrant grade separations, but they are discussed in the Master Plan for the cities. Aesthetics should always be kept in mind when choosing the final design of grade separations roadway intersections or traffic control devices in general. Pleasing colors, concise messages and wide open right-of-ways contribute greatly to safe and comfortable transportation.

Recommended phasing for construction of the road network is proposed in relation to the urban growth. In order to ensure adequate widths of right-of-ways for the future transportation corridors, it is recommended that right-of-ways be established and purchased as soon as possible. The early purchase of right-of-ways will minimize costs and also will establish minimum building setbacks for future developments. A recommended roadway construction schedule is as follows:

- By 1980 - Construction of a two lane road from Al Qara to Khamis-Mushayt-Butah main road. Construction of a two lane road from Muhayil to Abha - Ab Darb. Construction of an additional two lanes adjacent to the existing two lane road between Abha and Khamis-Mushayt. Reconstruct the first 30 km of road from Abha to Ab Darb.
- By 1985 - Construction of two lane road between Khamis-Mushayt and As Sulayyil, Khamis-Mushayt and Bisha
- By 1995 - Construction of two lane roads between: Bishah and Tathlith Najran and As Sulayyil Muhayil and Shugayg Raghwah and Madha Baysh and Al Juwah

It is estimated that 165 kilometers of new two lane roadways will be needed by the year 1980 and approximately 30 kilometers has to be reconstructed. The total construction cost of the proposed improvements is estimated to be 150 million S.R.

By the year 1985, it is estimated that an additional 540 kilometers of new two lane

roadways will have to be constructed. The total estimated cost is 450 million SR. By the ultimate year 1995, it is estimated that an additional 720 kilometers of new two lane roadways will have to be constructed including one through the mountain range to connect Jizan with Najran and Khamis-Mushayt. It is estimated that the total construction cost will be in excess of 650 million SR. All costs cited are estimated costs based on hypothetical road alignments and an average cost per kilometer excluding cost of right-of-ways.

11-2-8 URBAN VEHICULAR TRAFFIC

In planning for the accommodation of a safe and smooth flow of vehicular traffic and the convenient and efficient parking of automobiles in the major cities, the following should be taken into consideration.

1. Except when absolutely necessary (for example in making a local delivery) trucks larger than 4 tons should be restricted from commercial and residential streets because they would otherwise cause congestion. As can be seen in Table 11-2-3, trucks account for a large share of existing urban traffic. For this reason it is recommended that distribution centers where trucks can be loaded and unloaded be located at the periphery of each major city.
2. High-speed, high-volume, limited access highways should be excluded from built-up residential and commercial areas. The implementation of by-pass or ring roads can be useful for this purpose.
3. While access to commercial and residential streets should not be limited in the same manner as an inter-city highway, the number of driveways, curb cuts and other connections should be controlled. Entering and exiting such streets can be an additional source of congestion. The hierarchical order of the street system should be considered for general guidelines for street parking (see the Appendix, Planning Standards, Table A-2-8 (c)).
4. Interchanges with other streets should be well designed and controlled with traffic lights "Stop" or "Yield Right of Way" signs or other devices. Provision should be made to have policemen direct traffic at major intersections when necessary. See the Appendix, Planning Standards, Fig. A-2-9 (d) and A-2-9 (c) for examples of possible interchanges.
5. Parking areas of appropriate size and location should be provided in accord with established standards (refer to the Planning Standards) as well as the following guidelines.
 - A. Housing - 1 space per household
 - B. Office - 1 space per 30m² floor area
 - C. Commercial - 1-4 spaces per 40m² sales area (see the planning standards section A-2-6 for more details)
 - D. Industrial - 1 space per 5 employees
 - E. Hotel - 1 space per guest room
 - F. Entertainment - 1 space per 10 seats
 - G. Hospital - 1 space per bed
 Multi-level vertical parking garages can be

Table 11-2-2
UNITED STATES FEDERAL EXHAUST EMISSION
STANDARDS & CONTROL LEVELS 1977

TYPE OF VEHICLE	Emission Expressed in Grams Per Kilometer		
	HC	CO	NO _x
Light-duty gasoline Passenger Car	0.94	9.4	1.25
Light-duty diesel Passenger Car	0.94	9.4	1.25
Light-duty gasoline Truck	1.25	12.5	1.9
Light-duty diesel Truck	1.25	12.5	1.9

built for a price of about S.R. 30,000 to S.R. 50,000 per space, which is more economical than at-grade horizontal parking in areas where the land price is S.R. 1,000 to S.R. 2,000 or more per m².

6. As can be seen in Table 11-2-3, business and shopping account for the largest share of parking yet with the exception of some central suq areas, there exist no organized parking lots in the cities. At-curb parking is predominant in the cities, and is a major cause of congestion on narrow streets. It is recommended that that parking lots be constructed behind business and commercial establishments and that the government encourage such off-street parking.
7. Land costs are quite high in the central areas of the major cities (for example S.R. 8,000/m² in Abha and S.R. 5,000/m² in Khamis Mushayt), and multi-story garages should be introduced in these areas to cope with the growing parking demand (see number 5 above). Multi-story garages would cost from S.R. 30,000 to S.R. 50,000 per space for construction whereas in-grade lots could cost over S.R. 200,000 in the case of Abha.
8. At the present time parking lots are simply large paved areas without consideration for design or scale. Good design and landscaping should be introduced to alleviate this problem.
9. If it becomes apparent that a greater number of automobiles are coming into the city centers than can be conveniently accommodated and parked the following measures to control traffic may be considered:
 - (a) Charging for parking or raising the charge if one exists.
 - (b) Establishing a permit system (with a sticker to be affixed to the car) limiting parking (or even travel in extreme cases) to those who have reason to park or travel in a certain area, those without access to public transportation, or those who live too far away to walk.
 - (c) Encouraging car-pooling by offer free or reduced-rate parking to vehicles with three or more riders.

Table 11-2-8
KEY CHARACTERISTICS OF URBAN VEHICULAR TRANSPORTATION

		ABHA	KHAMIS MUSHAYT	BISHAH	NAJRAN	JIZAN
CAR OWNERSHIP						
NO. of CARS/1000 PERSONS		59.4	51.9	50.8	50.8	17.1
TRIP GENERATION						
TRIP/PERSON/DAY		1.90	1.99	2.50	1.92	2.09
TYPES OF CARS OWNED						
	SEDAN	400	520	-	200	120
	WAGON	160	60	20	80	20
	PICK-UPS	200	280	260	120	20
	TRUCK	160	500	40	660	40
	JEEP	380	380	140	380	140
	TOTAL	1300	1740	460	1440	340
MEANS OF TRIP (%)						
	PASSENGER CAR	57.0	33.7	33.3	27.0	31.3
	TAXI-BUS	23.8	51.7	6.7	35.0	39.5
	TRUCK-PICK-UP	13.0	11.1	43.3	24.8	17.4
	MOTORCYCLE & OTHERS	6.2	3.5	17.7	13.2	11.8
TRIP PURPOSE (%)						
	WORK/BUSINESS	40.6	40.6	30.0	32.3	39.9
	SHOPPING	8.7	8.7	15.0	15.4	8.7
	RECREATION	1.4	1.4	1.7	1.8	1.8
	RETURN HOME	47.9	47.9	50.0	44.9	43.3
	OTHERS	1.4	1.4	3.3	5.6	6.3
PURPOSE OF PARKING (%)						
	BUSINESS	28.4	6.9	5.6	13.2	3.9
	LOADING	14.1	21.1	8.3	18.1	16.2
	UNLOADING	8.4	17.1	7.1	11.1	8.8
	RECREATION	6.9	3.5	1.7	0.7	2.3
	SHOPPING	20.2	40.7	44.2	29.8	33.5
	LUNCH/DINNER	5.7	3.8	10.6	15.3	18.1
	OTHERS	16.3	6.9	22.5	11.8	17.2

SOURCE: Existing Conditions Reports, KTU, (URTEC Survey, 1975)

AN

7.1

2.09

20

20

20

40

40

40---

31.3

39.5

17.4

11.8

39.9

8.7

1.8

43.3

6.3

3.9

16.2

8.8

2.3

33.5

18.1

17.2

dbook

12. development plan

12-1 AGRICULTURAL DEVELOPMENT PLAN

12-1-1 POLICY SUMMARY

The National objectives for agriculture are to raise the per capita income and standard of living, to minimize dependence on foreign agricultural products, and to release surplus labor for employment in other sectors. The main national policies for achieving these objectives are:

1. Encouragement of private enterprise in agriculture.
2. Balancing resources between rural and urban areas.
3. Careful use of water resources
4. Self-sufficiency (as much as possible) in production of farm implements and supplies.
5. Encouragement of private enterprise in food processing
6. Encouragement of organizations supporting agriculture
7. Encouragement of foreign agriculture investment
8. Encouragement of private enterprise in agricultural infrastructure
9. Increasing credit for agricultural development
10. Provision by the Government of incentives and subsidies.

The implications of these objectives for the Region include:

1. Assumption of the role of major agricultural producer in the Kingdom, due to favorable water, soil, climatological, and labor conditions.
2. Careful planning to maximize production
3. Improvement of supporting facilities
4. Optimization of cropping patterns
5. Planning for organizational and administrative support.

12-1-2 IRRIGATION PLAN

The irrigation Plan is contained in Tables 12-1-1 through 12-1-3 and in Figures 12-1-1 and 12-1-2. Figure 12-1-1 describes the recommended expansion of different categories of agricultural land in the 20 year period 1975-1995. The most significant element is the land to be irrigated by the construction of new capital facilities, which amounts to 92,600 ha. With the inclusion of land which is irrigated by well, or satisfactorily watered by rainfall or less extensive temporary irrigation facilities, this will produce a total 185,000 ha of land in the Southern Region which is suitable for irrigation. This is equal to nearly two-thirds of all the potentially arable land in the Region.

Table 12-1-1 takes the figure of 92,600 ha which are to be irrigated and breaks it down both by sub-region and by geological category. It shows that the optimal result will be produced by a concentration of irrigation facilities in the coastal plain (40,000 ha) and the foothills (22,400ha) of the Tihama Sub Region with a major secondary concentration in the foothills (10,100 ha) and highlands (8,500) of the Asir Sub-Region.

Figure 12-1-2 demonstrates the recommended demand and distribution of the volume of water projected to be available in 1995. The importance of agriculture in the Southern Region is shown by the fact that 94% of the water usage will be for agricultural purposes, more than fifteen times that required for other uses. Reference is made in the table to the sections of the plan in which detailed information is available. Table 12-1-3 projects these on a series of five-year bases.

12-1-3 CROPPING PATTERN PLAN

The cropping plan is contained in Tables 12-1-4 and 12-1-5. The figures represent target production levels for the optimum utilization of the water and agricultural resources of the Southern Region. These tables have been formulated on the basis of known data as well as on projected changes in the economic return of various crops. In particular, the implicitly recommended cropping pattern was based on the following issues:

1. Carrying capacity of soil and the available amount of arable land. (See Summarized Classification of Region Soils, Southern Region, Existing Conditions, Vol. 1, Sec. 4-1-2.)
2. Improvement in irrigation and production methods. (See Tables 5-2-11, 5-2-13a, and 5-2-13b.)
3. Productivity per hectare of crops for various soils. (See Table 5-2-3.)
4. Net water demand of crops, irrigation cost, and availability of water by sub-region.

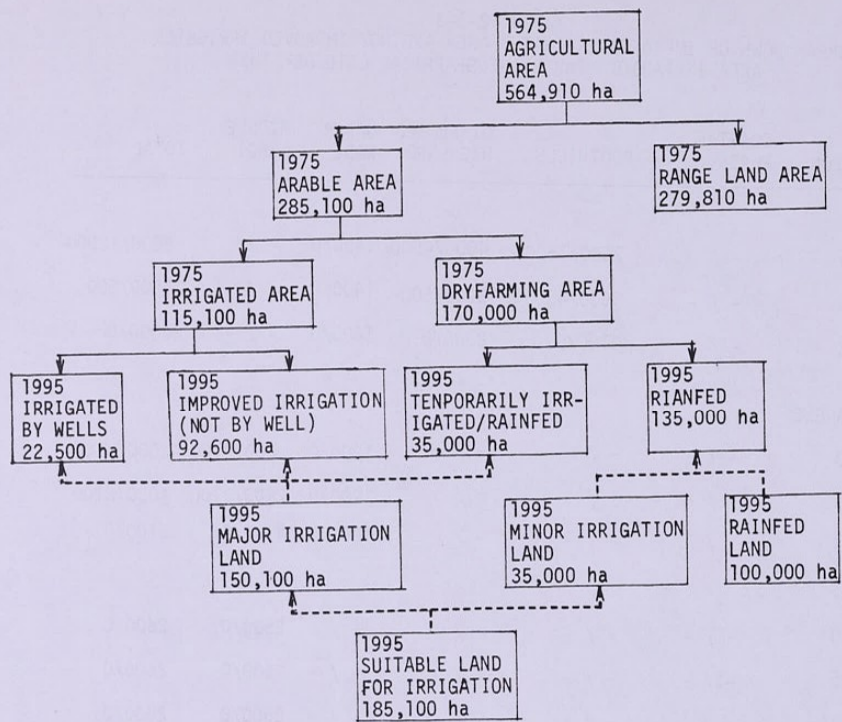


FIGURE 12-1-1
ESTIMATION OF AGRICULTURAL
AREA IN 1975 AND IN 1995

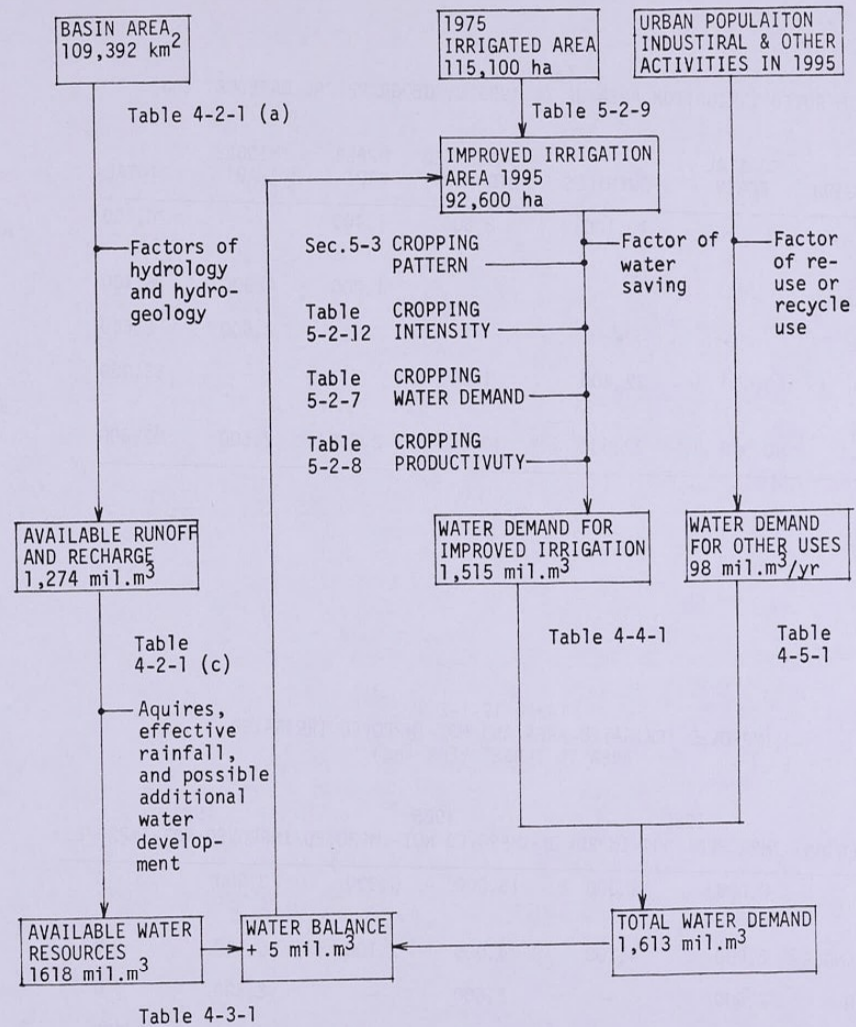


FIGURE 12-1-2
ESTIMATION OF TOTAL IMPROVED
IRRIGATED AREA UP TO 1995,
BASED ON WATER RESOURCES AND
WATER DEMAND

Table 12-1-1
IMPROVED IRRIGATION AREA UP TO 1995 BY GEOGRAPHICAL CATEGORY (ha)

SUB REGION	COASTAL PLAIN	FOOTHILLS	DISSECTED HIGHLAND	UPPER WADI	MIDDLE WADI	TOTAL
ASIR	-	10,100	8,500	1,400	-	20,000
WADI QUADRANGLE	-	-	-	1,200	4,900	6,100
NAJRAN	-	-	-	-	2,600	2,600
TIHAMA	40,000	22,400	1,500	-	-	63,900
REGION (TOTAL)	40,000	32,500	10,000	2,600	7,500	92,600

Table 12-1-2
IMPROVED IRRIGATED AREA AND NOT-IMPROVED IRRIGATED AREA IN TARGET YEAR (ha)

SUB REGION	1980		1985		1995	
	IMPROVED	NOT-IMPROVED	IMPROVED	NOT-IMPROVED	IMPROVED	NOT-IMPROVED
ASIR	8,000	12,000	15,000	5,000	20,000	0
WADI QUADRANGLE	2,000	4,100	4,000	2,100	6,100	0
NAJRAN	2,600	-	2,600	-	2,600	0
TIHAMA	7,000	79,400	37,000	49,400	63,900	22,500
REGION (TOTAL)	19,600	95,500	58,600	56,500	92,600	22,500

Table 12-1-3
BREAK DOWN OF IMPROVED IRRIGATED AREA AND NOT IMPROVED IRRIGATED AREA IN TARGET YEAR BY GEOGRAPHICAL CATEGORY (ha)

SUB-REGION	COASTAL PLAIN	FOOTHILLS	DISSECTED HIGHLAND	UPPER WADI	MIDDLE WADI	TOTAL
ASIR:						
1980	- / -	2600/7500	4000/4500	1400/0	- / -	8000/12000
1985	- / -	5600/4500	8000/500	1400/0	- / -	15000/500
1995	- / -	10100/0	8500/0	1400/0	- / -	20000/0
WADI QUADRANGLE:						
1980	- / -	- / -	- / -	1200/0	800/4100	2000/4100
1985	- / -	- / -	- / -	1200/0	2800/2100	4000/2100
1995	- / -	- / -	- / -	1200/0	4900/0	6100/0
NAJRAN:						
1980	- / -	- / -	- / -	- / -	2600/0	2600/0
1985	- / -	- / -	- / -	- / -	2600/0	2600/0
1995	- / -	- / -	- / -	- / -	2600/0	2600/0
TIHAMA:						
1980	0/62500	550/16900	1500/0	- / -	- / -	7000/79400
1985	18600/43900	16900/5500	1500/0	- / -	- / -	37000/49400
1995	40000/22500	22400/0	1500/0	- / -	- / -	63900/22500

NOTE: Improved Area/Not Improved Area

Crop
Sorghu
Wheat
Sesame
Cotton
Vegeta
Alfal
ates
Fruit
Groun
TOTAL
NOTE

Table 12-1-4
VOLUME AND VALUE OF SELECTED CULTIVATED CROPS
WITH IMPROVED IRRIGATION IN SOUTHERN REGION
(1995 PROJECTED)
(SR IN 1975 VALUE)

Crop	Gross Volume (Metric Tons)	Gross Value (SR x 1,000)	Net Value (SR x 1,000)	Distribution of Value
Sorghum	180,000	90,000	67,500	18.6%
Wheat	20,000	13,000	9,000	2.5
Sesame	20,000	22,000	16,500	4.6
Cotton	63,000	50,000	37,900	10.3
Vegetables	360,000	126,000	94,500	26.1
Alfalfa	440,000	15,000	11,250	3.1
Dates	12,000	7,000	5,250	1.5
Fruits	200,000	130,000	97,500	27.0
Groundnuts	50,000	30,000	22,500	6.2
TOTAL	1,345,000	480,000	361,500	100.0%

NOTE: Net volume cannot be determined, since it is a function of the efficiency and effectiveness of the methods of harvesting and processing. These, in turn, are largely a function of the volume of investment in modern equipment, worker training, and related elements. In some instances, it will be possible to increase net volume by "double usage"; for example, the stems, leaves, and roots of vegetables grown for human consumption may be utilized as animal fodder.

Net value is considered to be 75% of gross value in this instance.

Table 12-1-5
VOLUME AND VALUE OF SELECTED CULTIVATED CROPS USING
DRY FARMING METHOD IN SOUTHERN REGION
(1995 PROJECTED)
(SR IN 1975 VALUE)

Crop	Gross Volume (Metric Tons)	Gross Value (SR x 1,000)	Net Value (SR x 1,000)	Distribution of Value
Sorghum	120,000	60,000	47,000	22.7%
Millet	50,000	25,000	19,750	9.5
Wheat	10,000	6,000	4,740	2.3
Sesame	10,000	11,000	8,690	4.2
Cotton	30,000	24,500	19,355	9.3
Vegetables	10,000	3,500	2,765	1.3
Fodder	300,000	105,000	82,950	40.1
Fruits	40,000	26,000	20,540	9.9
Dates	3,000	1,800	1,422	0.7
TOTAL	573,000	262,800	207,612	100.0%

NOTE: See note in preceding table concerning calculation of net volume of crops.

Net value is considered to be 79% of gross value in this instance.

Table 12-1-6
AGGREGATE PRODUCTION VALUE (SR x 1,000) AND DEMAND FOR WORKERS
BY SUB-REGION, IRRIGATION IMPROVEMENT, AND YEAR
(SR IN 1975 VALUE)

Sub-Region	Existing Conditions	1980		1985		1995	
		Improved	Not Improved	Improved	Not Improved	Improved	Not Improved
ASIR							
Production Value	30,500	34,360	9,000	45,260	6,300	79,460	--
(Total)		(43,360)		(51,560)		(79,460)	
Workers (Total)	12,050	8,515	10,650	15,715	2,600	20,715	--
		(19,165)		(18,315)		(20,715)	
WADI QUADRANGLE							
Production Value	13,910	9,640	9,430	19,040	4,830	28,410	--
(Total)		(19,070)		(23,870)		(28,910)	
Workers (Total)	4,575	2,450	3,075	4,900	1,575	7,473	--
		(5,525)		(6,475)		(7,473)	
NAJHRAN							
Production Value	5,980	12,220	--	12,220	--	12,220	--
(Total)		(12,220)		(12,220)		(12,220)	
Workers (Total)	1,950	3,185	--	3,185	--	3,185	--
		((3,185))		((3,185))		((3,185))	
TIHAMA							
Production Value	85,830	26,000	76,530	140,300	46,110	245,150	20,250
(Total)		(102,530)		(186,410)		(265,400)	
Workers (Total)	43,500	8,238	39,700	31,503	24,700	47,703	11,250
		(47,438)		(56,203)		(58,953)	
REGION							
Production Value	136,220	82,220	94,960	216,820	57,240	365,740	20,250
(Total)		(177,180)		(274,060)		(385,990)	
Workers (Total)	62,075	22,388	53,425	55,303	28,875	79,076	11,250
		(75,813)		(84,178)		(90,326)	

Table 12-1-7
PRODUCTION VALUE (SR x 1,000) AND WORK DEMAND FOR DRYFARMING
(SR IN 1975 VALUE)

Sub-Region	1975	1980	1985	1995
ASIR				
Production Value	54,200	59,620	65,040	70,460
Workers	19,300	21,230	23,160	27,020
WADI QUADRANGLE				
Production Value	3,000	3,300	3,600	3,750
Workers	1,050	1,150	1,260	1,470
NAJHRAN				
Production Value	2,000	2,200	2,600	2,700
Workers	700	770	840	980
TIHAMA				
Production Value	96,000	115,200	124,850	134,400
Workers	20,270	22,297	24,324	28,378
REGION				
Production Value	155,200	180,320	196,000	211,310
Workers	41,320	45,447	49,584	57,848

Table 12-1-8
RATE OF GROWTH OF VALUE OF AGRICULTURAL PRODUCTS
(SR x 1,000 IN 1975 VALUE)

Sub-Region	1975	1980	1985	1995	GROWTH RATIO (ANNUAL GROWTH)
ASIR					
Products Value	109,700	137,480	184,400	228,370	
Growth Rate		5%	6.8%	2.4%	2.08 (5.5%)
WADI QUADRANGLE					
Products Value	24,310	34,670	48,220	55,960	
Growth Rate		8.6%	7.8%	1.6%	2.30 (6.8%)
NAJHRAN					
Products Value	10,980	14,470	25,420	30,570	
Growth Rate		16.4%	5.4%	2.0%	2.78 (9%)
TIHAMA					
Products Value	210,217	259,274	394,383	496,242	
Growth Rate		4.0%	14%	2.6%	2.36 (6.8%)
REGION					
Products Value	355,207	451,394	652,423	811,142	
Growth Rate		5.4%	9%	2.4%	2.28 (6.4%)

5. Growing seasons and possibility for double cropping.
6. Mix of crops for maximum economic return.
7. Analysis by sub-region.

In analyzing the data shown in Tables 12-1-4 and 12-1-5, it is of particular significance that by 1995, more than 53% of the value of crops produced in the irrigated sections of the Southern Region will be fruits and vegetables. These are important both because they are of high value and also because they are predominantly for human consumption. In the dry farming sections, on the other hand, only about 11% of the value of the crops can be used for such highly desirable and producing purposes. This emphasizes further the desirability of developing irrigation facilities wherever possible.

12-1-4 DEMAND FOR AGRICULTURAL WORKERS

The plan for allocation of agricultural manpower is shown in Tables 12-1-6 through 12-1-9. On the basis of target production levels and improvement in irrigation and production methodology, future demand for workers in the agricultural sector have been estimated. It is evident, especially in irrigated farming, that increased production will require involvement of larger numbers of agricultural labor, although productivity of individual workers is also projected to rise. Thus, to the extent that the national development objectives call for increased agricultural workers to other sectors of the economy, there is a potential conflict in policy. This conflict can be resolved only by large-scale introduction of agricultural machinery and modernization of the agricultural sector in general. It is estimated that up to one-third of the total agricultural worker demand of 177,084 in 1995 may be released by appropriate mechanization. (For a further discussion of agricultural machinery, see Sec. 7-3-2.)

Table 12-1-6 points out the value of crops produced and the demand for agricultural workers as a function of the sub-region, improvement of irrigation, and time. Table 12-1-7 shows the value of crops produced and the demand for agricultural workers in the dry farming areas. Table 12-1-8 demonstrates the absolute rate of growth of agricultural products and Table 12-1-9 does so on a worker basis.

Table 12-1-9
GROWTH RATIO OF AGRICULTURAL
PRODUCTION VALUE PER WORKER

SUB-REGION	1975	1980	1985	1995
ASIR:				
PRODUCTION VALUE (A)*	109,700	137,480	184,400	228,370
WORKERS (B)	36,150	45,675	47,235	54,455
A/B*	3.00	3.00	3.90	4.19
GROWTH RATIO	100	100	129	138
WADI QUADRANGLE:				
PRODUCTION VALUE (A)	24,310	34,670	48,220	55,960
WORKERS (B)	6,625	7,775	8,935	10,343
A/B	3.67	4.46	5.40	5.41
GROWTH RATIO	100	122	147	147
NAJRAN:				
PRODUCTION VALUE (A)	10,980	19,970	25,420	30,570
WORKERS (B)	3,300	4,670	4,805	5,075
A/B	3.33	4.28	5.29	6.02
GROWTH RATIO	100	128	159	180
TIHAMA:				
PRODUCTION VALUE (A)	210,217	259,274	394,383	496,242
WORKERS (B)	77,970	42,950	97,567	107,211
A/A	2.70	2.79	4.04	4.63
GROWTH RATIO	100	103	149	171
REGION				
PRODUCTION VALUE (A)	355,207	451,394	652,423	811,142
WORKERS (B)	124,045	151,070	158,542	177,084
A/B	2.86	2.99	4.12	4.58
GROWTH RATIO	100	105	144	160

NOTE: * x 10³ Saudi Rials

12-2 LIVESTOCK AND FISHERY
DEVELOPMENT PLAN

12-2-1 POLICY SUMMARY

Because livestock and fisheries are a sub-element of general agricultural development, the same national objectives and regional policies listed in Section 12-1-1 apply here.

The implication of these policies and objectives for livestock development are as follows:

1. Improvement of pasturage and feeding methods.
2. Improvement of native rangelands.
3. Development of improved methods of slaughtering, processing, cold storage, and distribution.
4. Maximizing economy and output by using by-products such as oilseed cake and vegetable stems and roots.
5. Improvement of breeding stock.

For fisheries, the implications are the following:

1. Organization of the fishing trade into cooperatives or similar groups to provide a base for development of the industry.
2. Government incentives and subsidies for the purchase of a more modern fleet, particularly large boats that can go out farther and remain out longer.
3. Updating of equipment and techniques.
4. Development of markets.
5. Development of processing and transport systems.

12-2-2 LIVESTOCK DEVELOPMENT PLAN

The plan for livestock development is shown in Tables 12-2-1, 12-2-2 and 12-2-3 and Figures 12-2-1 and 12-2-2.

Table 12-2-1 describes the volume and value of livestock to be produced in 1995. The figures given indicate that the volume of such products should be nearly double that of 1975 levels, and their value should be in excess of twice that of 1975. It also indicates significant levels of production of poultry meat and eggs whose 1975 levels are negligible. (See Table 6-2-1)

Table 12-2-2 demonstrates the level of animal food production which must be established in order to support the levels discussed above.

Table 12-2-1
1995 LEVELS OF LIVESTOCK PRODUCTION

Commodity	Volume (Tons)	Value (SR X1000) SR in 1975 Value
Beef/Veal	40,000	20,000
Mutton, Lamb and Goat	78,600	55,000
Poultry	40,000	20,000
Milk	75,000	15,000
Eggs	10,000	20,000

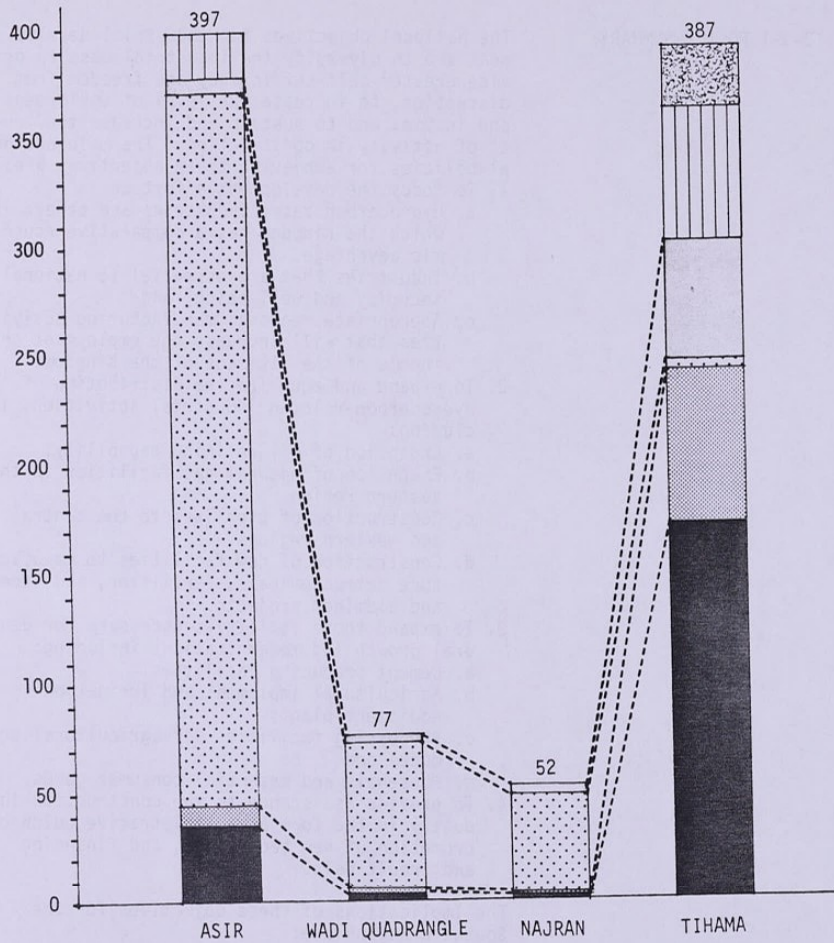
Table 12-2-2
PRODUCTION OF ANIMAL FEED
IN 1995 (1000 tons)

	Straw and Stalks (Irrig- ated)	Straw and Stalks (Dry Farm- ing)	Alfalfa	Vege- table By- Pro- Ducts	Sorghum Grain	Cotton seed Cake	TOTAL
ASIR	35	10	325	7	20	--	397
WADI QUADRANGLE	3	2	67	5	--	--	77
NAJRAN	2	1	45	4	--	--	52
TIHAMA	170	70	3	56	60	28	387
TOTAL	210	83	440	72	80	28	913

Table 12-2-3
CURRENT LEVELS OF
LIVESTOCK PRODUCTION
(tons/yr)

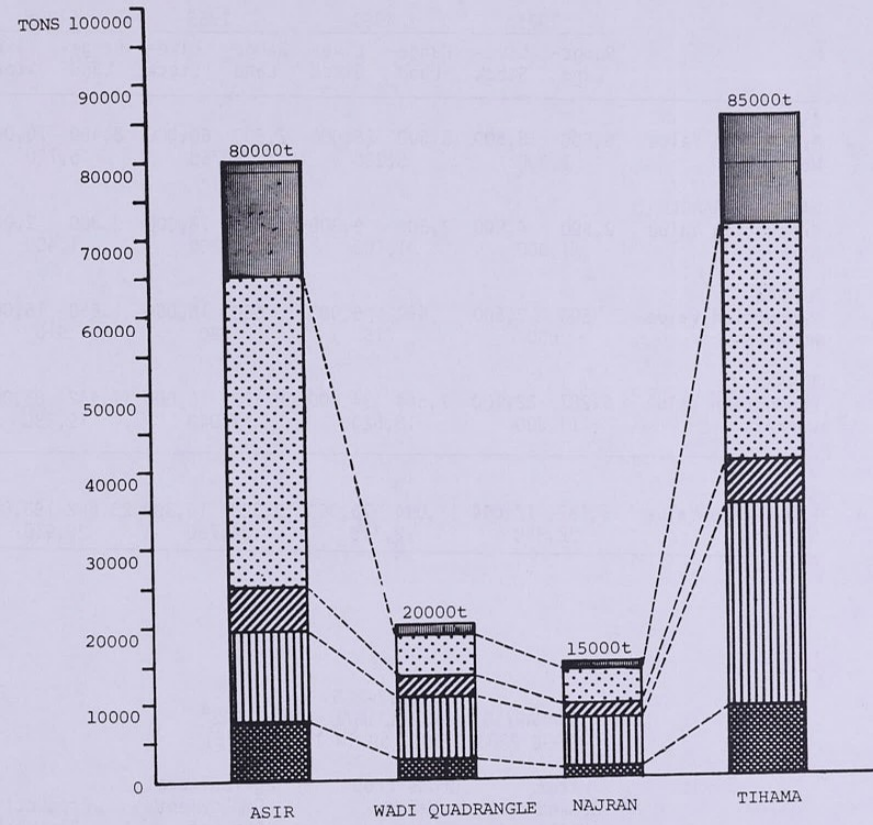
	Beef/Veal	Mutton	Milk	Poultry	Eggs	Total
Asir	7,500	12,000	5,500	40,000	15,000	80,000
Wadi Quadrangle	2,500	8,000	2,500	6,000	1,000	20,000
Najran	1,200	6,500	1,500	5,000	800	15,000
Tihama	8,800	28,500	5,500	29,000	13,200	85,000
Total	20,000	55,000	15,000	80,000	30,000	200,000

Source: ILACO updated by URTEC study.



- Straw and Stalks(Irrigated)
- Straw and Stalks(Dryfarming)
- Alfalfa
- Vegetable By-Products
- Sorghum Grain
- Cottonseed Cake

FIGURE 12-2-1
PRODUCTION OF
ANIMAL FEED
IN 1995
(1000 tons)



- eggs
- poultry
- milk
- mutton
- beef/veal

FIGURE 12-2-2
CURRENT LEVELS
OF LIVESTOCK
PRODUCTION

Table 12-2-4
PRODUCTION VALUE AND WORKER DEMAND FOR RANGELAND AND LIVESTOCK
(SR x 1,000) (SR IN 1975 VALUE)

	1975		1980		1985		1995	
	Range- Land	Live- Stock	Range- Land	Live- Stock	Range- Land	Live- Stock	Range- Land	Live- Stock
ASIR								
Production Value	6,500	18,500	6,500	28,000	7,800	60,000	8,450	70,000
Workers		1,900		5,280		5,760		6,720
WADI QUADRANGLE								
Production Value	2,500	4,900	2,500	9,800	2,750	18,000	3,300	2,000
Workers		1,000		1,100		1,200		1,400
NAJHRAN								
Production Value	500	2,500	550	5,000	600	10,000	650	15,000
Workers		650		715		780		910
TIHAMA								
Production Value	6,287	22,100	7,544	34,000	8,173	75,000	11,442	85,000
Workers		14,200		15,620		17,040		19,880
REGION								
Production Value	15,787	17,094	17,094	76,800	19,323	16,300	23,842	180,000
Workers		22,860		22,715		24,780		28,910

Table 12-2-5
SUMMARY OF AGRICULTURAL PARAMETERS^a
(1995 PROJECTED) (SR IN 1975 VALUE)

Sub-Region	Water Demand ^b (Million m ³ /yr)	Gross Crop Value (Thousand SR)	Agricultural Employment (No. of Workers)	Productivity Per Worker (SR)
Asir	328.8	228,370	54,455	4,190
Wadi Quadrangle	132.0	55,960	10,343	5,410
Najran	58.2	30,570	5,075	6,020
Tihama	995.7	496,242	107,211	4,630
Total	1,514.7	811,142	177,084	4,580 (Mean)

Notes:

- Sum of irrigated farming, dry farming, rangeland, and livestock.
- Demand for irrigation water only.

12-3 INDUSTRIAL DEVELOPMENT PLAN

12-3-1 POLICY SUMMARY

The National objectives for industrial development are to diversify the industrial base to provide greater self-sufficiency and freedom from disruption, to increase the level of employment and income, and to sustain and increase the level of activity in construction. The main national policies for achieving these objectives are:

- To focus the development effort on:
 - Hydrocarbon based industries and others in which the Kingdom has a comparative economic advantage.
 - Industries that are essential to national security and well-being, and
 - Appropriate regional manufacturing activities that will increase the employment and income of the citizens of the Kingdom.
- To expand and equalize the distribution of hydrocarbon-related industrial activities, including:
 - Expansion of oil refining capability.
 - Expansion of natural gas facilities in the eastern region.
 - Construction of pipelines to the central and western regions.
 - Construction of new facilities to manufacture petrochemicals, fertilizer, and steel and aluminum projects.
- To expand those facilities necessary for general growth and modernization, including:
 - Cement producing facilities.
 - Agricultural implement and irrigation equipment plants.
 - Processing facilities for agricultural products and
 - Household and essential consumer goods.
- To provide assistance to the construction industry in the form of administrative guidance, promotion of new technology, and financing and credit help.

The Implications of these objectives for the Southern Region are:

- To undertake efforts to process and store hydrocarbon resources (from other parts of the Kingdom) and to use them as raw materials for manufacturing.
- To expand cement production as extensively as possible, perhaps as much as ten-fold.
- To concentrate industrial development efforts on agro-industry, such as:
 - Date production and packing in Bishah and Najran.
 - Vegetable oil extraction

Table 12-3-1
INDUSTRIAL LAND USE (INDUSTRIAL PARK) REQUIREMENTS (ha)

	1975	1980	1985	1995
Abha	0	28	41	72
Khamis Mushayt	0	15	30	50
Jizan	(Cannot be determined until relocation is established)			
Nairan	0	5	30	30
Bisha	0	5	30	30

See City Master Plan Reports.

Table 12-3-2
INDUSTRIAL MANPOWER IN 1995

	Population**	Industrial Labor Force
Abha	91,500	2910
Khamis-Mushayt	85,000	2510
Jizan*	58,000	1856
Najran	75,000	1755
Bishah	28,000	720

Note: * Does not include any effect of relocation.

** 5% Survey Area only.

12-3-2 INDUSTRY DEVELOPMENT PLAN

- c. Slaughtering and meatpacking.
- d. Cotton farming near Jizan.
5. To explore possibilities for manufacturing tractors and other farm implements and machinery.
6. Expansion of established industrial activities, such as cement block making.

The Industrial Land Development Plan is shown in Table 12-3-1.

As has been discussed, a main function of industrial land use planning is to establish the industrial park concept. This will institute a gradual relocation of industrial facilities from scattered sites to a central location, as determined by the city plans, except for those limited operations whose location is determined by their use (e.g. gasoline and auto repair stations). With the exception of very heavy industry (See Section 7-2-6), Industrial sites will be a part of the urban area, although not in the central part of the city.

The figures listed in Table 12-3-1 represent increases by as much as twenty times existing levels, but will be accompanied by a reduction in the amount of land elsewhere used for industrial purposes.

12-3-3 INDUSTRIAL MANPOWER

Employment levels in industry are not possible to establish with accuracy; however, Table 12-3-2 provides an approximation based upon (a) the existing number of males in the working age group, 15-59, and (b) an assumption that the mean percentage of employment in the secondary sector in 1995 will be 12%.

12-4 COMMERCIAL AND SERVICE INDUSTRY PLAN

12-4-1 POLICY SUMMARY

The National objectives for commercial and service industries are to provide effective support for the social and economic development activities of the Kingdom (with the expectation that the domestic product of the commercial sector will double in five years) and to do so with maximum efficiency and uniformity of quality at a reasonable aggregate and per capita cost.

The main national policies for achieving this are promotion of sound business practices in such areas as accounting, inventory, and personnel, encouragement of greater intra-national and intraregional trade, and expansion of the availability of credit through public and private financial institutions.

12-4-2 COMMERCIAL AND SERVICE EMPLOYMENT PLAN

The commercial and Service Employment Plan is shown in Table 12-4-1.

In times of rapid economic development, it is a general rule that employment in the commercial and service sector grows at a rate even faster than the mean rate. Table 12-4-1 demonstrates how this is so. In the 20-year period covered by the plan, both the absolute numbers of such workers and their share of the workforce will grow in every city. In some cases, this will be quite dramatic-Bishah, for example, will see a more than ten-fold increase in the number of persons employed in commerce and services, and this will represent more than a doubling of the percentage of the labor force which they comprise.

12-4-3 COMMERCIAL AND SERVICE INDUSTRY LAND PLAN

The commercial and service industry land plan is shown in Table 12-4-2.

The plan reflects the experience of other countries (and other parts of the Kingdom of Saudi Arabia which are commercially more advanced) in that floor space devoted to this use decreases on a per capita basis, due to more intense and sophisticated use. For this reason, the absolute amount of commercial floor space does not expand at the dramatic rate at which, say, the employment rate does. The exception to this is when a city and its sub-region expand to the point that a higher order of commercial facility is required, as in Najran in 1995. Refer to Section 8-2-2.

Table 12-4-1
NUMBER OF WORKERS IN COMMERCE & SERVICE
(PERCENTAGE OF TOTAL WORKFORCE)

	1975	1980	1985	1995
Abha	715(11.0%)	1429(15.2%)	2546(19.0%)	5149(19.0%)
Khamis-Mushayt	1300(20.9%)	2850(31.9%)	4850(38.3%)	9550(38.3%)
Najran	761(18.6%)	1278(22.4%)	1944(25.2%)	3444(25.1%)
Jizan	767(17.5%)	1083(19.0%)	1294(18.2%)	2211(19.4%)
Bishah	350(17.9%)	760(28.7%)	1370(37.3%)	2800(38.9%)

Note: In 5% Survey area.

Table 12-4-2
COMMERCIAL AND SERVICE FLOOR AREA IN m² (LAND AREA IN ha)

	1975	1980	1985	1995
Abha	15,855(11.4)	20,895(14.9)	27,563(19.7)	48,038(34.4)
Khamis-Mushayt	27,400(17.8)	34,600(22.6)	43,750(28.7)	71,000(46.8)
Najran	6,900(8.8)	23,100(16.5)	27,300(19.5)	50,500(33.7)*
Jizan	15,540(11.2)	18,200(13.0)	21,000(15.0)	28,700(20.5)
Bishah**				

Note:* Includes regional shopping center as of 1995

**Because Bishah is substantially smaller than the other cities, (its commercial workforce is only about one-quarter of that of Khamis-Mushayt, for example) the same planning methodology cannot be applied. Refer to city plan.

12-5-1 POLICY SUMMARY

The National objectives for social development are to improve the standard of living for all citizens of the Kingdom and to do so in a comprehensive and uniform manner, both by extending special services to the rural and bedouin people who have not had access to them before and to encourage settlement of nomadic people so that they may better be served and contribute. These objectives are to be accomplished by action in four basic areas:

1. Manpower and employment
2. Education and training
3. Health care
4. Bedouin settlement

Because these areas are all interrelated, the plan calls for the concept of a social service delivery system. For the purposes of making clear the issues related to each area, however, the policies are discussed independently. In light of the general National objectives for social development stated above, the specific objectives to each area and the policies for achieving them are as follows:

Among the objectives for labor-related development are:

1. To increase the mean productivity of labor.
2. To increase the participation of Saudis in the labor force.
3. To supplement the labor force with foreign workers only as necessary, attracting labor from abroad but not allowing wholesale take-over of any sector by them.
4. To provide job-related education and training and the pre-career and in-service levels.

The key policies of these objectives are:

1. To increase productivity by training and educational programs.
2. To increase the number of Saudis in the labor force by improving working and remuneration standards.
3. To adopt whatever measures are necessary to attract and retain appropriate outside labor.
4. To develop further the system of job-related training programs.
5. To continue and expand training abroad.

The following are top priorities in educational development:

1. Boys' education: To ensure the availability of a high quality education, at least through elementary and intermediate level, and beyond if

the individuals' wishes and abilities and national need so indicate.

2. Girls' education: To ensure a high quality program at all levels of education, with at least 100% enrollment at the elementary level, 100% enrollment at the intermediate level, and 30% at the secondary level.
3. Higher education: To establish internationally distinguished programs at the University of Riyadh, King Abdul Aziz University, and the University of Petroleum and Mining; to emphasize technical training that will assist in meeting national needs; to provide a series of Regional Polytechnical Institutes.
4. Religious education: To make Islamic University into an international center for Islamic studies; to develop Imam Mohammed Ibn Saud Islamic Studies.
5. General. To engage in a vigorous program to meet the Kingdom's educational needs, emphasizing teacher training, industrial education (with at least 1600 graduates per year by 1980) agricultural education, and programs for the blind, deaf, and mentally retarded; to establish a network of adult education and in-service training centers.

The national objectives in health care field are to provide the Kingdom with a comprehensive system of preventive health services through the following steps:

1. To increase the number of modern hospital beds so that by 1980 the standard of 2.5 beds per 100 population will be met.
2. To increase the number of clinics, dispensaries, and other subordinate facilities so that such services are convenient to all sectors of the population.
3. To increase the number of supportive facilities so that it is not necessary for patients to be hospitalized unless there is a real need.
4. To strengthen the system of on-going primary health care and preventive services.
5. To establish a program of nutritional education, with governmental provision of supplements as necessary.
6. To improve public health supportive systems, such as sanitation, inoculation, and other means of disease control.
7. To increase the number of physicians to a ratio of 1 per 2000 population by 1980.
8. To establish health education programs.
9. To establish a health administrative system with primary responsibility at the local level.

The facilities necessary to accomplish the objectives include the following:

1. General hospitals of varying sizes, located in urban communities and offering both preventive and curative health services.
2. Specialized hospitals, located in the major cities of the Kingdom.
3. Dispensaries, staffed by physicians and providing both preventive and curative services, which communities of 10,000-15,000 (type 'A') and 5,000-10,000 (type 'B'), and 40,000 (district dispensaries).
4. Health centers providing, under the jurisdiction of a dispensary, both preventive and curative services, and serving the smallest communities.
5. District dispensaries (polyclinics), located in major towns and each providing both preventive and curative services to a population of 40,000.
6. Specialized facilities, providing services such as bilharzia and malaria control, chest disease clinics, and mother and child health centers.
7. Support services, including regional laboratories, equipment and supply warehouses, and engineering departments (one proposed at Abha).
8. Health offices, responsible for organizing the collection of vital statistics and providing guidance on preventive health services.
9. Mobile health services, to cover nomadic and other persons scattered in small villages.

The following summarize the conditions of nomadic life at the present time.

1. It is estimated that there are approximately 635,000 nomadic persons in the Kingdom, about 10% of the population. In the Southern Region, there are some 262,100 nomads, a mean of about 25% of the population. This figure is higher in Asir, Wadi Quadrangle, and Najran subregion, and lower in Tihama.
2. The economic life of nomadic people is tenuous, with little more than subsistence likely to be attained. Food is provided on an ongoing basis, with no ability to provide for the future. In times of drought, as has occurred during the past decade, land is often overgrazed and permanently damaged.
3. Settling is occurring but at the relatively low rate of about 20% per year.

While settlement is seen as inevitable, the Government should undertake to improve the living conditions in the meantime. Such steps include:

1. Grazing and rangeland control program.
2. Agricultural support programs such as:
 - a. Livestock improvement
 - b. Animal health protection

c. Training

3. Access to improved or irrigated land for final livestock fattening.
4. Assistance information of production and marketing cooperatives.
5. Support in provision of supplies (such as fuel to alleviate the need to cut trees and deteriorate rangelands).

The following have been identified as priority projects:

1. Provision of health centers.
2. Mobile health and hospital facilities.
3. Schools, such as boarding schools around population or marketing centers.
4. Special in-service training programs, including radio programs, in-service training, and other activities oriented toward adults.
5. Systematic assurance of Bedouin participation in social and welfare programs.
6. Media and information services to provide data relevant to pasture conditions, market prices, and related items, and to alleviate the isolation.

12-5-2 SOCIAL SERVICE DELIVERY SYSTEM PLAN

The concept of a social service delivery system has been developed for the purpose of establishing a clearly defined, effective, and uniform mechanism for meeting the needs of the population in such areas as health, education, and other aspects of life. Many elements can be included, depending on the particular situation. In some cases, the needs may be long-term, such as educating children over a period of years. In other cases, they may be short-term and very urgent, such as providing medical assistance to someone injured in an accident or finding a temporary home for a family whose residence was lost in a fire or flood. In some instances, the delivery of such services is not difficult. If someone lives in an urban area, they can probably walk to school, walk or be carried to an infirmary if hurt, or stay with relatives if left homeless. But since 92% of the population of the southern region is rural or nomadic, it is generally a problem to provide modern education, health, and removed from the facilities. It is obviously important that all people be given the right to receive such assistance, but even with a high rate of general development, it will likely be many years before a majority can conveniently be served by a fixed system of service delivery. Consequently, it will be necessary to establish a system of providing these services where the people are. This should be done in a manner that interferes as little as possible with tradition

and customs. The system of providing health, educational, and other services must be flexible and mobile, at least until a greater degree of permanent settlement is achieved.

As applied to the respective areas of social development, the following are among the particular issues addressed by the Social Service Delivery Plan.

Manpower and Employment:

1. Foreigners make up nearly one-third of the city workers in the Southern Region (21% Yemenis, 11.6% other, 32.6% total non-Saudi); this is in comparison with an average of 20% in other regions of the country.
2. It is estimated that more than half of the potential indigenous labor force now moves out of the southern region, largely to obtain better educational opportunities or better jobs.
3. It is important that the job training system include agricultural training, both pre-service and in-service. This will be difficult due to the low population densities and remoteness of the rural agricultural areas.
4. Due to the rapid rate of growth it is expected that the government sector will be the most rapidly growing (15.9% annually, compared with 7.9% for the entire labor force). Already 50.8% of the total personal income in the area comes from the Government. This is acceptable for the present, but private sector growth must be established for the long-term economic health of the region.

Thus the objectives should include:

1. Stabilizing and regularizing in-migration by means of a nationally-established policy.
2. Stabilizing migration by residents of the Southern Region within the Kingdom, by establishing a system to lessen wage disparities via subsidies and grants.
3. Improving educational facilities
4. Encouraging private sector growth.

Education and Training

1. The initial problem that must be overcome is reaching the school age population. This is difficult in the Southern Region because of the remoteness of the area, the highly dispersed population with relatively few areas of substantial density. No single action can overcome this, although it is clear that the school system must be sufficiently flexible and mobile to reach their clients.

2. Education plays a major part in other aspects of regional development. For example:
 - a. Seeking of better education by an individual or for his family is a major cause of out-migration.
 - b. Education is a fundamental part of a variety of social services that are to be developed, such as health care.
 - c. Education will be necessary for the operation of various high-level industrial, commercial, and agricultural activities.
3. Educational investment must take the form of both human and physical resources, and care must be exercised in development. It may be necessary to have mobile school facilities which can be transported along with nomadic peoples until settlement takes place. Other innovations may be required as well.
4. Educational policy will have a profound effect in stabilizing the population, stemming the flow of out-migration of skilled workers, and attracting skilled labor from outside the region. Careful attention must be paid in planning to maximize these objectives.

Health Care

1. It is important that the system of health care be integrated with other social systems, and that facilities of each type be associated at each level of the hierarchy.
2. It is important that the health system reach the constituents, and that health care be provided to areas of remoteness, low density, and mobile population.
3. Health planning must be undertaken at an early stage so that sites can be obtained and facilities be developed in appropriate locations.

Bedouin Settlement

It is a natural phenomenon that nomadic people should take advantage of opportunities to settle. It is difficult for them to participate fully in the national benefits without an essentially permanent location. Yet, the traditions, customs, and social structure of the Bedouin people that have developed over the centuries must be treated with sensitivity and respect. Particular attention must be paid to the special needs of the nomads as they are settled.

A system of Bedouin welfare services can be developed around the following concepts:

1. Education, health and welfare extension service (or "caravan").

2. A "port of entry" establishment in villages and towns to assist in marketing activities, education of children, and the settlement process.
3. A system of remote contact points at convenient locations.

The first assists in providing the basic human needs of the nomads; the second provides an initial contact with a settled form of living; the third provides certain amenities and necessities, such as food products that cannot otherwise be obtained.

It appears likely that the Southern Region will have a high degree of activity associated with nomadic programs. This is because:

1. It is a national policy to encourage and assist the settlement of nomads.
2. It is in the best material interests of the nomads themselves to settle.
3. The region contains a large area traditionally occupied by nomads, and a higher-than-average percentage of nomads in the regional population.
4. The likely future of the Southern Region will include development of agriculture, an element with which nomadic people are more familiar than, say, mining, refining, or manufacturing.

It is thus necessary that attention be paid in planning to the settlement process.

13. development administration

RECOMMENDATION FOR
IMPLEMENTATION OF
PROGRAMS AND PLANS

Based on the recommendations presented in the earlier sections of this report, implementation programmes should be formulated. First priority should be placed to the administration of the on-going investment works and the preparation of urgent projects.

In particular, the administration of regional and municipal planning requires massive inputs.

The organizational changes recommended for the Regional Planning Office at Abha are summarized as follows:

1. To add the following three sections:
 - a. Building and Architecture Section
 - b. Conservation and Preservation Section, and
 - c. Legal and Administrative Section.
2. To establish two coordinating bodies:
 - a. Regional Planning Committee
 - b. Regional Planning Council.

Such expansion of activities and the expanding work loads of the office requires an additional planning expert who would technically advise the chief of the office on a long-term basis. He should have a long experience in planning administration and will be assigned to the following tasks:

1. Supervision of consultants who are or will be undertaking investment, administrative and legal studies related to regional and urban development, and
2. Preparation of the establishment of the proposed new sections in the Regional Planning Office and provision of guidance upon establishment.

Another recommendation concerns the flexibility in planning. As external and internal conditions vary over time frequently causing developments in unexpected directions and degrees, constant modification of development projects and programmes are strongly needed. Such monitoring and evaluation of development should be undertaken constantly. It is recommended that an expatriate expert be recruited for this task.

ORGANIZATION AND
ADMINISTRATION

When the planning studies currently under way are completed, the whole of Saudi Arabia will be covered by physical development plans approved by the Ministry of Municipal and Rural Affairs and socio-economic plans approved by the Ministry of Planning. The existence of these plans cannot alone ensure the balanced growth and orderly development of the various regions. The effectiveness of regional planning depends to a large extent on the establishment of a suitable administrative struc-

ture to carry out these plans. In turn, the organization and functions of a regional agency will depend on the overall planning system that is to be applied.

Without altering the overriding importance of national planning and the dominant role of central agencies, some loosening of the over-centralization could occur through decentralization of some activities to the regional and local levels. Technical expertise and qualifications found in the General Department of Town Planning must be channeled to perform those functions truly compatible with its role as "a national advisory, consultation, and liaison center." However, if it is to discharge these vital responsibilities, administrative procedures should not be allowed to tie up invaluable manpower resources in extensive bureaucratic red tape.

Details of implementation and specific problems of individual municipalities can be transferred to lower level regional and local planning agencies.

13-2-1 THE NATIONAL LEVEL

There is considerable awareness at the national level that physical planning is a key element in the overall development of the country, and that it should be related to socioeconomic goals and objectives. Undoubtedly, this coordination must occur first and foremost at the national level. Inasmuch as development in one area affects growth patterns elsewhere, regions and component municipalities and villages cannot be studied and treated in isolation from the nation as a whole or from one another as closed systems. Despite strong administrative centralization, this coordination does not prevail. Until such time as it comes into practice, it is difficult to see how the enduring and costly damages of distorted patterns of growth, inefficient infrastructure systems, imbalances in the provision of community facilities and services, undesirable environmental conditions, and detrimental social consequences can be avoided or prevented.

1. General Policy Formulation

Suitable land development policies and guidelines must be formulated in close relationship with the Ministry of Planning and with adequate consultation of other ministries involved in physical planning activities.

The general line of policy drawn by the central authority constitutes the basic planning framework for the activities of all lower level agencies.

a. Coordination between socioeconomic and physical planning:

The Ministry of Planning is properly concerned with socioeconomic planning and the allocation of government expenditures to achieve national goals and objectives, while the Deputy Ministry of Town Planning Affairs is concerned with problems of physical development, design, construction, and building regulations. Yet, the growth targets and resource allocations set in the national development plans have important spatial implications.

The institutional framework for coordination and cooperation between the C.P.O. and the Deputy Ministry already exists in the Higher Planning Committee. It would seem, therefore, that strengthening the role of the Deputy Ministry and the Higher Planning Committee as national planning agencies would ensure that both socio-economic and physical plans would be formulated within the context of comprehensive and consistent national development policies. As a first step in this coordination effort, it is suggested that some correspondence be established between the boundaries of regions delineated respectively for socio-economic and physical planning purposes.

b. Intersectoral coordination:

Top level coordination between ministries whose responsibilities affect physical planning is necessary to ensure consistency and continuity in the formulation of national policies regarding the use and development of land. The role of the Deputy Ministry of Town Planning Affairs, embodying as it does both advisory and supervisory functions, is crucial in the coordination of activities between the various ministries and large number of departments involved in carrying out developmentatl projects. In particular, it would be highly desirable to relate housing currently under the Finance Ministry with other aspects of physical planning.

Expanding the membership and functions of the Higher Planning Committee or, alternatively, establishing a ministerial council for physical planning affairs would provide for the coordination of independent ministerial activities, to ensure maximum efficiency and desired balance, both between regions and within regions and component municipalities.

Special attention must be given to involving the Ministry of Finance in these deliberations, since the absence of municipal fiscal powers renders national budgeting decisions a critical factor in both regional and local planning. In this respect, setting up a contingency fund for municipal affairs would help to alleviate the proliferation of budgetary problems characterizing every field of municipal endeavor. To partially offset the inflexibility of the budgetary system which does not allow the transference of funds from one category of expenditure to another without the approval of the Ministry of Finance, the Department of Municipal Affairs would be authorized to draw upon the contingency fund to meet unanticipated costs which can entail delays in project planning and implementation. Requests for funds by regional and local bodies would have to be referred to the Deputy Ministry of Town Planning Affairs for review and approval before such funds could be allocated and disbursed.

2. Inter-relations with Regional and Local Planning Agencies

The allocation of planning responsibilities to national, regional, and local levels must be in accord with the level of specificity and detail that each type of master plan document must contain, in order to achieve the required level of coordination between socioeconomic and physical planning. Thus, the Deputy Ministry for Town Planning Affairs, Riyadh, should be responsible for the preparation of the Kingdom's regional plans. Its major responsibilities would be:

- a. To prepare and update regional master plans, integrating the socioeconomic and physical aspects of planning, in accordance with national five-year development plans, and consisting of the following broad elements:
 - A spatial distribution of major economic functions (agriculture, industry, mining, tertiary activities) among the Region's sub-areas, including the designation of lands to be reserved for later, public investment related development.
 - A settlement plan establishing target populations for urban and rural areas in relation to the regional sectorial investment program.
 - A regional infrastructure plan consisting of interurban arterial and rural feeder highways; communications (telephone, telegraph, radio, and television); the distribution of water; and, eventually, the treatment and disposal of liquid and solid wastes at the sub-regional level.
 - The designation of areas of regional scale to be set aside for recreational purposes, preserved for their historical or archeological value, or kept undeveloped to preserve the regional ecological balance.
- b. To provide the Regions and their municipalities with clear directives to guide land development. These fundamental guidelines can be issued as ministerial decrees.
- c. To advance measures which can be issued as general directives, to facilitate the implementation of regional and local master plans. These directives are binding as a common denominator and must be observed by all lower level planning agencies.

- d. To prepare and update regional master plans in accordance with national five-year development plans.

This approach provides a clear distinction between general plans which have to be prepared at the national level and detailed development plans which can and should be worked out by regional and local planning agencies. Thus, the Deputy Ministry for Town Planning Affairs, Riyadh, would always retain gradual decentralization of detailed planning and implementation would increasingly shift its role towards rationalization and equilibrium of planning activities in space and time, so that they conform to national objectives.

- e. To review and coordinate regional and local implementation efforts, including the resolution of differences between regional and local planning agencies.
- f. To evaluate, through follow-up and feedback, the degree of plan achievement and the effectiveness of implementation processes for programs and projects.
- g. To provide technical assistance and training to regional and local planning offices. The role of the Deputy Ministry for Town Planning in building up planning capabilities cannot be overemphasized. It can organize programs such as intensive seminars taught by experts in various technical fields, for officials in regional and local agencies. Certificates can be awarded to participants to encourage attendance. In view of manpower shortages, this type of on-the-job training and continuing education can prove highly rewarding. It allows the upgrading of local staff capabilities without depriving the agency of the services of badly needed personnel for the lengthy period required for regular formal education.

13-2-2 REGIONAL AND LOCAL LEVELS

The whole experience of municipal administration is fairly recent. Dating back to 1924 when the first five municipalities were established, it remained rather restricted until the late 1960's following the upgrading of the Department of Municipal Affairs [1]. This absence of a strongly established tradition of municipal government offers Saudi Arabia a unique opportunity to foster the development of regional planning with minimum disturbance to existing patterns of central-local relations. It should be recalled that many efforts at regional planning, both in the Arab world and elsewhere, have foundered over problems of prerogatives or autonomy of lower levels of government, such as provinces, districts, cities, and towns.

It is at the regional level that best consideration can be given to both national objectives and local needs and opportunities, offering as it does a balanced perspective between the broad macroscale aspects of national planning and the more narrow, immediate concerns of municipalities.

Economic, socio-cultural, and political factors vary greatly between regions, and must be taken into consideration in the implementation of current projects as well as in planning for future development.

Ideally, the functions of a regional planning office should comprise the following four:

1. To prepare detailed development plans on the basis of general master plans, policy guidelines and directives received from the central authority.

It is expected that the regional planning offices will continue to provide technical services in the preparation of both municipal and rural development plans for some time, as a result of the shortage of trained personnel. Preferably, however, the preparation of town plans

NOTE:

1. Twelve municipalities were established between 1924 and 1938, eight between 1938 and 1945, twelve in the 1950-1960 decade, eleven between 1960 and 1965, and the rest of the current total of 69 municipalities between 1966 and 1974.

should be delegated to the larger municipalities as soon as they are able to recruit a sufficient number of adequately trained staff.

All detailed development plans should continue to be submitted to the central authority for approval and ratification before their use as official documents for land development activities in urban and rural areas within the region. The periodic updating of master plans for the larger municipalities will be an important function to be undertaken by the regional office in cooperation with local planning officials. Small modifications of master plans should be simply dealt with at the regional level, but significant changes should be referred to the central authority for review and approval.

Plan approval processes which take unduly long periods should be speeded up. Time limits for central review should be specified and decisions of approval, disapproval, or conditional approval should be communicated to the regional and local authorities within these time limits.

2. To prepare implementation programs.

Since details of development must be sensitive to local conditions and suitable for local enforcement, they can be best worked out at the regional and local levels. Specifically, it is in implementation processes that some discretion must first be afforded to regional and local agencies. Indeed, guidelines should be drawn and distributed, clarifying and strengthening their implementation responsibilities. For example, the small scale of many local projects have resulted in municipalities being unable to attract bids from qualified contractors, and subsequent delays in implementation. It, therefore, appears desirable to transfer the solicitation of bids and contract award procedures from the local to the regional level. This would result in a rational agglomeration of small projects, in one or more locations, into a single, economically efficient request for proposals. While it is understandable that the central authority would want to be consulted on important matters, it is unthinkable that it could, or that it would want to, deal with the deluge of local problems that are bound to arise when attempts will be made to implement the new master plans and enforce the associated land development controls in the Kingdom. Nor is it reasonable or efficient, as mentioned earlier, that it continue to be concerned with the whole array of local difficulties encount-

ered at every phase of project planning and execution.

3. Inform central authorities about local problems and needs requiring immediate attention as well as opportunities which should be capitalized upon.

Increased awareness at the national level will expedite ministerial responses, particularly when associated with relief from current bureaucratic overburden resulting from mandatory indiscriminate referral of both important and trivial matters.

4. To collect and compile data.

Shifting of detailed planning and direct administrative management from central to regional and local agencies implies changes in the authorizations and functions of the existing Planning and Engineering Affairs Department for the Southern Region, changes which will entail some re-structuring of its administrative organization. In accordance with its role as the crucial link between national and local planning, the regional planning agency should consist of seven sections. Four of these already exist, namely: Surveying, Utilities, Engineering Affairs, and Town Planning. The proposed changes are aimed at:

- a. strengthening and expanding the planning function of the regional office.
- b. coordinating and rationalizing project planning and implementation programs by removing bureaucratically burdensome affairs from the technical sections.

It is proposed that the following sections be added:

1. Building and Architecture Section.

This section will be concerned mainly with studying, clarifying, spelling out details, and drafting proposed amendments for zoning and building codes and regulations, as well as assisting the municipalities in enforcing them.

2. Conservation and Preservation Section.

It is deemed necessary that this function be undertaken at the regional level, where knowledge of local conditions is coupled with the capacity to bring in the strength of central government as needed, in efforts at preservation of historic and archaeological sites.

3. Legal and Administrative Section.

At the regional level, this section will be concerned with investigation of problems arising from compliance with ministry directives, enforcement of master plans and land development controls, and specific issues in individual project planning and implementation.

In addition, two coordinating bodies are proposed:

1. A Regional Planning Committee.

This committee would consist of the heads of the different sections, as well as key government officials in the region, including one or more representatives from the Amir's office, to bring about as much internal consistency as possible between the various projects and programs implemented in the region.

2. A Regional Planning Council.

This council would assemble local planning officials from the different municipalities in the region in periodic meetings with the object of:

- a. Informing local officials of the wider context within which their activities occur, as well as relating these activities to national goals and socioeconomic objectives.
- b. Providing a feedback process through which local problems and plan implementation efforts can be discussed, studied, and relayed to the central authorities.
- c. Spelling out the fundamental objectives of plans and regulations, and clarifying their content.

Recognizing that shortages of qualified technical personnel will continue to prevail in the near future, it is suggested that expanding the authority and functions of the regional planning agency be a gradual approach. This will make it possible to:

1. test the workability and effectiveness of changes introduced in the administrative structure.
2. build up local technical expertise, so that broadened scope of regional management will be matched by increased competence in the planning office.

The proper functioning of a regional planning office will undoubtedly help remedy most of the procedural inadequacies.

13-3-1 INTRODUCTION

Since the purpose and the manner in which land is used have major impacts on the life of the people, it becomes an important obligation of the Government to direct land allocation to the highest and best use in terms of social as well as economic objectives. In the absence of alternative mechanisms, such as taxation and price controls, land use planning and implementation must rely solely on administrative regulations. The existing measures embodied in the document entitled "Regulations for the construction of roads and buildings," as supplemented by additional regulations, provides basic zoning and building codes.

1. Current land use patterns reflect socio-cultural conditions and levels of economic development, which vary widely among the five planning regions and between municipalities within each region. These wide differences will be reflected in both regional and city master plans currently under preparation. Land development regulations should also reflect the differing needs and aspirations of regions and municipalities.
2. Since municipalities are not empowered to issue regulations, the central directives are construed to apply equally to any area of the Kingdom.

Furthermore, the regulations on the construction of roads and buildings embody in a single document elements of both land development and building codes.

(1) Land Development Regulations

- (a) Zoning is essentially a legal instrument aspects of the master plan. A zoning ordinance divided the land area within the municipal boundaries into zones; designates the classes of industry, trade, commerce, business, residence, and other purposes for which structures are to be used in each district; and imposes varying standards of development, such as setbacks, height, bulk, and other requirements, for buildings and other structures to be constructed, reconstructed, altered, or repaired. The current zoning stipulations embodied in Section 2 of the Regulations for the Construction of Roads and Buildings are very general. For example, only broad categories of land use are considered; residential, commercial, and industrial; with no distinction between classes of development within each use, types of uses permitted and prohibited in the various zones, and classifications of industrial uses. As nationwide regulations, it sets a framework within which each municipality can develop and adopt a set of zoning regulations taking into consideration both existing conditions and desired growth patterns as expressed in its master plan.
- (b) Subdivision regulations apply to development of raw land, specifying the arrangement of streets, the dimensions of blocks and parcels, and the location of open spaces and community facilities, if any are required. While the standards they embody must also take into account existing conditions, their applicability can be wider, extending to a whole region.

(2) Building Regulations

Building codes have as a primary purpose the safety of the occupants by prescribing minimum standards for new construction, in terms of design, materials, and workmanship. These codes can apply throughout the Kingdom. In fact, it is desirable that a national code be developed by the Dupity Ministry of Town Planning, and periodically updated to reflect changing technology in the construction industry. Standards for prefabrication and modular buildings and factory-built housing need to be included, as well as new materials. However, full recognition must still be given to the fact that special structures in terms of both use and construction must be designed, submitted, and approved as single systems.

It should be noted that there are no housing regulations in existence. They differ from building codes in that they apply to existing structures. Their purpose is to ensure that housing is kept in acceptable condition structurally and sanitarially and that it does not present safety and health hazards.

It is evident that housing codes must reflect the nature, character, density, and age of the existing housing stock. Indeed, it would be highly desirable for a minimum standard housing code to be developed by the regional office for the Southern Region. The maintenance of the existing housing stock is and should continue to be an area of grave local concern.

Focusing on land development regulations for the Southern Region and its municipalities, it should be noted at the outset that:

- (1) There should be no conflict between proposed regulations and existing national regulations.
- (2) Development standards on which the regulations are based should be uniform and consistent throughout the Region, in order to:
 - (a) Simplify bureaucratic procedures in planning and implementation.
 - (b) Minimize variation in enforcement.
 - (c) Prevent potential conflict between stipulations in different municipalities.

(3) All regulations pertaining to land development should be grouped into two documents:

- (a) National regulations, classified by subject under titles pertaining to specific activities or problem areas. The regional office should be responsible for the sorting out and circulation of material relevant to the implementation of its own regional plan and those of the different municipalities in the region.
- (b) Local regulations. These would include the official master plan and associated zoning ordinance, subdivision, and other pertinent regulations. Necessary review and updating should be an ongoing process guided and coordinated by the regional office. Approval by the central authorities should be limited to changes which may entail significant impacts on the environment or involve clear departures from previously set directions.

13-3-3 THE MASTER PLAN

It is recommended that the Ministry, pursuant to Section 1 of the Regulations for the Construction of Roads and Buildings, ratify a master plan prepared for each municipality as an official legal document. This document would consist of two elements:

- (1) A series of maps outlining the basic patterns of development:
 - Land uses, existing and proposed;
 - Road network: hierarchy, alignment, and dimensions;
 - Utility systems;
 - Community facilities;
 - Parks, recreation areas, and preservation areas;
 - Location of government-owned land and delineation of land reserves.
- (2) A written statement outlining:
 - The objectives of the plan;
 - The basic concept;
 - The major proposals.
- (3) A three-year public investment program, to be updated annually, budgeting all public projects to be undertaken in the municipality.

Since the purpose of the written statement is to promote understanding of the plan and its aim, as a prerequisite to effective implementation, it should be clear and concise. Supportive material such as surveys, technical reports, and the like, submitted with or presented as part of the Master Plan,

13-3-2 LAND DEVELOPMENT REGULATIONS

should not be included in the legal document, since they might obscure key aspects and complicate enforcement. However, all background materials should be filed with the regional and local planning offices where the wealth of data and information they contain will be highly valuable for ongoing planning activities.

The importance of the Master Plan as a legal instrument cannot be overstated. In contrast to the official maps, whose major purpose is the delineation of street alignments to prevent encroachment of private buildings and any projections thereof on public thoroughfares, and to determine building lines, the master plan indicates the allocation of land among various uses and use mixes, and spells out principles of development to optimize future growth patterns. The adoption of official master plans will:

- (1) Ensure that the locations of various land-uses, and their interrelations, are socially acceptable, reasonably efficient economically, and aesthetically pleasing.
- (2) Help overcome unplanned piecemeal activities, as the location of industry and workshops, commercial and business establishments, community facilities, and other public uses will be regulated according to a clear picture of desired growth patterns, and not in response to demands of individual property owners.
- (3) Avoid ruthless re-development schemes, the bulldozer approach, with more regard to ornamental design than to impacts on the urban fabric.
- (4) Balance municipal activity, from current over-emphasis on road-related projects to a broader and more comprehensive planning approach.

13-3-4 ZONING REGULATIONS

Closely related to the Master Plan, zoning regulations consist of a map showing district boundaries and of a text spelling out the associated set of regulations. It must also be ratified as a legal document.

(1) Administration:

It will be the responsibility of the Building Departments in the various municipalities to enforce the provisions of the zoning and building regulations, including the layout of public ways, boundaries and building lines. Applicants for building permits must submit the necessary documentation, including plans and specifications to the Building Department. No permit will be granted for work not in conformity with the regulations. Violators should

be prosecuted by the appropriate area and municipal officials.

However, it is the responsibility of the Planning Department to:

- (a) Maintain the official zoning map and interpret and clarify the stipulations of land development regulations.
- (b) Recommend actions on:
 - (i) Special permits for uses designated as requiring special permits in each zoning district.
 - (ii) Variances from specific requirements in cases of:
 - Special circumstances or conditions applying to the land or building for which the variance is requested, such as exceptional dimensions or shape, or topography.
 - Changes in nature, character, or intensity involving non-conforming uses of land or buildings.Special requirements as are deemed necessary to ensure that the principles and policies of the Master Plan are safeguarded may be attached to the granting of variances and special permits.
- (c) Propose changes and amendments to the zoning district boundaries or the regulations for review, approval, and ratification by the appropriate authorities.
- (d) Specify off-street parking requirements.
- (e) Specify conditions for the excavation of earth material for use in construction and for grading the premises after completion of the earth works to safeguard surrounding properties and the general public from any damaging effects.

Procedures for appeals made against official orders, rules, decisions or actions relating to the interpretation of zoning, subdivisions and building regulations should follow the procedures outlined in the regulations for the construction of roads and buildings: Section 1, paragraphs 6, (e), 9 and 10, for zoning and subdivisions; Section 4, paragraph 34, for buildings.

(2) Zoning Districts:

In keeping with the character of the Southern Region, it is suggested that the following zoning districts be considered, and adapted as necessary to provide an accurate expression of individual municipal Master Plans:

(1) Administration (Cont.)

(2) Zoning District (Cont.)

- Agricultural
- Residential
 - Low Density
 - Medium Density
 - High Density
- Business and Commercial
 - Central District
 - Secondary Service Areas
- Industry
 - Light Industry
 - Heavy Industry
- Public Land
- Special Districts
 - Coastal Areas
 - Waterfront Recreation Areas
 - Old Quarters
 - Historic and Archeological Areas

Obviously, not all of these districts will be found on the zoning ordinance of each municipality.

Zoning district boundaries should as much as possible follow clearly demarkated lines, usually the center lines of streets, railroad or utility lines and property lines.

(3) General District Requirements:

No land can be used and no building or other structure can be constructed, reconstructed, or altered for purposes other than permitted in the district within which it is located. Nor can structures exceed the height limit, area, and bulk provisions, density and other requirements established for the district.

Minimum lot requirements should be adjusted to reflect established patterns in each municipality, and the utilization of privately owned land parcels which do not meet size requirements (width and depth) should be permitted with appropriate adjustment of requirements to ensure reasonable development standards.

(a) Non-Conforming Uses:

The continuance of an existing use cannot be prohibited even when it does not conform to the zoning regulations. This implies that normal repairs and maintenance will be permitted. However, alterations of volume, area or extent which result in expansion of the non-conformity are usually denied. Furthermore, in the case of severe damage by catastrophe to such an extent that the total cost of restoration would exceed 50% of replacement value, replacement by a con-

forming use is usually required. Similarly, when non-conforming uses cease, subsequent use of the land and buildings must be in accordance with the requirements of the district in which they are located.

(b) Safety Hazards:

Uses must be regulated to provide adequate safety devices against the hazards they occasion. Particular attention should be given to vibration, including traffic vibration, not only in terms of the inconvenience it creates, but equally important in terms of its adverse effect on the structural strength of older buildings.

(c) Nuisances and Pollution Controls:

- Performance standards should be set to:
- (i) Emissions of smoke, odors, and other forms of air pollution, such as dust fumes, vapors and gases. These should be regulated to prevent potential damage to health, animals, and vegetation.
 - (ii) Discharge of materials into open drainage ways or in the sea to avoid adverse effects on beach areas and prevent pollution of water supply sources.
 - (iii) Noise sources which exceed accept-standards:
 - Level
 - Time of operation
 - Length of operation
 - Character
 - Location

Examples of performance standards for noise control, smoke control, dust control and automobile exhaust control are shown hereunder:

Noise Control Standard

- (1) Measuring unit and noise measuring tools:
 - A "decibel" is a unit of measurement of the intensity of sound (the sound pressure level).
 - A "sound level meter" is an instrument standardized by the American Standards Association that is used for measurement of the intensity of sound and is calibrated in decibels.
 - An "octave band" is one of a series of eight bands that covers the normal range of frequencies included in

(3) General District Requirements (Cont.)

(3) General District Requirements (Cont.)

(c) Nuisance and Pollution Controls (Cont.)

sound measurements. Such octave bands serve to define the sound in term of its pitch components. An "octave band analyzer" is an instrument used in conjunction with a sound level meter to measure sound in each of eight octave bands. An "octave band analyzer" is an instrument used in conjunction with the sound level meter to measure the peak intensities of short-duration sounds.

(2) Method of Measurement

For the purpose of measuring the intensity or frequency of sound, the sound level meter, the octave band analyzer, and the impact noise analyzer shall be employed. The "C" network and the "slow" meter response of the sound level meter shall be used. Sounds of short duration as from forge hammers, punch presses, and metal shears, which cannot be measured accurately with the sound level meter, shall be measured with the impact noise analyzer. In order to determine the peak value of the impact.

(3) Maximum Permitted Decibel Levels

The sound pressure level resulting from any activity, whether open or enclosed, shall not exceed, at any point on or beyond any lot line, the maximum permitted decibel levels for the octave band as set forth in the following table.

Table A-3-(c)-1

Maximum Permitted Sound Pressure Level
(in decibels)

Octave Band (cycles per second)	decibels
20 to 75	79
75 to 150	74
150 to 300	66
300 to 600	59
600 to 1,200	53
1,200 to 2,400	47
2,400 to 4,800	41
Above 4,800	39

Standard for Control of Smoke, Dust and other Particulate Matter

(1) General and Measuring Unit:

"Particulate matter" is any finely divided liquid or solid matter capable of being air-or gas-borne. "Dust" is solid particulate matter capable of being air-or gasborne. "Process wight" is the total weight of all materials used in any process that discharges dust into the atmosphere. Such materials shall include solid fuels, but not liquid or gaseous fuels or combustion air. "Combustion for indirect heating" is the burning of fuel in equipment, such as steam boilers, water or air heaters, stills, or brew kettles, where there is no contact between the products of combustion and the materials being heated. "Standard Smoke Chart numbers" are the numbers on the Standard Smoke Chart-(U.S. Federal Standard) indicating graduations of light-obscuring capacity of smoke. "Smoke" is any visible emission into the open air from any source, except emissions of an uncontaminated water vapor. A "smoke unit" is a measure of the quantity of smoke being discharged and is the number obtained by multiplying the smoke density in a Standard Smoke Chart number by the time of emission in minutes. For example, the emission of Standard Smoke Chart Number 1 for one minute equals one smoke unit.

(2) Maximum Permitted Emission of Smoke

The density of emission of smoke during normal operations shall not exceed Standard Smoke Chart Number 2, and the quantity of smoke shall not exceed a maximum of 10 smoke units per stack

(3) Maximum Permitted Emission of Dust

a. Related to Combustion for Indirect Heating

The emission into the atmosphere of dust related to combustion for indirect heating from any source shall not exceed the maximum number of Kilograms of dust per million heat input per hour

(3) General District Requirements (Cont.)

(c) Nuisance and Pollution Controls (Cont.)

(3) General District Requirements (Cont.)
(c) Nuisance and Pollution Controls (Cont.)

as set forth herein:
The maximum permitted emission shall be 0.90 for minimum-size plants producing a heat input of 2.52 million or less kilocalorie per hour and 0.27 for maximum-size plants producing a heat input of 2,520 million or more kilocalorie per hour. All intermediate values shall be determined from a straight line plotted on log graph paper.

b. Related to Processes
The emission into the atmosphere of process dust or other particulate matter that is unrelated to combustion for indirect heating or incineration shall not exceed 0.50 kilograms per hour for 100 kilograms of process weight or 50 kilograms per hour for 100,000 kilograms of process weight. All intermediate values shall be determined from a straight line plotted on log graph paper.

(4) Odorous Matter and Regulation of it

The emission of odorous matter in such quantities as to be readily detectable at any point along lot lines or to produce a public nuisance or hazard beyond lot lines is prohibited.

(5) Toxic or Noxious Matter and Regulation of it

"Toxic or noxious matter" is any solid, liquid, or gaseous matter, including but not limited to gases, vapors, dusts, fumes, and mists, containing properties that by chemical means are:

- a. Inherently harmful and likely to destroy life or impair health, or
 - b. Capable of causing injury to the well-being of persons or damage to property.
- The emission of such matter shall be so controlled that no concentration at or beyond lot lines shall be detrimental to or endanger the public health, safety, comfort, and other aspects of the general welfare, or cause damage or injury to property.

Standard for Control of Automobile Exhaust Emission

The example of the exhaust emission standard is shown in the following table (United States Federal Standard translated in metric system).

Table A-3-(c)-2
Exhaust Emission Standards and Control Levels

Type of Vehicle	HC	CO	NO _x
Light-duty Gasoline Passenger Car	0.93	0.32	1.24
Light-duty Diesel Passenger Car	0.93	0.32	1.24
Light-duty Gasoline Truck	1.24	12.42	1.93
Light-duty Diesel Truck	1.24	12.42	1.93

(d) Fences

Fences in corner lots should not be allowed to obstruct traffic visibility across the corner, and their height should not exceed 3 meters as stipulated in the Regulations for the Construction of Roads and Buildings, Section 3, paragraph 29.

(e) Signs and Advertising Devices:

Other than residence nameplates and identification signs and signs identifying public or semi-public institutional uses, such as schools, hospitals, clinics and Mosques, illuminated and non-illuminated signs and billboards advertising products and services in business and industrial districts should be regulated in terms of size, projection, and height to prevent aesthetic damage to the business district, as well as inconvenience to adjacent residential properties.

(4) Detailed Schedule of Zone Requirements:

The traditional buildings are rapidly disappearing, replaced by new residential and commercial structures of modern design. The remaining traditional housing stock is rapidly deteriorating as a result of lack of demand by those able to afford the amenities of modern dwellings.

It can be argued that this construction activity is destroying the historical and visual quality of the environment in the urban areas by creating aesthetic incongruity in every quarter of the city. However, no one can ser-

(4) Detailed Schedule of Zone Requirements (Cont.)

iously envisage that the current small-scale character and low-profiled cityscape can be preserved in the face of economic development in the Southern Region. Rather, the municipalities of the Southern Region must strive to maintain the historical character of some of their areas while simultaneously introducing the modern amenities required by industry, business, and trade.

Aesthetic quality can be achieved by maintaining consistency in scale and architectural harmony between old and new construction. This is not easy to achieve, because it requires a delicate balance in the design of new structures. Just as blatantly, modern design can be inappropriate in the midst of traditional surroundings, to the point of becoming eyesores; modern, functional buildings, disguised behind pseudo-traditional facades and decorations can all too often look disturbingly artificial.

(a) Residential Uses:

Residential uses should take into consideration the nature of the soils and the method of sewage disposal to avoid surfacing of effluent, as is happening in Jizan. Similarly, it is important that zones for new residential development outlined in the Master Plan, and that stipulations embodied in the subdivision regulations, take into account the location of wells that supply drinking water to avoid contamination.

House design in the Southern Region places utmost importance on privacy. There are in every house separate entrances for men and women. As a result, the family dwelling is the most practical and economical housing type. Socioeconomic development, however lagging in the Southern Region, will ultimately entail changes in outlook that will affect traditional house design concepts, and consequently the pattern of residential land uses and life style, as evidenced by the housing in Faisalieh. These factors will lead to new needs and desires which cannot be clearly foreseen at the present, but which will affect patterns of urban and rural development.

Because the readily buildable areas are often limited by topography and by the ability of the municipality to provide public utilities and transport networks, medium and high density residential zones must be provided to permit the development of land

(4) Detailed Schedule of Zone Requirements (Cont.)

(a) Residential Uses (Cont.)

for a variety of multiple-family uses, as well as small hotels, rooming and boarding houses. Admittedly, multi-family structures will have to meet the household's need for privacy and provide means to safeguard the ways and traditions that constitute an essential part of everyday life. In time, it is to be expected that the concept of multi-family housing will acquire increasing importance.

Finally, the mix of residential uses, as well as the choice of an allowable density within the range given for each type, should be predicated upon the characteristics of each municipality's sewage disposal system: the existence or planned construction of sewers and the leaching capacities of soils in each zone.

(i) Residential - Low Density:

Land Uses:

- Permitted Uses
 - Family dwellings detached (villas)
 - Home occupations
 - Schools, elementary and secondary
 - Mosques
 - Open spaces, parks, and recreation areas.
- Permitted Accessory Uses
 - Private garages
 - Other accessory buildings
- Uses Requiring Special Permits
 - Community centers
 - Hospitals and clinics
 - Planned developments
 - First aid and ambulance facilities.
- Prohibited Uses [1] (by National Regulations)
 - Commercial and business establishments
 - Light and heavy industrial uses.

Dimensional Requirements:

- Minimum Lot Area 800 sq. m.
- Maximum Density of Occupancy: 1 person per 25 sq. m. [2]
- Minimum Lot Frontage: 20 m.
- Minimum Front Yard: 4 m.
- Minimum Side Yard: 4 m.
- Minimum Rear Yard: 4 m.
- Maximum Height: 2 stories or 12 m.
- Minimum Usable Open Space: 50%
- Maximum Floor Area Ratio: 0.5.

(4) Detailed Schedule of Zone Requirements (Cont.)

(a) Residential Uses (Cont.)

(ii) Residential - Medium Density:

Land Uses:

- Permitted Uses
 - Family dwellings - attached, detached, and group
 - Home occupations
 - Schools, elementary and secondary
 - Mosques
 - Open spaces, parks, and recreation areas
- Permitted Accessory Uses
 - Private garages
 - Other accessory buildings
- Uses Requiring Special Permits
 - Hotel
 - Rooms and boarding houses
 - Clubs and athletic fields
 - Fire stations and police stations
 - Postal substations
 - Planned developments
 - Health and social centers
 - First aid and ambulance facilities.
- Prohibited Uses
 - Commercial and business establishments
 - Light and heavy industrial uses.

Dimensional Requirements:

- Lot Area: 800 sq. m. - 500 sq. m.
- Maximum Density of Occupancy: 1 person per 15 sq. m.
- Minimum Lot Frontage: 15 m.
- Minimum Front Yard: 3 m.
- Minimum Side Yard: 3 m.
- Minimum Rear Yard: 3 m.
- Maximum Heights: 3 stories or 15 m.
- Minimum Usable Open Space: 20
- Maximum Floor Area Ratio: 1.5

(iii) Residential - High Density:

Land Uses:

- Permitted Uses
 - Family dwellings -- attached, detached and group
 - Apartment houses
 - Home occupations

NOTES:

1. Section 2 of the Regulations for the Construction of Roads and Buildings.
2. Of built-up area.

(4) Detailed Schedule of Zone Requirements (Cont.)

(a) Residential Uses (Cont.)

(iii) Residential - High Density (Cont.)

- Hotels
 - Rooming and boarding houses
 - Schools, elementary and secondary
 - Mosques
 - Open spaces, parks, and recreation areas.
 - Permitted Accessory Uses
 - Private garages
 - Other accessory buildings
 - Uses Requiring Special Permits
 - Clubs and athletic fields
 - Fire and police stations
 - Postal substations
 - Hospitals and clinics
 - Health and social centers
 - Civic centers
 - First aid and ambulance facilities.
 - Prohibited Uses
 - Commercial and business establishments
 - Light and heavy industrial uses.
- Dimensional Requirements: [1]
- Minimum Lot Area: 500 sq. m.
 - Maximum Density of Occupancy: 1 person per 5 sq. m.
 - Minimum Front Yard: H+L/8 but no less than 3 m.
 - Minimum Side Yards: H+L/8 but no less than 3 m.
 - Minimum Back Yards: H+L/8 but no less than 3 m.
 - Maximum Height: 6 stories or 30 m. but higher than this allowed by certain condition and special permit.
 - Minimum Usable Open Space: 20%
 - Maximum Floor Area Ratio: 2.0. F.A.R. higher than 2.0 needs special permit

NOTE:

- 1a. When structures are located on a corner lot, side yard setbacks parallel to a street should equal that of the front yard.
- b. "H" is the height of the building. "L" is the length of the wall measured parallel to the corresponding lot or street line. The front yard is measured from the center line of the street, but in no case may a building be nearer the street line or building line than 3 m.

(b) Commercial Uses:

Economic activity is centered around areas of two basic types:

1. The open space markets, the "suq," such as those of Khamis Mushayt, Abha, and Najran. For sanitary reasons, the food markets are now being moved into new covered structures. Whether open or covered, the market is an important element in the commercial fabric of the city. If open markets for animals are to be eventually relegated to the peripheral areas, it is important that the downtown have a commercial bazaar, similar to the one in Riyadh and other Arab cities.
2. Commercial and business establishments concentrated on a single corner and on offshoot secondary streets adjacent to the markets. These areas will form the core of central districts, devoted to business and commerce which will in the future encompass enterprises catering to the needs of the tourist trade. It will also, most likely, be the location of various service establishments and government offices.

The Master Plan presents the expansion of the commercial core in a manner which minimizes the damage to adjacent residential areas and avoids both extremes: large-scale clearance and redevelopment, as in the case of the Abha downtown area, or slow submersion by small waves of uncontrolled construction activity.

Because the predominant character of trade activities is specialization in commercial operations, a variety of shops, small workshops, and services are needed close to residential areas. Future development must provide for small-scale, convenience shopping on a planned basis in new residential areas if patterns of scattered business establishments are to be avoided.

(i) Central District:

- Land Uses:
- Permitted Uses
 - Business and professional offices
 - Merchandise stores
 - Business and service establishments (including insurance

(4) Detailed Schedule of Zone Requirements

(b) Commercial Uses (Cont.)

(i) Central District (Cont.)

- and real estate brokers and other agencies)
- Banks, and other financial institutions
- Food, fruit, vegetable, meat and poultry markets, and supermarkets
- Hotels
- Apartment houses
- Restaurants, cafes, and other eating places
- Automotive sales and accessories
- Bus and taxicab services
- Schools: technical, trade, special and higher education institutions
- Government offices
- Mosques
- Baths
- Civic centers
- Open spaces, parks, and recreation areas
- Police, fire, and postal stations
- Telephone and telegraph offices
- First aid and ambulance facilities.

- Permitted Accessory Uses
 - Off-street parking
 - Garages.

- Uses Requiring Special Permits
 - Warehousing for goods other than those restricted to industrial zones.
 - Small workshops employing less than 5 persons [1]
 - Hospitals and clinics
 - Clubs
 - Museums
 - Welfare and charitable institutions.

- Prohibited Uses
 - Light and heavy industrial uses.

NOTE:

1. Although it is unclear whether this is permitted under the letter of National Regulations, it seems that including small workshops often closely associated with shops in the public markets would not violate the intent of the regulations and be more sensitive to traditional usage.

(4) Detailed Schedule of Zone Requirements (Cont.)

(b) Commercial Uses (Cont.)

(i) Central---(Cont.)

- Dimensional Requirements:
- Minimum Lot Area: no requirements.
 - Maximum Density: no requirement.
 - Minimum Front Yard: no requirement.
 - Minimum Side Yards: no requirement.
 - Minimum Back Yard: no requirement.
 - Maximum Height: no requirement.
 - Minimum Usable Open Space: 10%
 - Maximum Floor Area Ratio: 3.0.

(ii) Secondary Commercial Service Area:

Land Uses:

- Permitted Uses
 - Retail and service shops
 - Food markets
 - Automotive services
 - Mosques
 - Health and social centers
 - First aid and ambulance facilities
 - Fire and Police stations
 - Postal substations
 - Open spaces, parks, and recreation areas.
- Permitted Accessory Uses
 - Garages.
- Uses Requiring Special Permits
 - Welfare institutions
 - Hotels
 - Rooming and boarding houses
 - Hospitals and clinics
 - Eating places.
- Prohibited Uses
 - Light and heavy industrial uses.

- Dimensional Requirements:
- Minimum Lot Area: 200 sq. m.
 - Maximum Density: no requirement.
 - Minimum Lot Frontage: 10 m.
 - Minimum Front Yard: no requirement
 - Minimum Side Yard: 3 m. from any adjacent residential property.
 - Minimum Back Yard: 3 m. from any adjacent residential property.
 - Maximum Heights: 3 stories or 15 m.
 - Minimum Usable Open Space: 10%
 - Maximum Floor Area Ratio: 1.0.

(c) Industrial Uses:

In the Southern Region, there are few industrial plants. In Jizan there is ice manufacturing; in Khamis Mushayt, a bottled drink plant, an aluminum window and door frame factory, many car repair and servicing shops.

The Port in Jizan is used for importing cement and other building materials.

Industrial uses which require direct waterfront access should be concentrated around the port area in locations where they will relate most effectively to the adjacent zoning districts. Waterfront used for industrial purposes and the port area should be zoned as heavy industry.

Industrial uses which do not require waterfront access should be located elsewhere to decrease the polluting effect of industry on the marine environment.

The location of military areas, as well as airports, airfields, and other facilities involved with aircraft operation constitute special uses, located and developed in accordance with plans prepared and approved by the appropriate authorities. Special restrictions may be applied to land around these uses to ensure proper operation of the facility. Similarly, buildings and structures which are part of public utility systems, such as sewage lift stations, sewage and water pressure control stations and treatment plants, electric plants and substations, telephone communications relay and transmittal towers, are located in accordance with the plans prepared and approved by the appropriate authorities. Such installations shall be surrounded by a fence and effectively screened from surrounding properties.

(i) Light Industry:

Land Uses:

- Permitted Uses
 - Warehousing, storage and industrial use not involving risk of fire or producing nuisance effects through noise, smoke, smell or appearance. Examples of light industry uses include but are not limited to the fol-

(4) Detailed Schedule of Zone Requirements (Cont.)

1. The first part of the document is a list of names and addresses of the members of the committee. The names are listed in alphabetical order, and the addresses are given in full. The list includes the names of the members of the committee, the names of the members of the sub-committee, and the names of the members of the advisory committee. The addresses are given in full, including the street, city, state, and zip code.

2. The second part of the document is a list of the names and addresses of the members of the committee. The names are listed in alphabetical order, and the addresses are given in full. The list includes the names of the members of the committee, the names of the members of the sub-committee, and the names of the members of the advisory committee. The addresses are given in full, including the street, city, state, and zip code.

3. The third part of the document is a list of the names and addresses of the members of the committee. The names are listed in alphabetical order, and the addresses are given in full. The list includes the names of the members of the committee, the names of the members of the sub-committee, and the names of the members of the advisory committee. The addresses are given in full, including the street, city, state, and zip code.

(4) Detailed Schedule of Zone Requirements (Cont.)

(c) Industrial Uses (Cont.)

(ii) Heavy Industry (Cont.)

- Brick ovens
- Fat and fertilizer manufacturing
- Fish packing, smoking, curing or storing
- Glue or gelatine manufacturing
- Incinerators, paper and pulp, storage of scrap iron, bottles or rages, tarring, and curing of raw hides, tar and yeast manufacturing.

- Prohibited Uses
- Residential uses.

Dimensional Requirements:

- Minimum Lot Area: 20,000 sq.m.
- Maximum Density: no requirements.
- Minimum Yards: Every structure shall be separated from adjacent residential property by a minimum setback of 30 meters to provide a buffer zone.
- Maximum Height: no requirements.
- Minimum Usable Open Space: 10%.
- Maximum Floor Area Ratio: 1.0.

(d) Public Land:

In accordance with the requirements stipulated in Section 1, paragraph 6 of the regulations for the construction of roads and buildings, all publicly-owned land and properties should be shown on the zoning map as such, including land reserves delineating between properties belonging to different public authorities.

Special public uses, including parks and recreation facilities, historical buildings of all types, hospitals, clinics and health centers, fire and police stations, and post offices will have variable lot size needs, and differing lot coverage and parking requirements. The only general prescriptions are as regards the relation of these uses to surrounding residential areas. It would be highly desirable that:

- Entrances and exists be located on non-residential streets and away from street intersections.
- Accessory uses and signs be adequately screened from adjoining residential properties.
- Setbacks of structures from adjacent

residential properties be about 15 meters.

(e) Agriculture:

Land Uses:

- Permitted Uses
 - Agricultural activities:
 - Land cultivation
 - Rearing of livestock
 - Farming
 - Family dwellings
 - Cemeteries
 - Mosques and other religious structures
 - Health and social service facilities
 - Open space and recreation.
- Permitted Accessory Uses
 - Farm and home occupation quarters
 - Other related living quarters
 - Animal barns, stables and pounds
 - Storage sheds.
- Uses Requiring Special Permits
 - Agricultural processing plants
 - Agricultural stations and schools
 - Light industries

- Prohibited Uses
- Heavy industry

Dimensional Requirements:

- Minimum Lot Area: 4000 sq. m./family dwelling.
- Maximum Density: no requirement.
- Minimum Front Yard: 8 m.
- Minimum Side Yards: 10 m.
- Minimum Rear Yard: 10 m.
- Maximum Height:
 - Traditional structure: variable
 - New buildings: 3 stories or 15 m.
- Minimum Usable Open Space: no requirement.
- Maximum Floor Area Ratio: no requirement.

(f) Special District:

(i) Historic Areas:

The historical and cultural heritage of any nation is an important resource that has to be preserved for future generations. So far, almost no attempts have been made to include historic preservation in regional

(4) Detailed Schedule of Zone Requirements (Cont.)

(c) Industrial Uses (Cont.)

(i) Light Industry (Cont.)

- lowing:
- Manufacturing of finished products
 - Bottling and canning plants, storage and distribution
 - Printing
 - General Contractors shops and yards
 - Construction materials, hardware and equipment
 - Public utilities, offices and yards
 - General warehousing and storage services
 - Machinery sales, rental and service
 - Automotive repairs
 - Freight and shopping services
 - Garages, taxicab and bus garaging and servicing
 - Ice manufacturing
 - Food products
 - Confectionary products
 - Furniture and office and home furnishings
 - Carpets and rugs
 - Leather goods.
- Permitted Accessory Uses
 - Related business offices
 - Accommodations for caretakers and watchmen
 - Garages and service areas
 - First aid and ambulance facilities
 - Police, fire, and postal stations
 - Telephone and telegraph offices
 - Mosques
 - Open spaces, parks, and recreation areas.
 - Uses Requiring Special Permits
 - Schools: technical and special education.
 - Prohibited Uses
 - Residential uses
 - Heavy industrial uses.
- Dimensional Requirements:
- Minimum Lot Area: 500 sq. m.
 - Maximum Density: no requirements.
 - Minimum Lot Frontage: no requirements.

(4) Detailed Schedule of Zone Requirements (Cont.)

(c) Industrial Uses (Cont.)

(i) (Cont.)

- Minimum Yards: All structures must be separated from adjacent residential property by a minimum buffer zone of 10 m.
- Maximum Height: no requirements.
- Minimum Usable Open Space: 10%.
- Maximum Floor Area Ratio: 1.0.

(ii) Heavy Industry:

This zone should group all industries and uses whose operation creates a nuisance to other uses.

Land Uses:

- Permitted Uses
 - All heavy industrial structures, facilities, and installation
 - First aid and ambulance facilities
 - Police, fire and postal stations
 - Telephone and telegraph offices
 - Mosques
 - Open spaces, parks, and recreation.
- Permitted Accessory Uses
 - Ancillary uses and structures necessary for efficient operation
 - Related offices
 - Accommodations for caretakers and watchmen
 - Garages and service areas.
- Uses Requiring Special Permits: Uses involving safety hazards or nuisance effects through smell, noise, smoke, or appearance
 - Hazardous Uses, such as but not limited to:
 - Gas storage
 - The manufacturing of corrosive acids, bleach, ammonia, chlorine, disinfectants, dyes, fireworks and explosive, matches, soda, soap and starch
 - Petroleum, refining, reduction
 - Petrochemicals
 - Potash works, smelters, and blast furnaces
 - Rolling mills
 - Noxious Uses, such as but not limited to:
 - Slaughterhouses and stockyards
 - Manufacturing of asphalt, cement, lime, gypsum, plaster, and creosote

(4) Detailed Schedule of Zone Requirements (Cont.)

(f) Special District (Cont.)

(i) Historic Areas (Cont.)

is not out of scale, and to enhance the general character of the area.
- Regulations for construction in the area and in adjacent zones.

All proposals for land development and building construction, alterations, or repairs that affect the character of a conservation area should be submitted to the regional planning office, where it should be reviewed and approved by a committee including members from the planning, historic preservation and conservation, building, and legal and administrative sections. This will ensure that in all aspects of the proposed project the district regulations are fully observed. In the case of work involving foundations, it would be desirable to mandate the examination of the soil for archeological material and the reporting of any finds to the regional office, which in turn can take it up with the Administrative of Antiquities.

It should be noted that zoning and building regulations can only prevent the intrusion of undesirable uses and structures that can adversely affect the character of a historical site, but it cannot stimulate the desired kind of developemnt [1].

(ii) Coastal Areas:

The wise management of natural resources has become a prime concern of government officials and planners, and the traditional, land-use, legal instruments, the master plan and zoning regulations, are now utilized to control sensitive areas. Few areas provide more opportunities and require more care in their utilization than coastal areas. They have traditionally been important sources of food, through coastal fishing; of economic activities, in port cities;

NOTE:

1. Taxation, which has been used as a promotional instrument to achieve desired changes, is not available.

(4) Detailed Schedule of Zone Requirements (Cont.)

(f) Special District (Cont.)

(ii) Coastal Areas (Cont.)

of recreation and tourism; and, more recently, of mineral wealth. Yet, several of these activities are potentially in conflict. The renewal of fish life and other marine resources can be threatened by man-made pollution; oil spills will destroy the recreational assets of beaches. Environmental controls and strong land-use regulations are necessary to ensure the orderly development of coastal sections, while maintaining their delicate ecological balance.

The legal designation of a coastal zone, together with its land uses and development controls, are an integral part of the Regional Master Plan. However, they involve the activities of other ministries and departments. The delineation of their boundaries and the drafting of particular regulations should therefore be the responsibility of a Coastal Zone Committee composed of representatives of the following government agencies:
- Deputy Ministry for Town Planning
- Ministry of Petroleum
- Central Planning Organization
- and the authorities responsible for ports and harbors, fisheries, and tourism.

The Coastal Zone Committee, with the assistance of staff from the Deputy Ministry, will be responsible for :

1. Delineating the boundaries of coastal zones that will include:
 - a. all coastal waters and the seabed to the outer limit of the Kingdom's territorial waters;
 - b. the land-sea interface, including beaches, dunes, cliffs, and other shoreland areas;
 - c. the hinterland of coastal areas insofar as their physiographic characteristics or uses are clearly related to or derived from their proximity to the areas described in (a) or (b), above.
2. Conducting an inventory of natural and man-made resources within the coastal zones, including:
 - a. renewable resources of marine and land animal and plant life

(4) Detailed Schedule of Zone Requirements (Cont.)

(f) Special District (Cont.)

(i) Historic Areas (Cont.)

planning, leaving this important function to be dealt with at the national and local levels.

Given the attitude of local officials toward historic monuments, it is not surprising that buildings of potential historical value are being torn down and replaced by modern structures, and archeological sites are totally neglected. A notorious example is Madinat-al-Ukhud, which can only be visited by special permission of the Emir, since it is on the national register of archeological sites. Yet, the size is left in total abandonment. Farmers from the surrounding areas freely take debris and rubble from the ancient city to use as fertilizer and building material. Ancient ruins in a village near Jizan are used as public facilities. The walls provide convenient urinals and the interior, shielded toilets.

This state of affairs should not be allowed to continue. To remedy the situation, the following conditions are necessary:

- Adequate public authority
- Adequate legal regulations
- Qualified experts in the agencies who are involved with preservation and conservation.

Certainly the general policy statements give due importance to the necessity of preserving historic heritage. The legal provisions embodied in the regulations issued since 1972, particularly regulation No. 26, dated 23/6/1392, provide the authorities with the necessary implementation tools. No major budgetary problems can be foreseen to obstruct systematic action, should such action be initiated. According to Section 13 of the Royal Decree, No. 26, dated 23/6/1392, it is incumbent on the Administration of Antiquities, Ministry of Education, to prepare a register of areas and monuments that are of special archeological and historic interest, and to advise the Deputy Ministry of Town Planning Affairs of their location.

(4) Detailed Schedule of Zone Requirements (Cont.)

(f) Special District (Cont.)

(i) Historic Areas (Cont.)

Admittedly, it is a gigantic task, given the size of the Kingdom. It is unclear how far the work has progressed. Furthermore, decisions regarding preservation and restoration can only be decided on a case by case basis, because it will depend on the site, the setting, the character and condition of the monument, the size and location of the area, the growth dynamics in and around it, and above all, its significance for the Nation, the Region, and the locality.

Keeping in mind that the best preservation is through integration in physical development plans [1], coordination is needed between the Deputy Ministry and the Antiquities Administration to ensure the timely completion of regional inventories of monuments and sites for incorporation in the regional and city master plans currently under preparation, so that the delineated historic areas can become part of the legal document. In addition, a joint committee of experts and officials from both departments should draft a circular, giving clear directives for the implementation of national regulations relating to historical and archeological sites, covering the following subject areas:

- Criteria for the designation of areas.
- Site description:
 - Type, character, and number of structures in each area.
 - Current use.
 - Generalized uses in surrounding zones.
- Proposed treatment of the site: access, landscaping, preservation, and restoration of monuments.
- Proposed design controls, including height, bulk, texture, and style of buildings, signs, parking and other provisions, as may be necessary to preserve a setting that

NOTE:

1. Socioeconomic forces operating at the regional and urban scale affect historical areas by the pressures they create in and around their physical location.

(4) Detailed Schedule of Zone Requirements (Cont.)

(f) Special District (Cont.)

(ii) (Cont.)

cognize that they are located within an environmentally sensitive area and be formulated with particular rigor. As such, the master plan of a municipality within the coastal zone can be thought of as a special zoning district whose regulations are designed within the context, and to further the wise management, of the coastal zone.

(iii) Waterfront Recreation:

The waterfront of the Southern Region constitutes one of its most important assets. It is anticipated that the Region will become a major tourist area. Beach recreation areas will be created and expanded to meet the needs of a growing population. Areas that are suitable for recreation purposes should be preserved and protected, not only against the intrusion of undesirable commercial and industrial uses, but even more importantly, against all kinds of possible pollution.

Land Uses:

- Permitted Uses
 - Agriculture
 - Fish and marine activities
 - Aquarium
 - Athletic fields
 - Restaurants, cafes and eating places
 - Public baths
 - Marinas for recreational crafts
 - Open spaces, parks, and recreation areas
 - Club houses for beach and water-related activities
 - Swimming pools
 - Water-sporting goods
 - Marine craft and accessories.
- Permitted Accessory Uses
 - Off-street parking
 - Automobile service stations
 - Camping areas
 - Boathouses and access sites, docking facilities
 - Recreational marine craft repair, without dry docks
 - Supplies and equipment and associated areas.

(4) Detailed Schedule of Zone Requirements (Cont.)

(f) Special District (Cont.)

(iii) Waterfront Recreation (Cont.)

- Uses Requiring Special Permit
 - Residential
 - Hotels
 - Refreshment stands.
 - Prohibited Uses
 - Light and heavy industrial uses.
- Dimensional Requirements:
- Minimum Lot Area: 1000 sq. m.
 - Maximum Density of Occupancy: 1 person per 25 sq. m.
 - Minimum Lot Frontage: 20 m.
 - Minimum Front Yard: 6 m.
 - Minimum Side Yards: 2 m.
 - Minimum Rear Yard: 5 m.
 - Maximum Height: 3 stories or 15 m.
 - Minimum Usable Open Space: 30%
 - Maximum Floor Area Ratio: 0.5.

(iv) Old Quarters:

The preservation of old quarters presents difficult problems. As stated in the Introduction, the municipalities of the Southern Region are rapidly losing their traditional structures and should make an effort to maintain the historical character of some of their area. With the exception of specific structures of great historical or aesthetic value which should be acquired, restored and maintained by the Administration of Antiquities, the successful economic and functional integration into the Master Plan.

Although the solution selected will vary for each municipality, three zoning approaches are available for old quarters:

- (1) The designation of a special "old city" zone, detailing allowable activities, standards for mixed uses, and specifying architectural and engineering requirements for the maintenance or alteration of existing structures. New construction is severely regulated and subject to design approval to ensure its compatibility with older buildings.

This approach should be selected where the existing old quarters are of significant architectural interest and/or historical value.

(4) Detailed Schedule of Zone Requirements (Cont.)

(f) Special District (Cont.)

(ii) Coastal Areas (Cont.)

- available, their rate of renewal, and their rate of exploitation compatible to achieve a sustained yield;
- b. non-renewable resources, such as petroleum, gas, sand, gravel, and other mineral resources of the seabed and the coastal zone;
 - c. land uses (industry, commerce, residential, recreation, extraction of minerals and fossil fuels, transportation routes and navigation lanes, water disposal, and fisheries), together with an assessment of the extent to which they represent a misuse of under-utilization of the coastal zone;
 - d. natural habitats and areas which are important to the continued productivity of the biological resources of the coastal zone;
 - e. natural areas which have aesthetic, recreational, historical, physical, or other qualities which should be preserved.
3. Formulating comprehensive development guidelines for the coastal zone that will avoid potential conflicts that may arise in the utilization of the zone's natural and man-made resources. Areas of potential conflict include but are not limited to:
- a. erosion of the immediate coastal area, including beaches and dunes, as a result of construction activity, clearing of vegetation, and overly-intensive utilization;
 - b. damage to wildlife habitats, particularly marine life breeding areas, from sewage pollution, oil spills, changes in water temperature, or salinity, siltation due to erosion, of other causes;
 - c. pollution of beaches, waterfronts, and ship channels;
 - d. despoliation of natural areas of aesthetic value or of historical sites by development activity.
4. Disagreements on the utilization of any portion of the coastal zone that may arise from any national,

regional, or local government agency.

Although the purpose of a coastal zone is not to stop all development, hard choices may have to be made between socioeconomic development and the preservation of ecologically sensitive areas. For example, shallow waters and coral formations may be simultaneously the best site for the construction of a new harbor, or an off-shore oil pier, and a critical fish-breeding area. An important function of the Committee will therefore be to decide whether, in such an instance, there may be a feasible alternative location; or, should there be no alternative, whether it is more important to preserve the fish-breeding area or construct the proposed facility.

The comprehensive guidelines formulated by the Committee shall be developed by the staff of the Deputy Ministry of Town Planning Affairs into a detailed land-use plan for the zone, including zoning regulations and such other developmental controls as may be deemed necessary to implement the guidelines, including the public ownership of important segments of land within the zone. Once incorporated into the Regional Master Plan, the coastal zone acquires the status of a legal document.

The administration of the zone's regulations and the implementation of designated projects within its boundaries should be the exclusive responsibility of the Regional Planning Office. The resolution of policy-related issues, as well as the interpretation of the zone's comprehensive development guidelines, should be referred to the Coastal Zone Committee.

It is suggested that municipalities, such as Jizan, that are located within the boundaries of a potential coastal zone would still be responsible for the formulation and implementation of their own master plan. In such cases, however, their individual master plans, although administratively excluded from the coastal zone, must still clearly re-

(4) Detailed Schedule of Zone Requirements (Cont.)

(f) Special District (Cont.)

(ii) Coastal Areas (Cont.)

13-3-5 SUBDIVISION REGULATIONS

Subdivision regulations are intended to regulate the subdivision of raw land in a manner ensuring orderly development of the municipality. It usually involves the construction of new streets and the division of large parcels of land into lots. The Regulations for the Construction of Roads and Buildings, Section 2, paragraph 21, and Section 3, paragraph 28, and the additional regulations embodied in Order Number 1270, dated 12/11/1392 A.H., spell out principles governing subdivisions.

The effectiveness of these regulations would be greatly improved if:

- (1) Subdivisions should apply to all division of land into four or more lots for the purpose of transfer of ownership or building development, or if a new street is involved in any division of land.
- (2) The respective responsibilities of the developer and the municipality are clearly specified regarding the construction of roads, water supply, sewage disposal, and other utilities.
- (3) Engineering standards for all infrastructure to be provided by the developer are included in the regulations and incorporated in the plan submitted for approval.
- (4) Granting of building permits on any subdivision lot is withheld until completion of the infrastructure serving this particular lot.

13-3-6 REGULATIONS PERTAINING TO LAND ACQUISITION FOR PUBLIC USE AND THE ADMINISTRATION AND DISPOSITION OF MUNICIPAL LAND

All over the world, municipalities have been struggling with land problems, whether for the organization and extension of existing communities or for the planning of new towns. Land is directly needed for public purpose projects and the provision of low and moderate income housing. Land is also needed to rationalize existing structural deficiencies in the urban fabric, such as undesirable land use mixes and inefficiencies in road and infrastructure systems, finally, control over key sites and peripheral areas is needed to further the implementation of approved regional and local master plans and to curb speculation which only leads to distorted growth patterns and undue costly delays in the layout and construction of important public projects.

Because the Southern Region has been largely bypassed by developmental activities in the past, its municipalities did not experience to any extent the damage of uncontrolled growth. However, social objectives will bring increased attention to this region to close the gap between it and the remainder of the Kingdom.

Efforts under way and anticipated projects to induce development can be broadened from current improvement of infrastructure to raising the level of amenities and further to giving a decisive role to government investment in influencing growth patterns.

In accordance with the Royal Order Number 20/1/13/1009, dated 17/6/1374 A.H., and pursuant to Directive Number 942/2, dated 26/3/1387 A.H., updated by Directive Number 3084/4, dated 6/8/1391 A.H., government-owned vacant land in, adjacent to, and around the urbanized area was turned over to municipalities for sale. These regulations were primarily intended for the promotion of low and moderate income housing adversely affected by high and rising urban land prices. Regulations issued in the following years authorized uses other than residential, including income-producing uses, in which case the sale would take place by public auction.

Simultaneously, municipalities are heavily involved in land acquisition for immediate project needs. Despite current problems associated with land assembly, the basic regulations covering the right of eminent domain are quite adequate and will become more expeditious as legal documentation of land ownership progresses. These procedures, which always involve hardships for owners and tenants alike, should continue to apply primarily to land needed for priority development projects only, including of course the widening of streets. More discrimination should be exercised in redevelopment schemes for central city areas, despite the fact that roads cannot meet the needs of modern transport systems and houses are functionally obsolete in terms of amenities and/or design, even when still structurally sound.

In this respect, relocation aspects of projects should be given serious attention. The resettlement of displaced persons is a social obligation incumbent upon the authority whose actions are causing the displacement. It should also be considered a legal obligation and the cost of relocating displaced households to alternative housing quarters suited to their socioeconomic conditions should be defrayed by the state.

There seems to be an inherent inconsistency in public land policy. Municipalities are on the one hand actively selling land which is currently in their possession, while on the other hand they face time-consuming problems in land acquisition, having to deal with scattered and legally complicated ownership patterns as well as rising land values and budgeting requirements. If this policy is not rationalized, municipalities will consistently find

(4) Detailed Schedule of Zone Requirements (Cont.)

(f) Special District (Cont.)

(iv) Old Quarters (Cont.)

- (2) Inclusion of the old quarters in the zoning regulation. This approach allows market mechanisms to treat the old quarters as a standard piece of real estate. The highest and best use is assigned by the zoning regulations and existing structures are allowed to continue as non-conforming uses until such time as rising land values warrant their redevelopment.

This approach has the advantage of being simple to administer, while still allowing the acquisition of individual structures for preservation. It should be selected where old quarters have no particular merit other than their age.

- (3) Designation of the "old city" as a redevelopment zone. This approach offers the greatest level of detailed control and should be selected where old quarters consist of an inextricable mixture of buildings that should be preserved and nondescript old structures. All properties within the zone are acquired by the Government. A redevelopment plan is prepared; buildings to be preserved are designated and repaired or remodeled; selected demolition occurs; infrastructure improvements are undertaken; new construction takes place, either directly by the Government and to be followed by resale to the private sector, or by private developers in accordance with strict design standards.

It should be noted that the dimensional requirements for lot sizes presented in all zoning districts are higher than those contained in the national regulations, which stipulate minimum lot sizes of 98.5 square meters and a frontage equivalent to one-third of the depth of the lot. This is in accordance with the prerogatives given to the municipalities under this same regulation; namely, Section 3, paragraph 28, a, b, c, and d of the Regulations for the Construction of Roads and Buildings. Higher standards are proposed in light of the necessity to allow for proper on-site disposal of sanitary wastes in new developments.

- (2) The following non-residential uses, provided that they are intended, in terms of location and capacity, for the use of the residents of the district:
- private garages;
 - clubs and athletic fields;
 - schools, elementary;
 - mosques.

Open spaces, parks and recreation areas:

- fire stations;
- health and social centers;
- small-scale, convenience shopping;

- (3) Uses requiring special permits; all uses requiring special permits in the district where the planned development is located, provided they are not listed under (2), above, or if listed, are intended to serve the residents of areas not included in the planned development.
- (4) Prohibited uses; all uses not specifically included in items (1) to (3), above.
- (5) Submissions and approvals, detailed plans, programs, and phasing of construction proposals shall be submitted to the Technical Department-Planning and Building Section of the municipality where the planned development is located, and to the Regional Planning Office for review, modification, and approval. Planned developments located outside municipal boundaries are to be submitted to the Regional Planning Office.

The review procedure will take into account that the proposed planned development is an exception to the zoning regulations and should therefore be approved only where it offers the advantage of a solution that is clearly superior to what could be achieved under the zoning regulation.

13-3-8 NEW COMMUNITIES

New communities can constitute an important part of the physical plan, in view of the fact that sizeable areas of vacant land are in Government ownership. A New Towns Programs should only be regarded as one program within the framework of national and regional development policies to create growth centers where warranted by need and potential in order to achieve:

- national objectives
- regional balance in terms of economic development and population distribution.

13-3-9 BUILDING REGULATIONS

A master plan for the new community should be prepared by the Regional Planning Office for review and approval by the central authorities.

Building regulations should have as a primary purpose the setting down of minimum standards necessary to ensure the health and safety of the occupants of a building. Regulations modeled on those of other countries are unsuitable to local conditions and can set standards that are too high, driving up the cost of housing for those who are least able to afford it. The stipulations embodied in parts 6, 7, 9, and 10 of the Regulations for the Construction of Roads and Buildings provide the necessary guidelines for the development of more detailed building codes, should such be desired by the municipalities. Differences in settlement patterns, building types, and materials that exist within the Region necessitate that additional or more detailed building regulations in design and construction, particularly the latter, be developed at the local level, or at least on a subregional level, in accordance with the three settlement-type areas identified in the report of existing conditions. Furthermore, they should be specifically related to the proposed master plans and action area projects.

A few comments are presented here on the principles embodied in the national regulations, in light of the climatic and socio-cultural conditions prevailing in the Southern Region. They are primarily intended as suggestions to be taken into consideration in the drafting of detailed regulations. In accordance with Section 4, paragraph 34, of the Regulations for the Construction of Roads and Buildings, construction, reconstruction, structural alteration, repairs, and demolition of any buildings require a permit to be issued by the municipality. It is recommended that requests for the issuance of permits should be submitted for review to the Technical Department, Planning and Building Section, and should include the following documentation:

1. Site plan, prepared by an engineer, architect, or surveyor illustrating:
 - boundary lines, dimensions, and topography
 - location and dimensions of all existing and proposed buildings
 - entrances, yards, fences, and open space uses, such as parking areas and storage spaces.
 - use of existing and proposed buildings.
2. A location map showing uses of all lands and

- buildings on properties across the road from, or adjoining to, the proposed project.
3. Other information as is required, such as floor plans, elevations, sections, specifications, etc.

In the case of rural dwellings or owner-occupied dwellings with a floor area of less than 60 square meters, or of small dwellings with a floor area of less than 70 square meters with one room used as an office, a shop or a workshop for home occupation, cottage industry, or small crafts, the documentation required for the issuance of building permits should be simplified to include only the title to the land and a site plan showing the boundary lines of the property, the dimensions of the building, and the minimum structural details.

(1) Requirements for Dwelling Size and Room Size:

In accordance with the regulations for the construction of roads and buildings, part 8, paragraph 97, the minimum size of a habitable room for new construction is 9 square meters of area and 20 cubic meters of volume. This implies a height of 2.25 meters, that is a floor to floor height of about 2.50 meters, which is very low in hot climates with the absence of mechanical ventilation. Consequently, it is suggested that minimum room height be increased to 3 meters; this is recommended by the U.N. standards for small buildings which allow room sizes of 8 square meters as a sound basis for design in hot, dry climates [1].

It would also be desirable to specify that the size of a dwelling unit be no less than 16 square meters of habitable floor area--which does not include kitchens, lavatories, bathrooms, hallways and other circulation spaces, and storage rooms--and that it must provide for a minimum of 4 square meters of habitable floor area per occupant. Furthermore, in the case of publicly subsidized housing, every room in a dwelling unit should not be occupied by more than two persons, with every two children under 7 years of age counted as one person.

NOTE:

1. It is apparent that heights of 3 to 5 meters are used, as is apparent from the regulations on wall thicknesses stipulated in Section 6, paragraph 58, of the Regulations for the Construction of Roads and Buildings.

(2) Light and Ventilation Requirements:

Regulations for hot, dry climates are difficult because comfort can be achieved through two methods, both of which must be permitted under the proposed legislation:

- Traditional construction with thick walls of stone or mud, and only small, high windows of the clerestory type.
- Modern brick and concrete construction with thin walls, and windows that need not be large, but should be well protected by projecting sun louvers to minimize sunshine penetration during the hot hours of the day.

The Regulations for the Construction of Roads and Buildings, stipulate in part 7, paragraph 74, and part 8, paragraph 98, that light and ventilation window area should be no less than 10 percent of the floor area of rooms. Given the hot, dry climate, it is suggested that in modern designed, new buildings:

- Each habitable room have at least one window open on the outdoors to adequately light and ventilate the room, such that the total window area be no less than 15 percent of the floor area of the room.
- Bathrooms, lavatories, and kitchens should have light and ventilation openings, such that the total minimum light and ventilation area be no less than 10 percent of the floor area of the room.

A certain amount of leeway should be afforded in the interpretation and application of national regulations to traditional construction, since these regulations are mainly intended for new construction which, as already noted, is along modern design.

(3) Health and Sanitation Requirements:

Every dwelling should have an adequate plumbing system connected to a potable water supply, and to a public drainage and sewerage system, or any other disposal system approved by the municipality. The required plumbing fixtures in a dwelling unit should be specified and should include, as a minimum, a lavatory, a water closet, and a kitchen sink.

Great care should be taken in the location and design of the capacity of soak-aways, septic tanks, cesspools, and leaching fields to avoid oversaturation and unhygienic conditions, as soils become choked up with effluent. It is clear that Section 7, paragraph 84, of the

A-0 INTRODUCTION

Planning standards and community facility design criteria are studied and summarized in this chapter. They are given here as a set of guidelines for facility planning and community grouping strategy. Obviously planning standards should vary from one locality to another reflecting different local needs and conditions. Standards should also vary from one state to the next in the development process reflecting the different constraints of each stage of development. Meanwhile standards applicable to relatively wide ranges of situations are also needed before a locally specific set of standards is created. The general standards are needed to determine or reflect policies for the region or areas covering more than one city. The study here was intended to create a set of standards with ranges wide enough to reflect all of the five cities' situations yet narrow enough to function as a guideline for the relatively detailed community planning. The standards provide recommended rigid target figures as well as their acceptable ranges providing strong guidelines whenever needed, as well as flexibility to adapt to local conditions. The standards are based on our understanding of the planning area and our general knowledge and philosophy gained through experience in other projects.

The standards for most items (such as service radius, population served and required land) depend on residential density and overall population size. In the first section of this appendix, the characteristics of population and its density are summarized for the five cities for both existing and future situations, providing the basic background reasons for the range of standards and the population grouping described in the later sections. In the second section, planning standards are described for each type of facility. They contain, as mentioned above, the recommended target numbers and their acceptable ranges. The third section presents a hypothetical example of a city of 60,000 and the distribution of land uses required.

should reflect this fact. The standard is to be applied not to the large city of population over 100,000 nor is to be applied to the small rural village of population less than 10,000. The standard here, therefore, should cover mainly the population group scale of normally called "Neighborhood" scale (population of order of 10^3) and normally called "Community" scale (population of order of 10^4). The population group scale normally called "Region" (population of order of 10^5) should also be discussed but the former two scales should be given more emphasis.

It should also be noted that the expected population increase for each city is over 100% in average and some city like Bishah is expected to grow over 200%. In this kind of rapid growth usually the protection of group privacy becomes seriously difficult due to the fact that, for example, the once quiet residential neighborhood is bisected by the traffic which should belong to much higher level of grouping order than neighborhood or it is exposed to the regional traffic with unacceptable proximity without any buffer. The standard should cover the problem related to this matter i.e. standards for buffer zone, street hierarchy and group privacy dealing with the rapid growth of the cities.

Table A-1-1
SURVEY POPULATION^a 1975 and 1995

	1975 ^b	1995 ^c	Increase
Abha	21,900	66,000	200%
Khamis Mushayt	29,300	85,000	190%
Najran	27,200	59,000	120%
Jizan	22,200	41,000	80%
Bishah	7,900	23,000	190%
Nimas Village Cluster	7,100	11,640	164%

- Notes: a. Population for KTU survey area only (not necessarily represent "city population")
 b. Southern Region Project Study, Existing Conditions
 c. Southern Region Project Study, KTU estimate, in the area inside of KTU socio economic survey area.

A-1 DEMOGRAPHIC AND DENSITY FRAME FOR STANDARDS

A-1-1 OVERALL POPULATION SIZE

Table A-1-1 shows population of five cities in 1975 and 1995. In 1995 each of five cities has population of somewhere between 30,000 to 70,000. The planning standards to be described

themselves without their own land to carry out public purpose projects, both in terms of the immediate expansion of the urbanized area, as well as in terms of future growth. Consequently, it would be highly desirable for municipalities to retain ownership of some land in and around the urban area, to a radius anticipating future road networks.

This would enable them to:

- (1) Control development in the fringe area, by preventing speculative holding of strategic or extensive parcels;
- (2) Preserve land for future public purpose projects, with the assurance that it is in appropriate locations and of adequate size.

Land supply reserved should cover needs as set in the master plan for a period of five to ten years, to ensure that development will occur in accordance with the public interest. The official master plan will determine the amount of space needed for each land use, as well as the location, rate, and timing of development to ensure efficient regional and local growth patterns.

In the absence of taxation as a tool for controlling urban land uses and values, the accumulation of public land reserves to meet future development needs is crucial. Under the stipulations of existing regulations and directives, the Deputy Ministry of Town Planning Affairs and its regional branch office can be empowered to advise on municipal land policy; namely:

- (1) Identify those parcels currently in public ownership which should be held as land reserves. Where necessary, municipal boundaries should be extended to allow them to hold adequate land reserves.
- (2) Determine those parcels currently in private ownership which should be purchased.
 - (a) When areas designated on the master plan for public purpose uses programmed in the immediate future include land in private ownership, acquisition procedures should be promptly initiated in order to avoid environmental deterioration and depriving owners of the effective use of their properties.
 - (b) For deferred development needs, alternative sites within the general area should be considered to forestall the necessity of resorting to eminent domain procedures.
- (3) Define land disposal strategy, so that land is released for private sale and public purpose projects to ensure successful implementation of master plans. In contrast to recent trends in

the west, it seems that publicly owned land offered for development should be transferred to private ownership, as is presently the practice. This will avoid compounding the land-related problems of municipalities by the addition of administrative responsibility for leased property. The mere task of record-keeping would largely offset any potential benefits, such as retention of some legal control or gains in land value for the State.

- (4) Impose appropriate restrictions on land transferred to private use, to ensure its development in accordance with master plan objectives. Some restrictions already exist. A time limit of one year for starting the construction of the specified project subject to confiscation of the land is stipulated in Directives Number 1/1/1/4/Q/2500/3, dated 13/8/1387 A.H. and subsequent Directives related to the sale of government-owned vacant land. Other restrictions, relating the size of plots to zoning, and under the subdivision regulations, should be added; for example, to ensure adequate provision of land for community facilities or desired architectural appearance, two issues which are not covered by existing regulatory measures.

13-3-7 PLANNED DEVELOPMENTS

Large-scale projects containing 150 or more dwelling units should be considered and treated as single systems. These planned developments provide opportunities for a variety of creative designs in the arrangements and relationships of buildings and land-uses. Full documentation pertaining to proposed developments should be submitted to the Planning Office for review, and approval should be granted, subject to all conditions necessary to ensure conformance with the character and nature of the zoning district in which it is located, as well as compatibility with adjoining uses.

As a general rule these new developments would consist of:

- (1) A variety of residential building types, with the provision that:
 - (a) the dimensional requirements specified by the zoning regulations for each residential district, that normally contains each building type, shall be observed; and
 - (b) the overall density of occupancy of large-scale projects shall not exceed one person per 15 square meters.

Regulations for the Construction of Roads and Buildings, which currently specifies a minimum of 20 meters between cesspools and potable water wells, is highly inadequate and should be revised. Furthermore, the application of uniform, national standards to sanitation problems is questionable. This is due to the fact that the absorptive capacity of soils varies greatly within the Kingdom, and even within a particular region, or an individual municipality. National or regional regulations should therefore be limited to establishing performance standards, while local regulations specify the necessary details of type, capacity, and location. Local regulations should take into account:

1. the existence or planned construction of a sewage system;
2. the leaching capacity of soils in various sub-areas of the municipality;
3. the existence and efficiency of a sewage pumping fleet; and,
4. allowable densities of development.

appendix: community planning standards

Department of Community Planning and Development

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A-1-2 POPULATION DENSITY

Table A-1-2 (a) summarizes the 1975 and 1995 population densities for the five cities. The Table indicates that density is low in overall city area in 1975 and therefore, in the next twenty years "in-fill" type of development is possible and recommended rather than "sprawl" type of development. The planning standards should reflect this fact. Unnecessarily low density developments in the central area should be discouraged or prohibited through these standards.

From Table A-1-2(a), following approximations are made:

1. Each city as a whole has a density of 10 pph (person per hectare) to 40 pph in 1975, and estimated density in 1995 is somewhere between 20 and 120 pph.
2. Each city's central district (approximately 100 to 200 ha area) has a density of 50 to 150 pph.
3. Each city's highest density zone (approximately 10 to 40 ha area) has a density of 100 to 200 pph.

It is also assumed that the central district density will increase from 50 to 75% and the density of a city's highest density zone may increase up to 200 pph due to the limited availability of land and of the peripheral area. If no renewal is done, no density increase is expected in the central zone. The standards should be written with a wide enough range to enable planning within the density ranges listed.

Table A-1-2(b) summarizes the density range used for the determination of planning standards.

A-1-3 SCHOOL AGE GROUP DISTRIBUTION

Table A-1-3(a) shows the per cent share per age of children in the total population. The numbers are based on the results of the 1975 5% Sample Survey. From this table it is apparent that there are 3 to 4 (3.01 to 4.20, to be exact) children per age per 100 population for the age group 0 to 9, and there are 2 to 2.5 (1.95 to 2.69, to be exact) children per age per 100 population for the age group 10 to 19. An analysis of the existing conditions indicates that the population pyramids in the cities of the Southern Region do not have normal, stabilized characteristics due to a lack of working age population. In a normal and growing population, approximately 3% and 2.5% of the total population are estimated for the age group of 0 to 9 and 10 to 19, respectively.

Presently larger numbers of children exist in

Table A-1-2(a)
POPULATION DENSITY 1975 and 1995 (pph)^a

	CITY AVERAGE		CENTRAL DISTRICT		HIGHEST DENSITY ZONE	
	1975	1995	1975	1995	1975	1995
Abha	20 (1100 HA)	60	50 (150 HA)	150	150 (10 HA)	200+
Khamis Mushayt	40 (720 HA)	120	100 (230 HA)	150	200 (10 HA)	200+
Najran	10 (3400 HA)	20	100 (70 HA)	150	100 (40 HA)	200+
Jizan	40 (500 HA)	80	150 (100 HA)	150	200 (10 HA)	200+
Bishah	20 (470 HA)	60	50 (100 HA)	150	100 (20 HA)	200+

Note: a. From Southern Region Study, Existing Conditions. The nearest multiple of 10 and 50 in "City Average" column and other columns respectively. City areas are defined as the 5% sample survey areas.

Table A-1-2(b)
APPLICABLE DENSITY RANGE FOR PLANNING STANDARDS

	DENSITY RANGE (pph)	EXAMPLE
Low Density	Up to 50	1975 City Average
Low-Medium Density	50 to 100	1975 Central District 1995 City Average
Medium Density	100 to 200	1975 Highest Density Zone 1995 Central District
High Density	200 and up	1995 Highest Density Zone

these five cities than in normal cities. In the future, this deviation may be reduced by regaining working age populations back to these cities. Table A-1-3(b) indicates the range of children population taken into consideration in the determination of the standards.

Analysis of the existing distribution of the numbers of boys and girls indicates that boys and girls number basically the same for each age group, and the standards do not need to differentiate between the two, although ratio of school enrollment may differ between the sexes.

Table A-1-3(a)
POPULATION OF AGE GROUP 0 TO 19 IN THE FIVE CITIES^a
NUMBER OF CHILDREN PER AGE OUT OF 100 POPULATION
EXISTING CONDITIONS IN THE FIVE CITIES

AGE GROUP	ABHA	BISHAH	JIZAN	KHAMIS MUSHAYT	NAJRAN	AVERAGE	CASE
0 TO 9	3.5	3.9	3.0	3.9	4.0	3.7	3.0
10 TO 19	2.3	2.5	2.7	2.0	2.1	2.5	2.5

NOTE: a. Southern Region Project Study, Existing Conditions

Table A-1-3(b)
APPLICABLE RANGE OF CHILDREN POPULATION FOR PLANNING STANDARDS

AGE GROUP	NUMBER OF CHILDREN OUT OF 100 POPULATION
0 TO 9	3 TO 4 Children/age
10 TO 19	2 TO 3 Children/age

Based on the Table A-1-3(b), Nursery-Kindergarten enrollment is desired as following:
If Nursery-Kindergarten (ages 3 to 5) enrollment is 25 or 50% of the total population of that age group, the enrollment may be calculated to be between 2.25% and 6.0% of the total population as shown below:

	25% ENROLLMENT	50% ENROLLMENT
3% per age x 3 ages = 9%	9% x 25% = 2.25%	9% x 50% = 4.5%
4% per age x 3 ages = 12%	12% x 25% = 3.0%	12% x 50% = 6.0%

Also based on the Table A-1-3(b), Elementary School enrollment is derived as following:
Elementary School age group is 6 through 11 and the enrollment rate should be very close to 100% for both boys and girls. Therefore 16% to 22% of the total population may be estimated for elementary school enrollment (total of boys and girls) as shown in the following calculation:

$$3\%/\text{Age} \times 4 \text{ ages (6,7,8 and 9)} + 2\%/\text{Age} \times 2 \text{ ages (10,11)} = 16\%$$

$$4\%/\text{Age} \times 4 \text{ ages (6,7,8 and 9)} + 3\%/\text{Age} \times 2 \text{ ages (10,11)} = 22\%$$

Intermediate School age group is 12 through 14, and close to 100% of the age group population should be enrolled. Intermediate School enrollment thus is estimated to be somewhere between 6% and 9% (total of boys and girls) of the total population (See below):

$$2\%/\text{Age} \times 3 \text{ ages (12,13 and 14)} = 6\%$$

$$3\%/\text{Age} \times 3 \text{ ages (12,13 and 14)} = 9\%$$

For secondary schools, enrollment in 1995 is assumed to be somewhere around 37.5% of the age group population (15,16 and 17). Secondary school enrollment is expected to be somewhere between 2.25% and 3.38% of the total population.

$$2\%/\text{Age} \times 3 \text{ ages (15,16 and 17)} \times 37.5\% = 2.25\%$$

$$3\%/\text{Age} \times 3 \text{ ages (15,16 and 17)} \times 37.5\% = 3.38\%$$

A-1-4 SUMMARY OF DEMOGRAPHIC AND DENSITY FRAMEWORKS

The key elements to be taken into consideration of planning standards which have been discussed individually, are analyzed in a combined way. Table A-1-4 shows potential population grouping on the left hand side, density and enrollment ranges across the top, and the combined implications on the contents of the table. The combined implications are in terms of land area requirements for each population group, service radii, and school enrollments.

Table A-1-4
SUMMARY OF POPULATION GROUP, DENSITY, AND ENROLLMENT

POPULATION GROUP RANGE	DENSITY RANGE		RANGE OF ENROLLMENT				INTERMEDIATE SCHOOL		SECONDARY SCHOOL		
	50pph	100pph	200pph	2.25%	6.0%	16.0%	22.0%	6.0%	9.0%	2.25%	3.38%
500	10 ^a (178) ^b	5 (126)	2.5 (89)	12 ^c	30	80	110	30	45	11	17
10 ³ =1000	20 (252)	10 (178)	5 (126)	23	60	160	220	60	90	23	34
5000	100 (564)	50 (399)	25 (282)	115	300	800	1100	300	450	112	169
10 ⁴ =10000	200 (798)	100 (564)	50 (399)	230	600	1600	2200	600	900	225	338
50000	1000 (1784)	500 (1261)	250 (892)	1150	3000	8000	11000	3000	4500	1125	1690
10 ⁵ =100000	2000 (2523)	1000 (1784)	500 (1261)	2300	6000	16000	22000	6000	9000	2250	3380

Notes: a. Land Area for Group Population in Hectares.
b. Service Radius in m.
c. School Enrollment

The table indicates that a population of 10^{3a} (i.e. an a-multiple of population group 10³) provides a normally acceptable range of elementary school enrollment per school when the value of a is between 2.5 and 5, and the resulting elementary school enrollment (160a to 220a) is 400 to 1100. In this case the service area (20a to 5a) is 100 ha to 12.5 ha, and its radius from the center to the edge is 600m to 200m (for densities between 50 pph and 200 pph) which is equivalent to 10 to 3 minute walking distance. If one elementary school (if boys' and girls' schools are counted separately, then two schools) is located in this territory then both the number of enrollment per school and the walking distance to the school are acceptable to the standards recommended.

The table also indicates that a population of 10^{4b} (i.e. a b-multiple of population group 10⁴) provides a normally acceptable range of intermediate school students per school when the

value of b is between 1 and 2, and the resulting intermediate school enrollment (600b to 900b) is 600 to 1800. In this case the service area (200b to 50b) is 400 ha to 50 ha, and its service radius is 1200m to 400m (for the densities between 50 pph and 200 pph) which is equivalent to 20 minute to 6 minute walking distance. If one set of boys' and girls' intermediate schools is located in this territory then both the number of enrollment per school and the walking distance to the school are within the acceptable range of the standards recommended.

The table also shows that a population of 10^{4b} (i.e. a c-multiple of population group 10⁴) provides a normally acceptable range of secondary school enrollment per school when the value of c is between 2 to 4, and the resulting enrollment (225c to 338c) is 450 to 1352. In this case, the service area (200c to 50c) is 800 ha to 100 ha and the service radius is 1600m to 560m (for the densities between 50 pph to 200 pph) which is equivalent to 25 to 8 minute walking distance. If one set of boys' and girls' secondary school is located in this territory then both the number of enrollment per school and the distance to the school are acceptable to the standards recommended.

From these findings, the following observations may be made for the densities and population characteristics of the cities in the region:

1. Elementary School oriented territory includes a population of 2,500 to 5,000 (3,750 represents the range as typical).
2. Intermediate School oriented territory includes a population of 10,000 to 20,000 (15,000 represents the range as typical).
3. Secondary School oriented territory includes a population of 20,000 to 40,000 (30,000 represents the range as typical).

Obviously the standards recommended are not so restrictive as to exclude possibilities other than those listed above. However, the range definition is justifiable not only because of the acceptability of the key standard elements normally used by the consultant but also because of the convenience in establishing a hierarchical order of population grouping. As mentioned in A-1-1 of this section, the grouping of population with order of 10³ is conventionally called "Neighborhood" and the grouping of population with order of 10⁴ is called "Community". The elementary school oriented territory defined above corresponds to a "Neighborhood" and the intermediate and secondary school oriented territories correspond to a "Community". Taking

these traditional names and the hierarchical, structural character of the grouping into consideration, the following pattern and names are used:

Table A-1-5
SUMMARY TABLE OF POPULATION GROUPING

GROUPING LEVEL	NAME OF GROUPING	TYPICAL POPULATION
G ₀ (Level 0)	Residential Unit Group	250
G ₁ (Level 1)	Sub-Neighborhood	937 (Say 1000)
G ₂ (Level 2)	Neighborhood	3,750 (2,500 to 5,000)
G ₃ (Level 3)	Sub-Community	15,000 (10,000 to 20,000)
G ₄ (Level 4)	Community	30,000 (20,000 to 40,000)

G₀ and G₁ represent sub-areas of a neighborhood to function as the smallest units of territories for intimate social activities.

A "Residential Unit Group", as the smallest grouping, provides at its center a tot-lot and seating areas for the approximately 250 residents who live in the vicinity. The service radius and scale are so small and intimate that these shared outdoor spaces are conceived almost as extensions of living room activities.

A "Sub-Neighborhood" provides nursery-kindergarten and other facilities whose immediate accessibility from the residential area and whose sense of spatial intimacy is crucial. Using Table A-1-4, it is estimated that each G₀ group has a territory of 5 ha to 1.25 ha with a radius of 120m to 60m (2 to 1 minute walking distance); each G₁ group has a territory of 20 ha to 5 ha with a radius of 250m to 125m (i.e. 4 to 2 minute walking distance), and 23 to 60 nursery-kindergarten enrollment.

The following sections assume these basic grouping ideas as guidelines. The ideas in this section, in turn, were influenced by a study of each set of standards summarized in the next section.

A-2 PLANNING STANDARDS FOR EACH FACILITY

A-2-1 PLANNING STANDARDS FOR EDUCATIONAL FACILITIES

A-2-1-1 NURSERY-KINDERGARTEN

Age of Children:	3 through 5
Enrollment:	25% to 50% of age group population is enrolled. 9% to 12% of the total population is in this age group. Therefore, 2.25% to 6% of the total population is enrolled.
Population Served:	Approximately 1000 with an acceptable range of 500 to 1,500.
Size of Facility:	40 pupils/school with an acceptable range of 20 to 80.
Radius of Area Served:	Maximum 200m (3 minute walking distance) is recommended. 600m (10 minute walking distance) is also acceptable if density is less than 50 pph.
Sub-Unit:	20 pupils/class (3 year old); 25 pupils/class (4 year old); 30 pupils/class (5 year old). 1 nurse and 1 assistant for each class are recommended.
Land Area Requirement:	5m ² /pupil is recommended (3m ² to 7m ² /pupil is acceptable) for building area and service area. For play area (see next section, "Nursery-Kindergarten Playlot".)
Floor Area:	3m ² /pupil is recommended (2m ² to 4m ² /pupil is accepted).
Location:	It shall be closely located to the center of gravity of residential sub-neighborhood and away from major traffic. Play lot is either a part of or closely located to it.
Other Requirement:	3 and 4 year old children could be separated from the 5 year old children if there is room. (Although ages are close, there is a substantial difference of activity between the two groups.) Mixed for boys and girls.

A-2-1-2 ELEMENTARY SCHOOL FOR BOYS

Age of Children:	6 through 11 (8% or 11% of total population) Boys only
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Enrollment: Close to 100% of age group population is enrolled. 8% to 11% of the total population is enrolled (boys' school). Ministry of Education Standards (M. E. Standards) indicates that 10% of the total population is equal to the expected enrollment for boys' elementary school.

Population Served: 3,750, say 4,000, is recommended. 2,500 to 5,000 is acceptable. (Even a further deviation may be acceptable with good planning reasons.)

Size of Facility: 375 enrollment (boys only) is recommended. 200 to 550 is acceptable. (M. E. Standards indicate 450 pupils/school = 30 pupils/classroom x 15 classrooms.)

Radius of Area Served: Maximum of 300m (i.e. 5 minute walking distance.) 600m (10 minute) is also acceptable. If density is less than 50 pph, and a school bus system is developed, then further expansion of the radius is also acceptable.

Sub-Unit: 30 pupils/class is recommended. 20 - 40 pupil/class is also acceptable. (M. E. Standards indicate 30 pupils/class and 15 classes/school.)

Land Area Requirement: 12m²/student is recommended for building and site area.* (12m²/student x 375 student = 0.5 ha) plus 400m² for play area for lower grades exterior activity is recommended. Playground for upper grade athletic program is located either in, or close to, the school site. Playground standard is given later. Minimum width of site is 80m. But less than 80m is also acceptable if accompanied by an acceptable layout plan. (M. E. Standards recommend 100m x 100m site; 80m x 95m as minimum.)

Floor Area: 4.5m²/student, i.e. 1700m²/375 student is recommended. 3m² to 6m²/student is also acceptable depending on the degree of programs for non-classroom facilities such as library, special purpose rooms and indoor athletic play facilities.

Location: It should be situated in the center of grouping Level 2, i.e. "Neighborhood". It should be accessible by footpath from residential areas not interrupted by major auto traffic, even by the distributor roads. It should be separated from the girls' school.

Other Requirement: Playground should be a part of or close to the school. Elementary schools should be integrated with neighborhood shopping and neighborhood cultural facilities to create a multi-activity "Neighborhood center". Play area of the school should be fenced from the street.

A-2-1-3 ELEMENTARY SCHOOL FOR GIRLS

Age of population, population served, radius of area served and sub-units are the same as boys' schools. Locational requirements are similar to those of boys' elementary school. Site area for girls' elementary school is slightly small at present (M. E. Standards indicate a minimum site of 80m x 70m) and the rate of enrollment is also smaller than the rate for boys. The consultant, however, hesitates to recommend any smaller or lesser standards to girls' schools than boys' schools because of the urgent and strong necessity for girls' education in the kingdom.

A-2-1-4 INTERMEDIATE SCHOOL FOR BOYS

Age of Student: 12 through 14 (3.0 to 4.5% of total population; boys only)

Enrollment: Close to 100% of age group population is enrolled, therefore 3.0% to 4.5% of the total population is enrolled (boys). Although M. E. Standards indicate that 5% of the total population is to be enrolled for boys intermediate schools.

Population Served: 15,000 is recommended. 10,000 to 20,000 is also accepted. (Even wider range is accepted if good planning reasons exist.)

Size of Facility: 600 enrollment per school (boys) is recommended. 300 to 900 enrollment per school is also acceptable. (M. E. Standards indicate 30 students/class x 15 classes/school = 450 student/school.)

Radius of Area Served: Maximum 1200m (20 minute walking distance) is recommended. Larger radius is also accepted if density is less than 50 pph. In this case the acceptability standard should be provided on a case by case basis.

Sub-Unit: 25 to 30 students/class or homeroom (M. E. Standards recommend 30 students/classroom and 15 classrooms/school.)

Land Area Requirement: 20m²/student is recommended for the building and ground area. (20m²/student x 600 students = 1.2 ha) plus playfield which is either inside

NOTE: * School "building and site" area is the area within which school buildings, access drive-way, drop-off, parking areas, court and gardens, landscaped areas and other ancillary facilities are located. Athletic play ground (or play field) and formal paved play area are excluded from the "building and site" area.

of the school site or closely located to it.
 (See "Standards for Playfield" - Level 1.)
 Minimum width of site 80m with an acceptable
 building layout plan. (M. E. Standards recom-
 mend 100m x 100m but not less than 80m x 95m.)

Floor Area Require-
 ment: 6.5m²/student, i.e. 4200m²/600 students, is
 recommended. 5m²/student to 8m²/student is al-
 so acceptable depending on the degree of non-
 classroom facility (library, indoor sports) pro-
 grams.

Location: It should be situated in the center of grouping
 Level 3, i.e., "Sub-Community". It should be
 accessible either by footpath, lanes, alleys (V7),
 local access street (V6) or distributor road (V5)
 with sidewalks (See definition of V7 through V5
 in the "Road Standard" section) It should be
 separated from girls' school.

Other Requirements: Playfield - Level 1 should be a part of or close
 to the school; it shall be used for intermediate
 school curriculum and also by the neighboring
 population for weekend and off-working-hour
 sports activities.

A-2-1-5 INTERMEDIATE SCHOOL
 FOR GIRLS

Age of population, population served, radius of
 area served, and sub-unit standards are the
 same as intermediate school for boys. Although
 the standards for girls' school are inferior at
 the moment, it is recommended that 100% enroll-
 ment up to intermediate school be mandatory not
 only for boys but also for girls. From this
 view point the standards for girls' school
 should be basically identical.

A-2-1-6 SECONDARY SCHOOL
 FOR BOYS

Age of Student: 15 through 17 (3 to 4.5% of total population;
 boys only).

Enrollment Assump-
 tions: 37.5% of the age group served is assumed to be
 enrolled (boys enrollment is assumed 50%, girls'
 enrollment is assumed 25%). Therefore, 1.50 to
 2.25% of total population is assumed to be en-
 rolled for boys' secondary schools. M. E. Stan-
 dards estimate that 2.5% of total population is
 enrolled for boys' secondary schools.

Population Served: 30,000 is recommended. 20,000 to 40,000 is al-
 so acceptable. (Even wider range is acceptable
 if good reasons exist.)

Size of Facility: 600 enrollment per school (300 to 900) is rec-
 ommended within the enrollment assumptions des-
 cribed above. (M. E. Standards indicate 30
 students/classroom x 18 classrooms/school = 480
 students/school.)

Radius of Area
 Served: Maximum 1600m (25 minute walking distance) is
 recommended. Larger radius is also acceptable
 if density is less than 50 pph. In this case
 the acceptability standard should be provided
 on a case by case basis.

Sub-Unit: 25 to 30 student/class (M. E. Standards recom-
 mend 30 students/class and 18 classes/school.)

Land Area Require-
 ment: 25m²/student is recommended for building and
 ground area (25m²/student x 600 student =
 1.5 ha). In addition to the building, the play-
 field should be provided next to or close to the
 school. (See "Standards for Playfield" - Level
 2.) Minimum width of site is 95m, but it could
 be less than that if acceptable building layout
 plans are provided. (M. E. Standards recommend
 100m x 100m but not less than 95m x 110m.)

Floor Area Require-
 ment: 7m²/student, i.e. 4200m²/600 students is recom-
 mended. 6m²/student to 8m²/student is also ac-
 ceptable depending on the degree of provision of
 non-classroom facility (such as indoor athletic
 facilities) programs.

Location: It should be situated in the center of grouping
 Level 4, i.e., "Community". It should be acces-
 sible by either footpath, lanes, alleys (V7), local
 access street (V6), distributor road (V5) or minor
 collector road (V3). It should not be directly
 accessible from the residential area through arte-
 rial road (V2 or V1).
 (See section on "Road Standard" for the definition
 of V7 through V1) It should be separated from
 secondary schools for girls.

Other Requirements: Playfield - Level 2 should be a part of or close
 to the school. It shall be used by secondary
 school curriculum by the neighboring population
 of "Community" for weekend and off-working hour
 sports activities.

A-2-1-7 SECONDARY SCHOOL
 FOR GIRLS

Age of population, population served, radius of
 area served and sub-unit standards are the same
 as those of secondary school for boys. Enroll-
 ment assumptions should be lower than the case
 for boys. The enrollment of girl students
 should in the future go higher and eventually as
 high as the boys. For the present planning pur-
 poses, it is assumed that 30% of the girls' will

be enrolled in the secondary school (instead of 50% for boys). 30% of age group means 0.9% to 3.16% of the total population is enrolled in a girls' secondary school.

A-2-1-8 TEACHERS' SCHOOL

Age of Student: Varies

Enrollment and Size of Faculty: M. E. Standards recommend 30 students/class x 24 classrooms/school = 720 students/school.

Population Served/Radius of Area Served: One Teachers' School for each city with population over 20,000.

Sub-Unit: 25 to 30 students/class.

Land Area Requirement: 30m²/student (2.1ha/720 students) (M.E. Standards require 100m x 100m for building and site area)

Floor Area Requirement: 8m²/student

Location: Directly accessible from the town center or from an arterial road leading to the town center.

Other Requirement: When college is established, the Teachers' School can be absorbed into it. Athletic field should be easily accessible.

A-2-1-9 TECHNICAL SCHOOL

Age of Student: Varies but over 15.

Enrollment and Size of Facility: M. E. Standards recommend 30 students/class x 24 classes/school = 720 students/school.

Population Served/Radius of Area Served: One technical school for each city with population of 20,000 or more.

Sub-Units: 25 to 30 students/class.

Land Area Requirement: 30m²/student (2.1ha/720 students.)

Floor Area Requirement: 8m²/student. (M. E. Standards require 100m x 110m for building and site area)

Location: Directly accessible to the town center or accessible from an arterial road leading to the town center.

A-2-1-10 TECHNICAL SCHOOL FOR GIRLS INCLUDING SEWING LEARNING PROGRAM

Age of Student: Varies but over 15.

Population Served/Radius of Area Served: One female technical school for each city with population of 20,000 or more.

Land Area Requirement: 1 ha recommended. Minimum 80m x 70m.

Floor Area Requirement: 7m²/student.

Location: Accessible from the city center or from an arterial road leading to the center.

A-2-1-11 COLLEGES

Age of Student: 18 to 21 or 18 to 19.

Population Served: The first college at Abha by 1980. By 1995, Jizan, Khamis Mushayt and Najran will also have one college each.

Size of Facility: Average size of 1,000 students.

Land Area Requirement: 100m²/student to 50m²/student.

Floor Area Requirement: 15m²/student excluding dormitory facilities. (If dormitory is needed then 25m²/dormitory resident is additionally needed.)

Location: Accessible from the city center through arterial road. Locate as closely as possible to the city's central cultural area so that cultural-educational facility of the college is shared by the community.

A-2-1-12 SPECIAL COLLEGE

Age of Student: 18 to 21 or 18 to 19.

Population Served: The first special college (for medicine, agriculture and engineering) at Abha by 1995 serving the regional population.

Size of Facility: Average size of 600.

Land Area Requirement: 100m²/student excluding dormitory facilities.

Location: Located on regional arterial road or major arterial road connecting to and situated close to the city center.

A-2-2 PLANNING STANDARDS FOR RECREATIONAL AND ATHLETIC FACILITIES

A-2-2-1 TOT-LOT

Main Population: Pre-school children 2 years old to 5 years old and their supervising adults (mothers).

Main Function: Infants' exterior play, supervising adults' seating, conversation, and evening stroll.

Size of Population Served: Approximately 250. 12 to 16% of the total population, i.e. 30 to 40 is in ages 2 through 5.

Radius of Area Served: Maximum 120m (2 minute walking distance) is recommended. If density is less than 50 pph, 300m (5 minute walking distance) is acceptable.

Land Area Requirement: 500m²/lot is recommended. 300m² to 1000m²/lot is also acceptable.

Location: Situated in the center of each residential group unit (or grouping level of G₀ as defined in A-1-4) directly accessible from each unit without crossing any street or preferably even group parking spaces or access lane. It should be bordered by residential units or pedestrian activities but not by parking or streets.

Other Requirement: Infant play area and seating area should be arranged in such a way as to enable adult surveillance over the infants at play. Enough planting and shaded area should be provided. Play area should be visible from as many dwelling units as possible for the adults in house to survey their children at play in the tot-lot. Connected to the nearest nursery-kindergarten playlot by footpath through narrow but well controlled exit point.

A-2-2-2 NURSERY-KINDERGARTEN PLAYLOT

Main Population Served: 3 to 5 year old children enrolled in nursery-kindergarten. It also serves surrounding infants, accompanied by adults, and lower grade

elementary school children during off-school hours.

Main Function: For nursery-kindergarten outdoor play or for organized group play for pre-school children.

Size of Population Served: Approximately 1,000 inhabitants. 2.25% to 6% of the total population is enrolled in the nursery-kindergarten (See "Standards for Nursery-Kindergarten" in the previous section).

Radius of Area Served: Maximum 200m (3 minute walking distance) is recommended. 600m (10 minute walking distance) is also acceptable if density is less than 50 pph.

Land Area Requirement: 2000m² is recommended. 1000m² to 3000m² is also acceptable.

Location: Situated in the center of "Sub-Neighborhood" (See "Nursery-Kindergarten Standards".)

Other Requirement: Integral part of kindergarten design. Footpath connection to surrounding small scale tot-lots should be provided. Should not be bordered by major traffic. If bordered by any auto traffic, fences should be provided. Play pool for children may be included.

A-2-2-3 NEIGHBORHOOD PARK

Population Served: All inhabitants in the "Neighborhood", all age groups.

Main Function: General recreation. Preservation of natural environment in the neighborhood. Common garden for neighborhood residents.

Size of Population Served: 3,750, say 4,000, is recommended. 2,500 to 5,000 is accepted.

Radius of Area Served: Maximum 300m (i.e. 5 minute walking distance) is recommended. 600m (10 minute) is also acceptable. If density is less than 50 pph and access path to the park is designed over a long distance and properly separated from auto traffic, then radius may be extended.

Land Area Requirement: 5m²/inhabitant is recommended; 2m² to 10m²/inhabitant is also acceptable.

Location: Situated in the center of "Neighborhood" (grouping Level G₂). Should not be surrounded or bordered by major traffic (street classification of "collector road" or higher).

Other Requirement: Connected to major neighborhood level facilities (such as elementary school, neighborhood shopping, small mosque, etc.) by footpath without crossing major traffic. Park itself could be stretched along such a path to create a linear park along which neighborhood facilities can be clustered. Trees, green areas, seating areas with benches and paved paths should be provided. Recreational adult swimming pool with ancillary facilities may be provided.

A-2-2-4 PLAYGROUND

Main Population Served: Primarily elementary school children at school time. Secondarily other inhabitants at off-school-hours and weekends.

Main Function: Active play and game for elementary school athletic programs.

Size of Population Served: 3,750, say 4,000, is recommended. 2,500 to 5,000 is acceptable. 750 children (400 to 1,100 in range) per playground are expected, of which half are boys. Boys' and girls' playground are separated and each should be located in or close to the school.

Radius of Area Served: Maximum of 300m (i.e. 5 minute walking distance) is recommended. 600m (10 minute walking distance) is also acceptable. When density is less than 50 pph, longer service radius is acceptable if safe and pleasant access to the playground is provided.

Land Area Requirement: 20m²/elementary school student is recommended. 10m² to 30m²/elem. school student is acceptable.

Location: Situated at the center of the "Neighborhood" (See "Elementary School Standards"). Situated in convenient proximity to both boys' and girls' elementary schools.

Other Requirement: Designed as an integral part of an elementary school. Connected to the elementary school and residential zone on footpath crossing no major traffic. Off-school time usage by the adult population is recommended and elementary school utilities such as water-drinking and toilet should be available for those adults. Enough pavement space should be provided for medium size sports activities such as basketball, tennis, etc. Childrens' pool, fenced and equipped with locker room and shower can be provided as a part of the playground program or a part of school program.

A-2-2-5 COMMUNITY PARK OR SMALL CITY PARK

Population Served: All residents of the "Community" whose population range is 20,000 to 40,000 (30,000 as average).

Main Function: Passive recreation on a weekly to monthly participation basis (not daily use) to be integrated with cultural, religious facilities. It also functions as a linear connector of "Community" level facilities.

Size of Population Served: 30,000 is recommended. 20,000 to 40,000 is acceptable.

Radius of Area Served: Maximum 1000m (15 minute walking distance) is recommended. 1600m (20 minute) is also acceptable. When density is less than 50 pph, longer service radius may be acceptable if the park penetrates into the residential zones as a linear park to provide safe and pleasant footpath to the center of the park.

Land Area Requirement: 4m²/inhabitant is recommended. 2m² to 6m²/inhabitant is acceptable.

Location: Situated in the center of a "Community" whose population range is 20,000 to 40,000. It should be located between two sub-community centers in order to connect them and to create a park-open space spine in the middle of which the "Community" center is located.

Other Requirement: Fruit trees or agricultural land use could be used as a part of community park function since a part of the function is as visual relief or visual buffer between two adjacent subcommunities. Where community park comes in contact with community commercial (or shopping) area, the park design should reflect an "urban park" where extensive pavement and landscaping are concentrated in a limited area.

A-2-2-6 PLAYFIELD - LEVEL 1

Main Population Served: Primarily for intermediate school students at school hour; secondarily, for other inhabitants in the "Sub-Community" at off-school-hours or weekends.

Main Function: For athletic curriculum activities of intermediate schools (boys and girls). Practice field for "Sub-Community" sports club or sports team activity.

Size of Population Served: 15,000 is recommended. 10,000 to 20,000 is acceptable. 600 to 1800 intermediate school enrollment (boys plus girls) is assumed in the service area.

Radius of Area Served: Maximum 1200m (20 minute walking distance) is recommended. When density is less than 50 pph, longer radius is acceptable if bus service is provided the areas beyond the recommended walking distance.

Land Area Requirement: 30m²/intermediate school student is recommended. 20m² to 40m²/student is accepted.

Location: Situated at the center of a "Sub-Community", whose population range is 10,000 to 20,000, and in close proximity to or in integrated part of both boys' and girls' intermediate schools.

Other Requirement: Parking space should be provided for the adult field users (10 to 20 spaces). Official pavement sizes for game courts should be provided for sports requiring smaller spaces, such as tennis and basketball, but not necessarily full size official dimensions for the field and track. Boys' and girls' fields should be separated with enough distance. Swimming pool(s) can be provided with shower rooms and locker rooms.

A-2-2-7 PLAYFIELD - LEVEL 2

Main Population Served: Primarily for secondary school students at school hour; secondarily for the other residents in the "Community" off-school-hours or weekends.

Main Function: For athletic curriculum activity of secondary schools (boys and girls separately). Practice and competition or game for the community sports teams and clubs.

Size of Population Served: 30,000 is recommended. 20,000 to 40,000 is acceptable. 900 (450 to 1350) students per playfield are expected, 70% of whom are boys.

Radius of Area Served: Maximum 1000m (15 minute walking distance) is recommended; 1600m (20 minute) is also acceptable. When density is less than 50 pph, longer service radius may be acceptable if bus system and pleasant pedestrian path are provided to cover the "Community" and if ample parking space is provided.

Land Area Requirement: 50m²/secondary school student. 40m² to 60m²/student is also acceptable. Minimum land area is 4ha/playfield.

Location: Situated at the center of a "Community" whose population range is 20,000 to 40,000 and in close proximity to both boys' and girls' secondary schools.

Other Requirement: Parking space should be provided for the adult field users and game spectators. Full size official dimensions for courts, track and fields. Simplified spectator seating area, either by stands or by banking should be provided. Boys' and girls' playfields should be separated with enough distance. Swimming pool with full official size can be provided with full ancillary activities (indoor and outdoor).

A-2-2-8 CITY PARK

Population Served: All residents and non-resident workers of a city with a population of 60,000 or more.

Main Function: Weekend family recreation for residents. Lunch time recreation for downtown workers. Park as an integral part of city's cultural and recreational center.

Size of Population Served: 40,000 or more. In 1995 all five cities with the exception of Bishah and Najran should have a "city park". Bishah and Najran will have a "Community Park" functioning as a "small scale city park".

Radius of Area Served: Entire city. Radius varies.

Land Area Requirement: 4m²/inhabitant is recommended. 2m² to 6m²/inhabitant is acceptable.

Location: Situated at the center of city with main cultural, community, and educational functions clustered around it.

Other Requirement: Historical district and architecture are to be integrated into the network of a city park. The park is conceived as a combination of a central park and its extended network to which the lower hierarchical park network is connected. Arena (enabling indoor sports, exhibition, theater, musical festival and other multi-purpose uses) should be integrated in the city park site.

A-2-3 PLANNING STANDARDS FOR RELIGIOUS FACILITIES

A-2-3-1 SMALL MOSQUE

Population Served:	75% to 100% of the adult male in the age group 15 and above (i.e. approximately 20% to 25% of the total population potentially attends one of the mosques in the city).
Size of Population Served:	One neighborhood mosque (small mosque) for every 3,750 inhabitants (potential attendance 800 to 1000 persons) is recommended. 2500 to 5000 inhabitants (500 to 1250 prayers) is acceptable.
Radius of Area Served:	Maximum 200m (i.e. 3 minute walking distance) is recommended. 600m (10 minute walking distance) is also acceptable.
Land Area Requirement:	0.2 to 0.3 ha/mosque.
Floor Area Requirement:	1.2m ² /person, i.e. 600m ² to 1500m ² .
Location:	Situated at the center of a "Neighborhood" with population of approximately 2500 to 5000.
Other Requirement:	Elementary school and neighborhood cultural facilities should be closely linked to the mosque to foster an integration of religious and educational functions.

A-2-3-2 JAMI'A MOSQUE

Population Served:	10% of the inhabitants of the service area.
Size of Population Served:	One Jami'a Mosque for each 15,000 inhabitants (i.e. approximately 1500 prayers) is recommended. 10,000 to 20,000 inhabitant range is also accepted (i.e. 1000 to 2000 prayers).
Radius of Area Served:	Maximum 1200m (20 minute walking distance) is recommended. Larger radius may be acceptable if density is less than 50 pph. In this case standards should be provided on a case by case basis.
Land Area Requirement:	0.6 to 0.8ha/mosque.
Floor Area Requirement:	1.2m ² /prayer (i.e. 1200 to 2400m ² /mosque) is recommended.

Location: Situated at the center of a "Sub-Community" with a population of 10,000 to 20,000.

Other Requirement: Intermediate schools should be close to the mosque in order to foster an integration of religious and educational functions.

A-2-3-3 EID MOSQUE

Population Served:	1 to 2% of the population in the served area; 20 to 25% of the total population should be included for the determination of land area.
Size of Population Served:	One for every 100,000 to 300,000 population. Therefore none of the cities in the southern region can justify an Eid Mosque due to a lack of population. Abha and Khamis Mushayt's combined population in 1995 is estimated to be 151,000 and will together require one Eid Mosque.
Radius of Area Served:	Not specified.
Land Area Requirement:	0.6m ² /prayer, i.e. 1.2 ha to 3.6ha/unit is recommended.
Other Requirement:	The mosque is a fenced open area; it is provided with a guard room and a storage.

A-2-4 PLANNING STANDARDS FOR SOCIAL AND CULTURAL ACTIVITIES

A-2-4-1 NEIGHBORHOOD CENTER

Size of Population Served:	3,750 (say 4,000) is recommended. 2,500 to 5,000 is acceptable.
Main Function:	General social interactions (meetings, elementary school PTA, games). Offices for a neighborhood association to program activities, maintenance, and utilization of parks and facilities. Supervision and coordination of sub-neighborhood activity and facilities. Adult education associated with elementary school facilities and small mosque activities (including a neighborhood library).
Radius of Area Served:	Maximum 300m (i.e. 5 minute walking distance) is recommended. 600m (10 minute) is also acceptable.

If density is less than 50 pph, maximum radius may be increased depending on the local condition.

- Land Area: 0.1 to 0.5ha/center. If the center abutts a neighborhood park and the park is directly accessible from the center, less than 0.1 ha is acceptable.
- Floor Area Requirement: 0.05m²/inhabitant (i.e., 125m² to 250m²) is recommended. 0.03 to 0.1m²/inhabitant is also acceptable.
- Location: Situated at the center of a "Neighborhood" whose population is in the range of 2,500 to 5,000. Close to the neighborhood park, playground, small mosque, and neighborhood shopping area.
- Other Requirement: Courtyards and other small scale exterior spaces for seating and visual relief should be provided. Footpath access from surrounding residential area without crossing any major traffic.

A-2-4-2 COMMUNITY CENTER

- Size of Population Served: 30,000 is recommended. 20,000 to 40,000 is acceptable; even wider range is acceptable if good reasons exist.
- Main Function: General social interactions for residents in the "Community" (meetings, adult education, social ceremonies, entertainment, cultural activity programs, PTA for intermediate and secondary schools). Offices for a community association to program activities for maintenance and utilization of community parks, community facilities, intermediate and high school facilities and playfields.
- Radius of Area Served: Maximum 1600m (25 minute walking distance) is recommended. Even larger radius is accepted if density is less than 50 pph, depending on the situation.
- Land Area Requirement: 0.2 to 1.0ha/center is recommended. If the center abuts a community park and direct access to it is available, less than 0.2 ha is also acceptable. In any case 0.1 ha is the minimum.
- Floor Area Requirement: 0.01m²/inhabitant (i.e. 200m² to 400m²) is recommended. 0.005m² to 0.02m²/inhabitant is also acceptable.
- Location: Situated at the center of a "Community" whose population range is 20,000 to 40,000. Close to

the community park, community shopping center, Jami'a Mosque, secondary school community museum, library, youth center (these could be a part of the community center) and playfield, Level 2.

- Other Requirement: Additional standards for potential components of community center:
- a. Community library: One for each 30,000 inhabitants (20,000 to 40,000). Land area 0.1m²/inhabitant if library is in an independent building and not a part of community building. If the library is located in the community center, the land area is increased by 0.05m²/inhabitant from the community center building land requirement. Floor area is 0.01m²/inhabitant.
- b. Community museum: Standard is identical to that of community library with the exception of museums located in a renovated old structure. In such a case, standards should be created on a case by case basis.

A-2-4-3 CIVIC CENTER

- Size of Population Served: 60,000 and over. One center for every city.
- Main Function: Cultural and social center for the city. Art gallery, exhibition hall, small arena, museum and auditorium are included.
- Radius of Area Served: Entire city and its vicinity. Radius varies.
- Land Area Requirement: 0.5m²/inhabitant (i.e. 3ha/60,000 inhabitants) or more. If the Civic Center is designed as an integral part of other downtown activities such as commercial areas, the land area requirement can be reduced to 0.25m²/inhabitant.
- Floor Area Requirement: 0.05m²/inhabitant (i.e. 300m²/60,000 inhabitants) is recommended, including art gallery, exhibition hall, arena-auditorium (these facilities can be put in one structure or in separate buildings) and other general and multi-purpose rooms.
- Location: Situated at the center of city with a population of 60,000 or over. Closely located to the administration-commercial center of the city and city park system.
- Other Requirement: Pedestrian zone should be clearly defined, eliminating auto traffic and providing in the city a pedestrian island of which the Civic Center is a core. Downtown historical artifacts should be preserved and maintained as a part of a Civic

Center-city park complex.

A-2-5 PLANNING STANDARDS FOR HEALTH FACILITIES

A-2-5-1 PHARMACY

Size of Population Served:	One general practitioner and/or pharmacy for every neighborhood of population size 2,500 to 5,000.
Main Function:	Outdoor treatment, diagnosis, and general treatment. Providing hospital information to the residents. Providing patient information to the community clinic and higher level hospitals.
Radius of Area Served:	Maximum 300m (i.e. 5 minutes walking distance) is recommended. 600m (10 minute) is also acceptable.
Land Area Requirement:	0.1ha/unit approximately.
Floor Area Requirement:	0.05m ² /inhabitant or more.
Location:	Situated at the center of a "Neighborhood". Access by footpath without crossing major traffic.

A-2-5-2 SUB-COMMUNITY DIAGNOSIS AND TREATMENT CENTER (INCLUDING RED CRESENT BUILDING)

Size of Population Served:	One for 15,000 (10,000 to 20,000 more or less) inhabitants.
Main Function:	Public health centers for general treatment and diagnosis and for red crescent program.
Radius of Area Served:	Maximum 1200m (20 minute walking distance) is recommended. Larger radius may be acceptable when density is less than 50 pph.
Land Area Requirement:	0.3m ² /inhabitant (i.e. 0.3ha to 0.6ha/center) is recommended.
Floor Area Requirement:	0.05m ² /inhabitant (i.e. 500m ² to 1000m ² /center) or more is recommended.
Location:	Situated at the center of a "Sub'Community" with a population of 10,000 to 20,000.

A-2-5-3 COMMUNITY/GENERAL HOSPITAL

Size of Population Served:	One for each city with a population over 30,000 more or less.
Main Function:	General hospital for normal treatment clinics, diagnosis and treatment, long term care, public health, nursing units, and emergency and firstaid.
Radius of Area Served:	Varies. The hospital serves not only the city population but also the surrounding suburban population.
Land Area Requirement:	0.5m ² to 1.0m ² /inhabitant is recommended (i.e. 2.5 ha to 5ha/hospital for a city with 50,000 inhabitants).
Floor Area Requirement:	3 to 4 beds/1,000 inhabitants is recommended. 20 to 40m ² /bed is recommended. (i.e. 3000m ² to 8000m ² /hospital for a city with 50,000 inhabitants.) 200 to 500 beds/hospital is generally recommended.
Location:	Close to the center of the city yet easily accessible from the main arterial and regional road for easy emergency access and easy access for the suburban population. Psychological, visual, and accoustical relief should be secured by not locating in the middle of the built-up areas.

A-2-5-4 SPECIAL HOSPITALS AND NURSING HOME

Size of Population Served:	One mental hospital for each 50,000 inhabitants or more. One special long term hospital for each 50,000 inhabitants or more. One nursing home for each 50,000 inhabitants or more.
Land Area Requirements:	0.1ha/1000 inhabitants for mental hospital or long term hospital. 0.02ha/1000 inhabitants for nursing home.
Floor Area Requirement:	5 beds/1000 inhabitants, and 20m ² to 45m ² /bed (mental hospital). 3beds/1000 inhabitants, and 20m ² to 45m ² /bed (special long term hospital). 1 to 2beds/1000 inhabitants, and 20m ² to 45m ² /bed (nursing home).

Table A-2-1
SPECIAL HOSPITAL REQUIREMENT IN SOUTHERN REGION
(PRESENTLY IDENTIFIED BY THE MINISTRY OF HEALTH)

	ASIR	JIZAN	BISHAH	NAJRAN	TIHAMA
CHEST DISEASE	1*	0	0	0	0
OBSTETRICS AND GYNECOLOGY	2	1	1	1	2
OPHTHALMOLOGY & OTOLARYGOLOGY	1	0	0	0	0
HOSPITAL FOR ACCIDENT	2	1	1	1	1
FEVER (COMMUNICABLE)	1*	1	0	0	0
PSYCHIATRY	1	0	0	0	0
LEPROSY	0	1	0	0	0
TOTAL	8	4	2	2	4

NOTE: * Existing Al-Asan Hospital is for both chest disease and other communicable (fever) diseases. In future, the fever hospital will be separated to the new location.

Table A-2-2
DOCTOR REQUIREMENT

1 General doctor for 40-50 patients
1 Special doctor for 10-15 patients
1 nurse for 4-6 patients

A-2-6 PLANNING STANDARDS FOR
COMMERCIAL FACILITIES

A-2-6-1 NEIGHBORHOOD SHOP-
PING CENTER

Size of Population Served:	4,000 inhabitants more or less. (2,500 to 5,000.)
Main Functions:	Food market, drugstore, bakery, barber shop, laundry and dry cleaning, hardware, stationery, restaurant, etc.
Radius of Area Served:	Maximum of 300m (i.e. 5 minute walking distance) is recommended. 600m (10 minute) is also acceptable. If density is less than 50 pph, a larger radius may be acceptable depending on the situation.
Land Area Requirement:	2 to 4m ² /inhabitant, i.e. 0.8 ha to 1.6ha/4000 inhabitants.
Floor Area Requirement (Sales Area):	0.25 to 0.5m ² /inhabitant (i.e. 1000m ² to 2000m ² /4000 inhabitants) is recommended.
Location:	Situated at the center of neighborhood with population size of 2,500 to 5,000 or along the local distributor road connecting the center of the neighborhood to the "Sub-Community" with a population of 10,000 to 20,000. Closely located to or integrated with neighborhood center, neighborhood park and other neighborhood facilities.
Other Requirement:	If a shopping center for a higher hierarchical group order exists in the vicinity, the neighborhood shopping center is incorporated into the larger shopping center. A portion of neighborhood shopping center could be substituted by the corner stores in the neighborhood. 1:1 parking (i.e. parking area : sales area = 1:1) is recommended. Less than 1:1 is acceptable if density is more than 100 pph.

A-2-6-2 COMMUNITY SHOPPING
CENTER

Size of Population Served:	30,000 inhabitants more or less.
Main Function:	Basic retail service to the "Community" population. Shops whose financial viability requires larger population than neighborhood population are located in the community shopping center (such as florist, shoe shops, giftshops, candy, lingerie, book stores, toys, childrens' wear,

radio and TV repairs, etc.). "Second Floor Office" could be included.

Radius of Area Served:

Maximum 1200m (20 minute walking distance) is recommended. Larger radius is also acceptable if density is less than 50 pph and ample parking space is provided.

Land Area Requirement:

0.5m² to 1.0m²/inhabitant is recommended. (i.e. 1.5 ha to 3ha/30,000 inhabitants.)

Floor Area Requirement (Sales Area):

0.1m² to 0.2m²/inhabitant (i.e. 3000m² to 6000m²/30,000 inhabitants) is recommended.

Location:

Situated at the center of community with population size of 20,000 to 40,000 or along the arterial road connecting community center to city center. Close to or integrated with community center, park and other community facilities.

Other Requirement:

When a regional shopping center or a downtown shopping center is in the vicinity, the community shopping center may be incorporated into the larger shopping center. 2:1 parking (i.e. parking area : sales area = 2:1). Less than 2:1 is acceptable if density is more than 100 pph.

A-2-6-3 SUB-REGIONAL SHOPPING CENTER

Size of Population Served:

100,000 inhabitants or more.

Main Function:

Downtown shopping center to serve the regional population. This could also be located along a major arterial extending from the city center. It will provide, in addition to the stores normally found in the neighborhood and community shopping centers, fashion goods, furniture, household equipment, women's apparel, etc.

Radius of Area Served:

City and its neighboring communities. Regional population beyond city and its surroundings also uses on a less frequent basis.

Land Area Requirement:

0.5m² to 1.0m²/inhabitant (i.e. 5 ha to 10ha/100,000 inhabitants) is recommended.

Floor Area Requirement (Sales Area):

0.1m² to 0.2m²/inhabitant (i.e. 10,000m² to 20,000m²/100,000 inhabitants) is recommended.

The following table indicates per capita sales areas for different sizes of the city popula-

tion (including neighborhood, community and regional shopping centers):

Table A-2-6-1
SALES AREA PER CAPITA

CITY POPULATION	COMPONENTS(m ² /inh.)	TOTAL(m ² /inh.)
4,000	0.25 to 0.5	0.25 to 0.5
30,000	0.25 to 0.5 plus 0.1 to 0.2	0.35 to 0.7
100,000	0.25 to 0.5 plus 0.1 to 0.2 plus 0.1 to 0.2	0.45 to 0.9

Building area is about 1.5 times the floor area.

Location:

Situated in the downtown area of major cities or along the regional arterials leading to the major city centers.

Other Requirement:

4:1 parking is recommended. 2:1 is also acceptable if located in the middle of downtown.

A-2-7 PLANNING STANDARDS FOR PUBLIC BUILDINGS

A-2-7-1 FIRE STATION

Population Served:

One for each community of population of 20,000 to 40,000 inhabitants.

Radius of Area Served:

In a high value district:
a. Maximum 1.5 km for engine companies.
b. Maximum 2.0 km for ladder companies.
In a normal residential district:
a. Maximum 3.0 km for engine companies.
b. Maximum 5.0 km for ladder companies.
In a high density residential district:
a. Maximum 2.5 km for engine companies.
b. Maximum 3.5 km for ladder companies.

Land Area Requirement:

Approximately 10m²/1000 inhabitants is recommended.

Floor Area Requirement:

3m²/1000 inhabitants is recommended.

Location:

In residential district, station should be located to the center. Additional stations

should be near extensive industrial or business districts and near districts where there is a high life hazard. An intersection of roads is a preferred station location.

Other Requirement: Water supply system with adequate pressure should be developed. Reserve capacity: 5-day reserve with maximum daily rate.

A-2-7-2 POST OFFICES

Population Served: One post office for each city. One branch post office for each neighborhood with a population of 2,500 to 5,000.

Radius of Area Served: Maximum 300m (5 minute walking distance) is recommended for branch office. 600m (10 minute) is also acceptable if density is less than 50 pph. A larger radius is acceptable depending on the situation.

Land Area Requirement: 0.2 ha to 0.4ha/city post office.

Floor Area Requirement: $2m^2/1000$ (i.e. $100m^2/50,000$ city). City post office should be located at city center. Branch post office should be located at the center of center of neighborhood with population range of 2,500 to 5,000. It can be located inside of the neighborhood center.

A-2-7-3 POLICE STATION

Population Served: One for each city with population over 50,000, i.e. at minimum a city of 50,000 inhabitants should have one police district with approximately 10 police. (1.5 to 2.0 police/1000 inhabitants.)

Radius of Area Served: 1000ha/district (1.8 km radius) or more at a density of 50 pph or less. At lower densities, service radius may be extended. Mobile unit is needed in any case.

Land Area Requirement: 0.2 to 0.4ha/district station.

Floor Area Requirement: $2m^2/1000$ inhabitants (i.e. $100m^2/50,000$ inhabitants).

Location: Situated in the center of town with comparable distances to different parts of its service population. Corner site is preferred for the convenience of the mobile unit.

A-2-7-4 GOVERNMENT OFFICES

Population Served: One for each city. The percentage of government employment to total population is in a range from 6% to 14% (at present the 5 city average is approximately 10%) of which it is assumed 3% to 7% (half) are in administrative sectors (excluding teachers, police, firemen, etc., who have normal place of work rather than offices), i.e. 2,500 to 3,750 are located in the administrative offices (for the case of a 50,000 city).

Floor Area Requirement: Assuming 80% gross efficiency and proper use of net areas, there should be $10m^2$ to $20m^2/employee$ (i.e., $25,000m^2$ to $75,000m^2$ for city of 50,000). If FAR = 2, then land area is approximately 2.5 ha.

Location: Situated and concentrated in the center of town.

A-2-8 PLANNING STANDARDS FOR HOUSING AND DENSITY

Table A-2-8 shows the approximate ideas on the relationship between residential building types and residential densities. "Net residential density" defined as the ratio of the number of inhabitants to the total area inside the property boundary lines excluding street areas in the residential district. "Net neighborhood density" is ratio of the number of inhabitants to the net neighborhood area including amenities, schools, residential streets, and neighborhood services but excluding non-used reserve areas or areas devoted to facilities which serve community structure at a higher level than neighborhood. As shown in the right hand side of the Table, gross density for a neighborhood area varies from 15 pers./ha (for single family villa) to 252 pers./ha (for average equivalent of 10 story apartments). In reality, there is little possibility of having only single family villas or 10 story apartments in one neighborhood, exclusive of other types. It is estimated that actual, net neighborhood density in many cases is somewhere between 50 pers./ha to 200 pers./ha depending on the mixture of unit types.

As far as net residential density is concerned, it is estimated that the most probable case is in the vicinity of 150 to 200 pers./ha. For example, the combination of 10% standard villa (say $750 m^2$ site/unit, 5 persons/unit) 60% smaller villa (say $250 m^2$ site/unit, 5 persons/unit) and 30% multi-family units (say $100 m^2$ site/unit, 5 persons/unit) results in approximately 150 to 200 pers./ha of net density.

A-2-9 PLANNING STANDARDS FOR ROAD AND STREET NETWORK

Table A-2-9(a) shows the classification and standards for roads and streets. Clear recognition of the hierarchical order of the street network system is crucial to achieve group privacy in an automobile oriented society. The street network hierarchy should be integrated into the hierarchical order of facility distribution and territorial sequence to maximize the access convenience yet to minimize the potential hazard and nuisance caused by auto traffic in the residential area.

Diagram A-2-9(b) indicates typical sections for each type of road classified in Table A-2-9(a).

Diagrams A-2-9(c) and A-2-9(d) indicate general outlines for road intersections.

A-3 APPLICATION OF PLANNING STANDARDS

A-3-1 A HYPOTHETICAL EXAMPLE

Table A-3-1(a) shows an example of land area distribution based on the standards developed in the previous sections. In order to reflect the situation in the Southern Region in 1995, a hypothetical city of 60,000 inhabitants is analyzed. It is found that such a city will require approximately 1,140 ha, 750 ha or 550 ha with net residential densities of 100 pph, 200 pph, or 400 pph, respectively. (These densities correspond to net densities of "villa"; mixture of "villa" and "one family semi-detached"; and low-rise "multi-family", respectively, see Table A-2-8 column C).

Table A-3-1 (b) is based on the result of computation on Table A-3-1 (a). It shows the land distribution for each use in the hypothetical residential city of 60,000 inhabitants. It is assumed that such a city will have two "Communities" of 30,000 residents, each of which will have two "Sub-Communities" of 15,000 residents, each of

which, in turn, will have four "Neighborhoods" of 3,750 residents. Since this model does not take into consideration non-used or reserved area of the city, the percentages for the listed use per total "actual" city area should be less than those listed. The table, therefore, is a preliminary guide to the allocation of "used-land" to different uses.

A-3-2 HIERARCHICAL ORDER OF GROUPING

Figure A-3-1 shows an example layout of prototypical city in which the recommended standards are expressed as a diagram. This is merely one of many acceptable interpretations of the standards. It is not the consultants' intent to impose a fixed solution to the planning. Rather, this is just a demonstration of one example against which the planning concepts for each city may be evolved.

Table A-2-8
RESIDENTIAL TYPES OF HOUSES AND DENSITIES

	A	B	C	D	E	F	G
	LAND AREA PER FAMILY m ²	NET DWELLING DENSITY Fam./ha	NET DENSITY* Pers./ha	RATIO OF NET RESIDENT- TIAL DENSITY TO NET NEIGH- BORHOOD DENSITY**	NET NEIGH- BORHOOD DWELLING DENSITY Fam./ha	NET NEIGH- BORHOOD DENSITY Pers./ha	APPROX- IMATE AVERAGE NET NEIGH- BORHOOD DENSITY Pers/ha
(1) LARGE VILLA	4,000 2,000	2.5 5.0	12.5 25.0	80.9% 78.6%	2.0 3.9	10.1 19.7	15
(2) STANDARD VILLA	1,000 500	10.0 20.0	50.0 100.0	74.4% 67.2%	7.4 13.4	37.2 67.2	52
(3) 1 FAMILY SEMI-DETACHED OR SMALLER VILLA	300 200	33.3 50.0	166.5 250.0	59.5% 52.1%	19.8 26.1	99.1 130.3	115
(4) MULTI-FAMILY LOW-RISE (2 STORY)	150 125	66.7 80.0	333.5 400.0	46.3% 42.5%	30.9 34.0	154.4 170.0	162
(5) MULTI-FAMILY MID-RISE (3-5 STORY)	100 75	100.0 133.3	400.0 533.2	42.5% 36.6%	42.5 48.8	170.0 195.1	183
(6) MULTI-FAMILY HIGH-RISE (6-10 STORY)	50 25	200.0 400.0	800.0 1600.0	28.5% 17.2%	57.0 68.8	228.0 275.2	252

NOTE: * 5 Pers./Fam. is assumed for building types (1) through (4);
4 Pers./Fam. is assumed for building types (5) and (6).

** -Net residential area:
Net area is the area within residential property lines. The area for streets and area for neighborhood facilities are excluded from the net residential area. The population (or number of residential units) divided by this area is called "net residential population (or dwelling) density."

-Net neighborhood area:
Net residential area defined above plus the area for streets (streets at the neighborhood scale) and area for neighborhood facilities is called net neighborhood area. The area for neighborhood buffer zone, area for facilities to serve higher levels of community hierarchy (such as, community shopping center and intermediate and high schools) and the areas for non-neighborhood scale streets (such as regional highways) are excluded from this "net neighborhood area". The population (or the number of dwelling units) divided by the "net neighborhood area" is called "net neighborhood population (or dwelling unit) density".

-Computation of column "D" is based on the following formula:

$$y = \frac{P}{(P+ax) \cdot (1+c)}$$

where:

y = ratio of net neighborhood density to net residential density

x = net residential density

P = typical population of neighborhood.

P = 3750 is assumed.

a = neighborhood facility area excluding circulation space (8.1 ha in table A-3-1 (a) as a total of (1) through (7); plus contingency of 10%, i.e., 8.1 x 1.1 = 9 ha).

a = 9 ha is assumed.

c = ratio of circulation space to net neighborhood area minus neighborhood circulation space.

c = 0.2 is assumed.

This formula is calculated in the following process:

$$x = \frac{P}{R} \text{ (where, R = net Residential Area)}$$

$$y = \frac{P/N}{P/R} = \frac{R}{N} \text{ (where, N = net Neighborhood Area)}$$

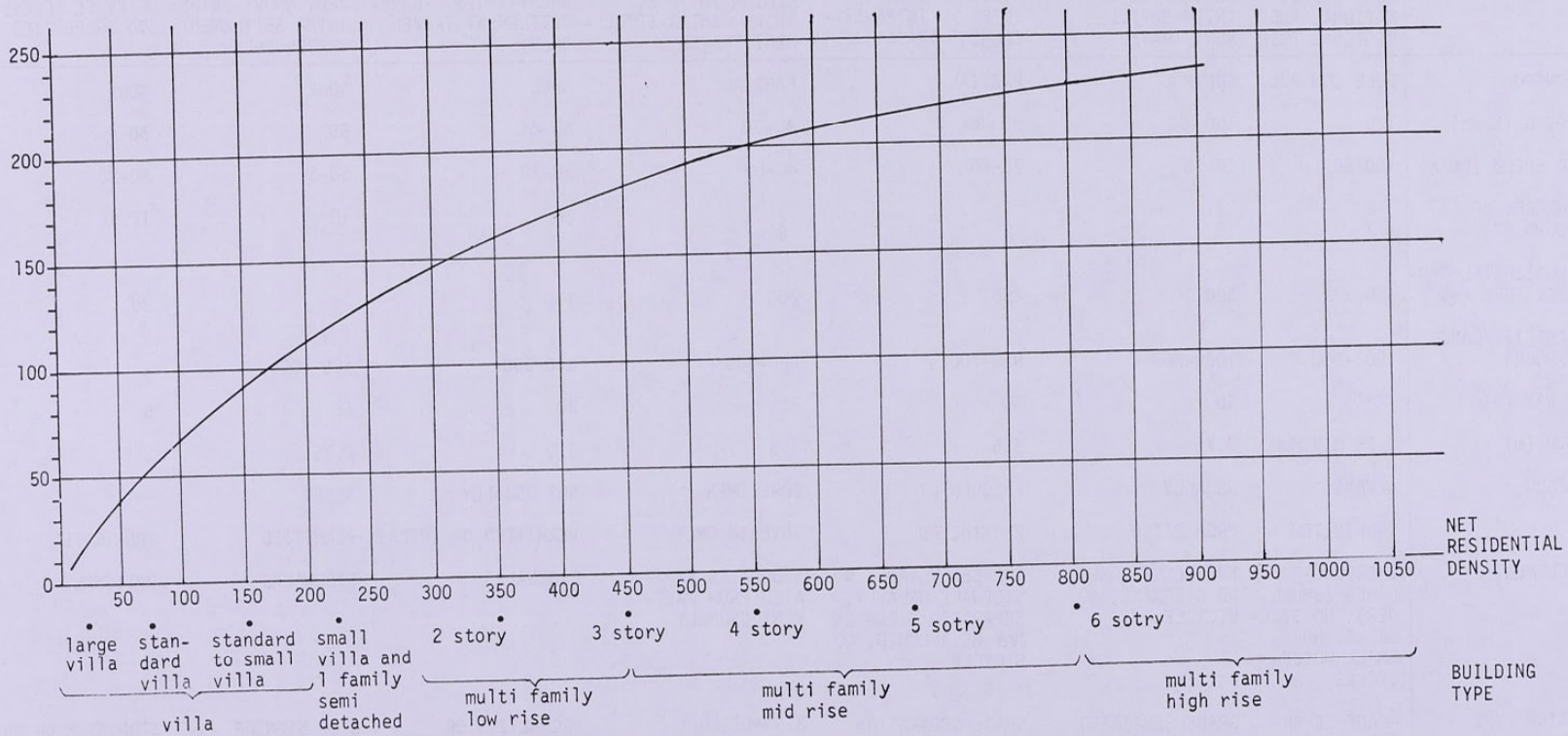
$$N = (R + a) \cdot (1+c)$$

from above,

$$y = \frac{R}{(R+a) \cdot (1+c)} = \frac{P/x}{(P/x+a) \cdot (1+c)} = \frac{P}{(P+ax) \cdot (1+c)}$$

FIGURE A-2-8
 RELATIONSHIP BETWEEN NET
 RESIDENTIAL DENSITY AND
 NET NEIGHBORHOOD DENSITY
 AND
 RELATIONSHIP BETWEEN NET
 DENSITY AND BUILDING TYPE

NET NEIGHBORHOOD
 DENSITY
 (pers./ha)

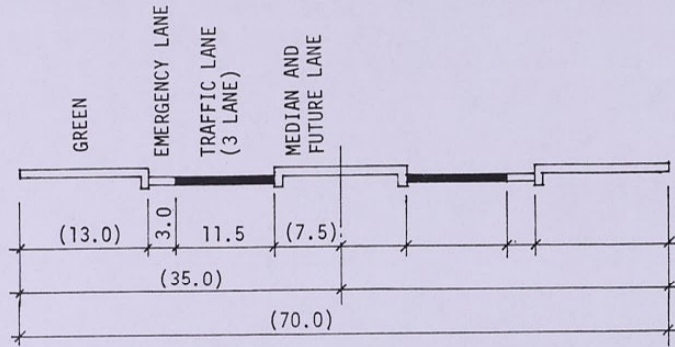


- NOTE: 1. The relation between net neighborhood density and net residential density shown here is based on the discussion developed in the Section A-2-8 and Table A-2-8. It shows one "example case" and not necessarily always true. Actual relationship is depending on detail planning and design of the neighborhood. The figure is shown here for the purpose of providing "approximate example idea" of the relationship between the two densities.
2. Actual relation between net residential density and building type is depending upon the dwelling unit size, family size and many other conditions.

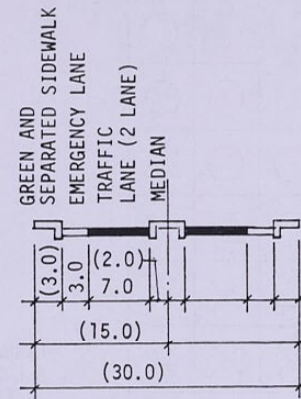
Table A-2-9(a)
CHARACTERISTICS AND HIERARCHY OF ROADS AND STREETS (RECOMMENDATION ONLY)

SYSTEM CLASSIFICATION	PRIMARY ROAD SYSTEM		SECONDARY ROAD SYSTEM				LOCAL ROAD SYSTEM	
	V ₁ REGIONAL HIGHWAY	V ₂ MAJOR ARTERIAL	V ₃ ARTERIAL	V ₄ COLLECTOR	V ₅ DISTRIBUTOR	V ₆ LOCAL ACCESS ROAD	V ₇ SERVICE ROAD	
FUNCTIONAL CLASSIFICATION	LONG TRIPS: NATIONAL AND REGIONAL TRIP	MEDIUM TRIPS: INTER-SETTLEMENT TRAVEL	MEDIUM TRIPS: INTER TO INTRA-SETTLEMENT TRAVEL	MEDIUM TO SHORT TRIPS: INTRA-SETTLEMENT TRAVEL	SHORT TRIPS: INTRA-SETTLEMENT TRAVEL ONLY	VERY SHORT TRIPS: INTRA-SETTLEMENT TRAVEL ONLY	SERVICE ACCESS TO PROPERTIES	
ACCESS CONTROL	FULL CONTROL	CONTROL	PARTIAL	PARTIAL	NONE	NONE	NONE	
DESIGN SPEED (km/h)	120	100-80	90-80	80-70	60-50	50	30	
OPERATING SPEED (km/h)	100-80	80-70	70-60	60-50	50-30	50-30	30-20	
MAXIMUM GRADE: UP (%) DOWN (%)	6 7	7 8	7 8	7 8	8	10	12	
MINIMUM HORIZONTAL RADIUS OF CURVATURE (m)	500	300	250	200	150	75	30	
HOURLY CAPACITY/LAND (VEHICLE/HOUR)	1500-800	1000-800	900-700	900-600	600-300	400-200	-	
RIGHT OF WAY (m)	70	50	30	25	20	15	5	
LANE WIDTH (m)	3.75 MINIMUM	3.75	3.5	3.5	3.0	2.75	2.5	
DIVIDED FLOW	ALWAYS	USUALLY	FREQUENTLY	SOMETIMES	NOT USUALLY	NEVER	-	
PARKING	PROHIBITED	PROHIBITED	PROHIBITED	INTERIM ONLY	PERMITTED OR INTERIM	PERMITTED	PROHIBITED	
RELATED ELEMENTS	EMERGENCY LANES (SHOULDER), NO SIDEWALKS, NO SMALL MOTORCYCLES	EMERGENCY LANES, NO SIDEWALK, NO BICYCLE	EMERGENCY LANES NO SIDEWALK USUALLY, SEPARATED SIDEWALK MAY BE ALLOWED, NO BICYCLE	SIDEWALKS SEPARATED FROM PAVEMENT USUALLY	SIDEWALKS	SIDEWALKS	OPTIONAL	
INTERSECTION TYPE	GRADE SEPARATED ALWAYS	GRADE SEPARATED IN GENERAL	GRADE SEPARATION OPTIONAL	SIGNALIZED	SIGNALIZED OR STOP SIGNS	STOP SIGN OR UNCONTROLLED	STOP SIGN OR UNCONTROLLED	
DISTANCE BETWEEN INTERSECTIONS (m)	1,000 MINIMUM	400 MINIMUM	250 MINIMUM	200 MINIMUM	200 MINIMUM WHEN POSSIBLE	-	-	
NORMAL NUMBER OF LANES	6-4 USUALLY	4 MINIMUM	4-2	4-2	2	2	1 or 2	

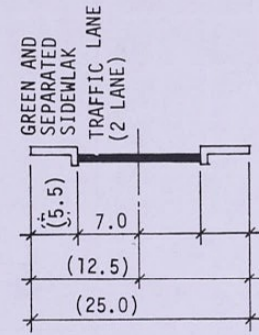
V₁ EXAMPLE
(REGIONAL HIGHWAY)
6 LANE



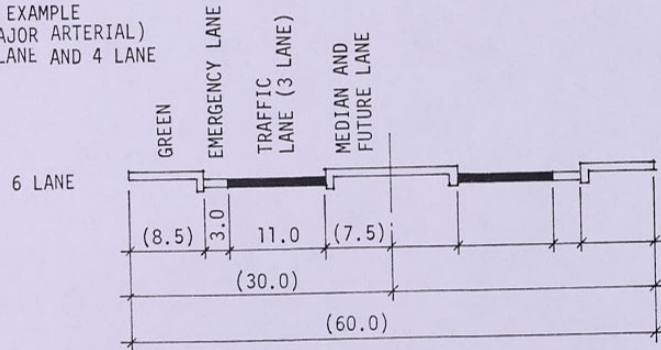
V₃ EXAMPLE
(ARTERIAL)
4 LANE



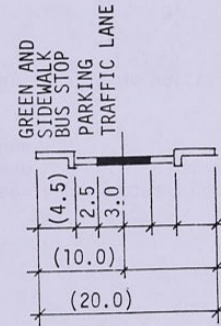
V₄ EXAMPLE
(COLLECTOR)
4 LANE



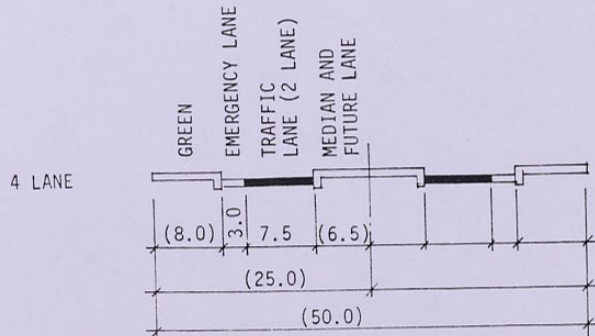
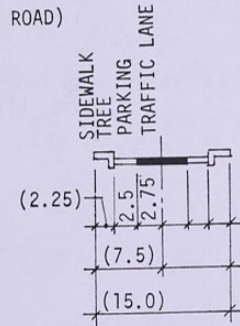
V₂ EXAMPLE
(MAJOR ARTERIAL)
6 LANE AND 4 LANE



V₅ EXAMPLE
(DISTRIBUTOR)
2 LANE



V₆ EXAMPLE
(LOCAL ACCESS ROAD)
2 LANE



NOTE: () Dimensions can vary depending on the local condition and detail design, sometimes median strip and green zone can even be eliminated where elimination is justified by the detail planning.

FIGURE A-2-9 (b)
ROAD SECTIONS BY
CLASSIFICATION
(EXAMPLE)

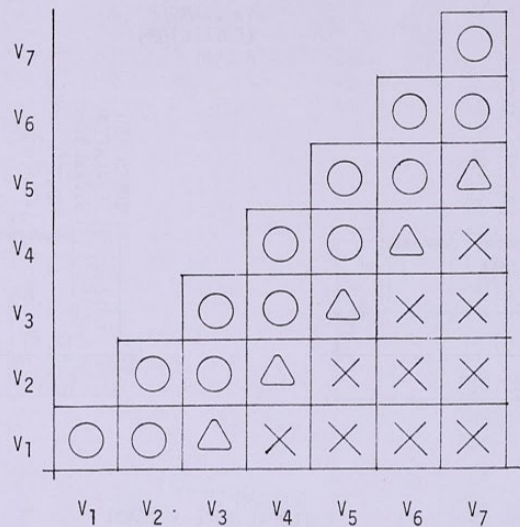
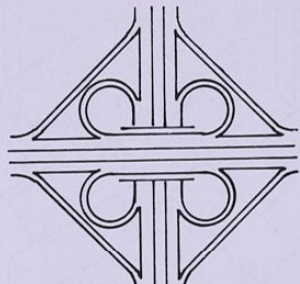
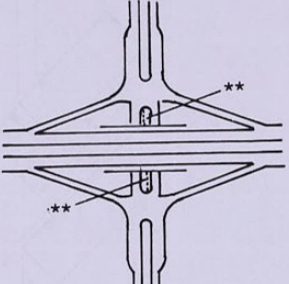
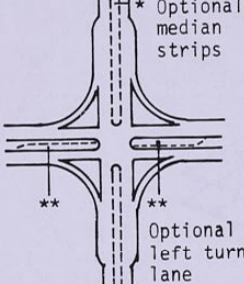
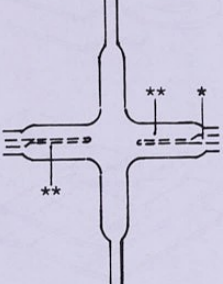
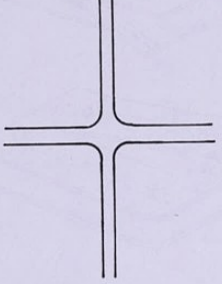
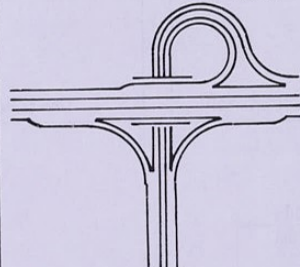
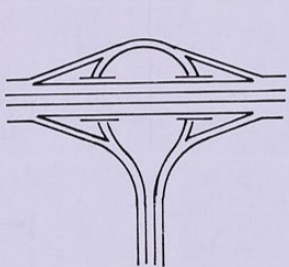
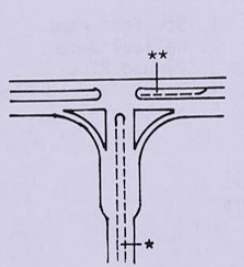
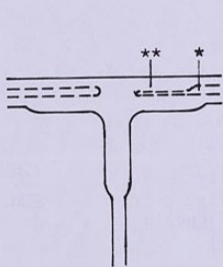
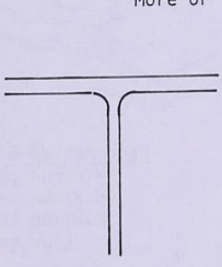


FIGURE A-2-9 (c)
ALLOWABLE ROAD
INTERCHANGES

NOTE: When two roads (with classification V_m and V_n) intersect, then interchange (V_m/V_n) is:

- Allowed when (○) $|m-n| = 0$ or 1
- Not allowed when (△) $|m-n| = 3$
- Allowed but not recommended when (X) $|m-n| = 2$

	Cloverleaf	Diamond	Channelized	Flaired	Common
Four leg Cross intersection	 <p>Approximate scale: 200-400 M</p>	 <p>100-200 M</p>	 <p>* Optional median strips ** Optional left turn lane 50-100 M</p>	 <p>** * 50-100 M</p>	 <p>50 M More or less</p>
Three leg "Tee" intersection			 <p>** * *</p>	 <p>** * *</p>	
Basic characteristics of intersection	Vertical separation Flow separation Ramps Speed control	Vertical separation Flow control Ramps Speed control Signal/sign control	Flow control Traffic channels Signal control	Flow control Traffic channels Signal/sign control	Sign control or Uncontrolled
Types of roads intersecting	V_1 / V_1 (V_1 intersecting V_1) V_1 / V_2 V_2 / V_2 V_2 / V_3	V_2 / V_2 V_2 / V_3 V_3 / V_3 V_3 / V_4	V_3 / V_3 V_3 / V_4 V_4 / V_4 V_4 / V_5	V_4 / V_4 V_4 / V_5 V_5 / V_5 V_5 / V_6	V_5 / V_5 V_5 / V_6 V_6 / V_6 V_6 / V_7

Note:
Intersections shown above are "examples" only.
Actual design should be based on detailed analysis
of each case in each location.

* Median strips may be eliminated, then
roadway width can be decreased accordingly

** Left turn lane may be provided
for safer turn (optional)

FIGURE A-2-9(d)
INTERSECTION
EXAMPLES

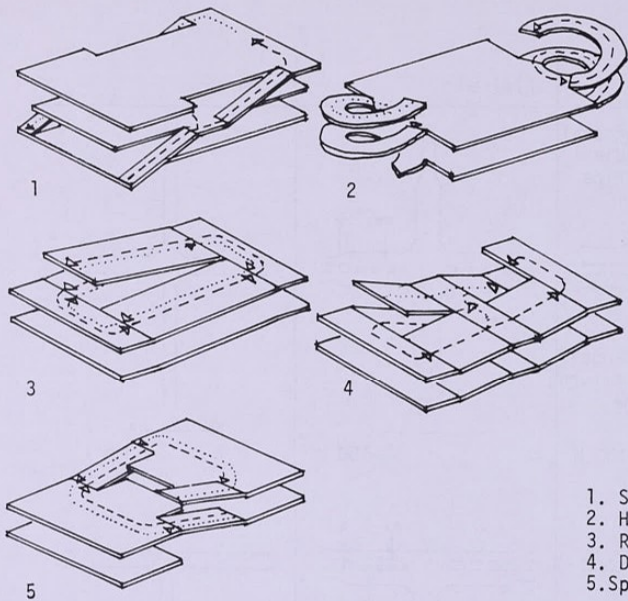


FIGURE A-2-9 (e)
STRUCTURE PARKING
(EXAMPLES)

1. Straight Ramp
2. Helical Ramp
3. Ramped Floor
4. Double Ramped Floor
5. Split-level Floor

Recommended Size

Minimum capacity	200 cars
Maximum capacity	500 cars
Maximum No. of Levels (for garage)	6

Unit Parking Dimensions

45° one-way	14.5 to 16.5 m.
60° one-way	17.0 to 19.0 m.
90° two-way	18.5 to 19.5 m.

Entrance and Exit

Number	At least one with multiple lanes, minimum 15 m from street intersection.
Width of lanes	3.5 m for one-way
Radius of Curb (inside)	Minimum 3.5 m.

Ramps and Driveways

Slope	15 per cent maximum.
Width	
Straight	Minimum 3.0 m.
Curved, inside lane	Minimum 3.5 m.
Curved, outside lane	Minimum 3.0 m.
Curvature	4 m. diameter to inside.

Parking Stalls

Length	5.5 m.
Width	2.5 m.

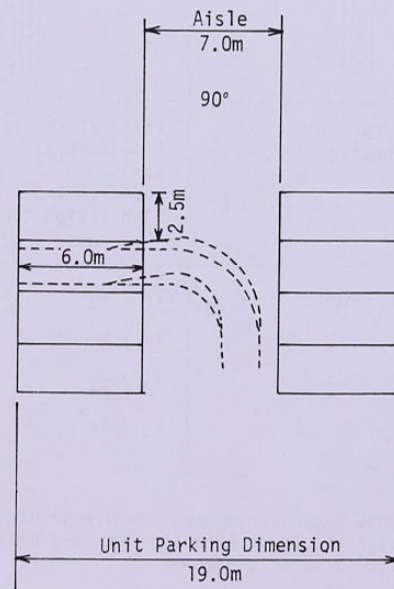
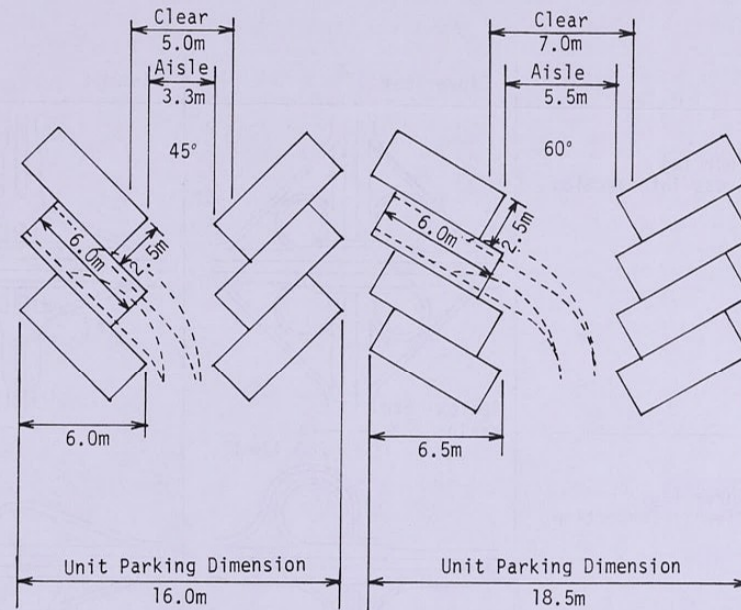


FIGURE A-2-9-(f)
UNIT PARKING
DIMENSION (EXAMPLES)

Table A-3-1(a)
LAND AREA DISTRIBUTION FOR A PROTOTYPICAL CITY OF 60,000 INHABITANTS (in ha)

		NEIGHBORHOOD (3750 Inh)	SUB-COMM. (15,000 Inh)	COMMUNITY (30,000 Inh)	CITY TOTAL (60,000 Inh)	
(1) EDUCATIONAL FACILITIES	NURSERY-KINDERGARTEN	0.02x4=0.1	x4= 0.4	x2= 0.8	x2= 1.6	
	ELEMENTARY SCHOOL(BOYS)	0.5	x4= 2.0	x2= 4.0	x2= 8.0	
	ELEMENTARY SCHOOL(GIRLS)	0.5	x4= 2.0	x2= 4.0	x2= 8.0	
	INTERMEDIATE SCHOOL(BOYS)		1.2	x2= 2.4	x2= 4.8	
	INTERMEDIATE SCHOOL(GIRLS)		1.2	x2= 2.4	x2= 4.8	
	SECONDARY SCHOOL(BOYS)			1.5	x2= 3.0	
	SECONDARY SCHOOL(GIRLS)			0.9	x2= 1.8	
	TEACHERS SCHOOL				2.1	
	TECHNICAL SCHOOL(BOYS)				2.1	
	TECHNICAL SCHOOL(GIRLS)				1.0	
	COLLEGE WITH ATHLETIC FACILITIES				10.0	
	TOTAL (1)		1.1	6.8	15.6	46.7
	(2) RECREATIONAL/ATHLETIC FACILITIES (to be cont.)	TOT-LOT	0.5x16=0.8	x4=3.2	x2= 6.4	x2=12.8
NURSERY-KINDERGARTEN PLAY LOT		0.2x4=0.8	x4=3.2	x2= 6.4	x2=12.8	
NEIGHBORHOOD PARK		2.0	x4=8.0	x2=16.0	x2=32.0	
PLAYGROUND		1.5*	x4=6.0	x2=12.0	x2=24.0	
PLAYFIELD LEVEL 1			3.6**	x2= 7.2	x2=14.4	

NOTE: * 0.75 ha for boy; 0.74 ha for girl
 ** 1.8 ha for boys; 1.8 ha for girls
 *** 2.0 ha for boy; 1.0 ha for girl

		NEIGHBORHOOD (3750 Inh)	SUB-COMM. (15,000 Inh)	COMMUNITY (30,000 Inh)	CITY TOTAL (60,000 Inh)
RECREATIONAL/ATHLETIC FACILITIES (CONT.)	COMMUNITY PARK	-	-	12.0	x2=24.0
	PLAYFIELD LEVEL 2	-	-	3.0***	x2= 6.0
	CITY PARK	-	-	-	24.0
TOTAL (2)		5.1	24.0	63.0	150.0
(3) CULTURAL FACILITIES-RELIGIOUS, SOCIAL AND CULTURAL FACILITIES	SMALL MOSQUE	0.25	x4= 1.0	x2= 2.0	x2= 4.0
	NEIGHBORHOOD CENTER	0.3	x4= 1.2	x2= 2.4	x2= 4.8
	JAMI'A MOSQUE	-	0.7	x2= 1.4	x2= 2.8
	COMMUNITY CENTER	-	-	0.6	x2= 1.2
	CIVIC CENTER	-	-	-	3.0
TOTAL (3)		0.6	2.9	6.4	16.1
(4) HEALTH FACILITIES	PHARMACY	0.1	x4= 0.4	x2= 0.8	x2= 1.6
	DIAGNOSIS/TREATMENT CENTER	-	0.5	x2= 1.0	x2= 2.0
	GENERAL HOSPITAL	-	-	-	4.5
TOTAL (4)		0.1	0.9	1.8	8.1
(5) COMMERCIAL FACILITIES	NEIGHBORHOOD SHOPPING CENTER	1.2	x4= 4.8	x2= 9.6	x2= 19.2
	COMMUNITY SHOPPING CENTER	-	-	1.1	x2= 2.2
	DOWNTOWN SHOPPING	-	-	-	4.5
TOTAL (5)		1.2	4.8	10.7	25.9

Table A-3-1 (a) continued

		NEIGHBORHOOD (3750 Inh)	SUB-COMM. (15,000 Inh)	COMMUNITY (30,000 Inh)	CITY TOTAL (60,000 Inh)
(6)PUBLIC FACILITIES	GOVERNMENT OFFICE	-			2.6
	POST OFFICE	-		0.1	x2= 0.2
	POLICE STATION	-		0.1	x2= 0.2
	FIRE STATION	-		0.1	x2= 0.2
	WATER SUPPLY STATION	-	0.5	x2= 1.0	x2= 2.0
	SEWAGE TREATMENT	-	1.0	x2= 2.0	x2= 4.0
	POWER STATION	-	1.0	x2= 2.0	x2= 4.0
	GARBAGE DISPOSAL	-	1.0	x2= 2.0	x2= 4.0
	MUNICIPAL LIBRARY OR MUSEUM	-	0.2	x2= 0.4	x2= 0.8
TOTAL (6)		-	3.7	7.7	18.0
(7)INDUSTRIAL	FACTORY, WAREHOUSE DISTRIBUTION CENTER	-	10.0	x2=20.0	x2=40.0
TOTAL (7)			10.0	20.0	40.0
TOTAL of (1) through (7)		8.1	53.1	125.2	304.5
(8)RESIDENTIAL	CASE 1 100 pph NET DENSITY	37.5	x4= 150.0	x2= 300.0	x2= 600.0
	CASE 2 200 pph NET DENSITY	18.8	x4= 75.0	x2= 150.0	x2= 300.0
	CASE 3 400 pph NET DENSITY	9.4	x4= 37.5	x2= 75.0	x2= 150.0

		NEIGHBORHOOD (3750 INH)	SUB-COMM. (15,000 INH)	COMMUNITY (30,000 INH)	CITY TOTAL (60,000 INH)
TOTAL of (1) THROUGH (8)	CASE 1	45.6	203.1	425.2	904.5
	CASE 2	26.7	128.1	275.2	604.5
	CASE 3	12.5	90.6	200.2	454.5
(9)TRANSPORTATION	STREET/SIDE-WALK* CASE 1	9.1	x4=36.4	x2=72.8	x2=145.6
	CASE 2	5.3	x4=21.2	x2=42.4	x2= 84.8
	CASE 3	3.5	x4=14.0	x2=28.0	x2= 56.0
	ARTERIES**				
	CASE 1	-	20.3	42.5	90.4
	CASE 2	-	12.8	27.5	60.4
	CASE 3	-	9.1	20.0	45.4
TOTAL (9)	CASE 1	9.1	56.7	115.3	236.0
	CASE 2	5.3	34.0	69.9	145.2
	CASE 3	3.5	23.1	48.0	101.4
GRAND TOTAL of (1) THROUGH (9)	CASE 1	54.7	259.8	540.5	1140.5
	CASE 2	32.0	162.1	345.1	749.7
	CASE 3	21.0	113.7	248.2	555.9

NOTES: * Assumption: 20% of total of (1) through (8) for small streets related "inside" of neighborhood
 ** Assumption: 10% of total of (1) through (8) for arterries outside of neighborhood

Table A-3-1(b)
 GENERAL STANDARDS FOR URBAN LAND DISTRIBUTION^a
 (% OF TOTAL AREA WITHOUT RESERVE
 LAND, NON USED OR BUFFER AREAS)

	NEIGHBORHOOD (3750 INH.)			SUB-COMMUNITY (15,000 INH.)			COMMUNITY (30,000 INH.)			CITY (60,000 INH.)		
	Case 1	Case 2	Case 3	Case 1	Case 2	Case 3	Case 1	Case 2	Case 3	Case 1	Case 2	Case 3
(1)Educational*	2.0	3.4	5.2	2.6	4.2	6.0	2.9	4.5	6.3	4.1	6.2	8.4
(2)Recreational/ Athletic	9.3	15.9	24.3	9.2	14.8	21.1	11.7	18.3	25.4	13.2	20.0	27.0
(3)Cultural/ Religion and Social	1.1	1.9	2.9	1.1	1.8	2.6	1.2	1.9	2.6	1.4	2.1	2.9
(4)Health	0.2	0.3	0.5	0.3	0.6	0.8	0.3	0.5	0.7	0.7	1.1	1.5
(5)Commercial*	2.2	3.8	5.7	1.8	3.0	4.2	2.0	3.1	4.3	2.3	3.5	4.7
(6)Public Facility	-	-	-	1.4	2.3	3.3	1.4	2.2	3.1	1.6	2.4	3.2
(7)Industrial	-	-	-	3.8	6.2	8.8	3.7	5.8	8.1	3.5	5.3	7.2
(8)Residential	68.6	58.8	44.8	57.7	46.3	33.0	55.5	43.5	30.2	52.6	40.0	27.0
(9)Transportation	16.6	16.6	16.7	21.8	21.0	20.3	21.3	20.3	19.3	20.7	19.4	18.2

Note: a. Parking is included in each use category.
 b. Case 1: 100 pph, NET RESIDENTIAL DENSITY
 c. Case 2: 200 pph, NET RESIDENTIAL DENSITY
 d. Case 3: 400 pph, NET RESIDENTIAL DENSITY
 * School athletic ie. palyground/playfield is excluded from this
 category in this computation.



Oxford

If 2-1/4" tabs specify AC182-115
If 3-3/4" tabs specify AC182-113 .

And state tab color and Position(s) desired
If 4" tabs all right end specify AC182-215
and tab color desired.



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