

IV

THE PERSPECTIVES OF THE NATIONAL PHYSICAL PLAN

CHAPTER IV

THE PERSPECTIVES OF THE NATIONAL PHYSICAL MASTER PLAN

With the three fundamental choices of unity, balanced development and rationalization of expenditures, the major guidelines of the National Physical Master Plan are presented in 8 points:

- 1 - Structure the territory around the major urban centers;
- 2 - Associate all regions to the national economic development;
- 3 - Distribute the major public facilities in an effective and integrated manner;
- 4 - Unite the territory with an efficient and developed transportation network;
- 5 - Insure an urban development of good quality, respecting the characteristics of each region;
- 6 - Highlight and benefit from the natural wealth of the country;
- 7 - Exploit the water resources in a sustainable way; and
- 8 - Resolve efficiently the problems of quarries, wastewater and solid wastes.

IV.1 STRUCTURING THE TERRITORY AROUND THE MAJOR URBAN CENTERS

The general economic performance of the country depends largely on the strength of its cities. When the economy is getting more dependent on the tertiary and industrial sectors, the cities would play the driving force role in the development of the regions and state.

This economic necessity meets with the objectives of a balanced development (at the large regions level: North, East, South) on one hand, and of unity and integration on the other. The dynamism of the cities is a prerequisite for the global development of the surrounding regions. Cities are also the place where different social classes intermingle, exchange and meet with each other.

The choice of a major role for large cities meets as well with the concern of preserving the character of the rural areas, villages, natural zones and major agricultural areas. Construction would be allowed at a specified density, which limits urban encroachment on other areas.

For large cities to play an effective leading role in the development of their regions, the National Physical Master Plan advocates a general structure where major agglomerations interact with the surrounding villages, particularly through a series of

small “relay-villages” that secure administrative, commercial and service functions for a number of villages.

This interaction would ensure that sufficient income is guaranteed to the rural regions for the population to stabilize in place and develop its life conditions.

IV.1.1 Proposed urban structure

The proposed structure consists of an urban system that should operate as the organs of the same body. Its components are:

The major agglomerations are:

- The Central Urban Area (Beirut and the Mount Lebanon);
- Cities located at the gates of this Central Urban Area: Jbayl and Saida;
- The large metropolis of the north: Tripoli;
- The metropolis of balance (growth centers): Zahlé-Chtaura and Nabatiyeh; and
- The large patrimonial cities: Baalbeck and Tyre.

The rural regions consist of:

- The relay-villages; and
- Other localities.

Today, the major agglomerations (the ones with more than 40 000 permanent residents) account for two thirds of the country’s population. The National Physical Master Plan adopted maintaining this proportion for 2030, which means stabilizing of population between cities and villages. Among the major agglomerations, the relative weight of the “Central Urban Area” should decrease. It would diminish from 40% of the population to 35%, under the dual effect of an objective factor namely a lower natural growth rate, and a subjective effect, which is the will to strengthen the country’s other major agglomerations.

The rest of the territory (one third of the residents in more than 1 000 localities) will be planned around significant urban centers: the North and Akkar around Tripoli; Beqaa and Baalbeck-Hermel around Zahle-Chtaura and Baalbeck; the South and Nabatieh around Saida, Nabatiyeh and Tyre; and the highlands of Mount Lebanon around the Central Urban Area.

Interconnections with the rural world are assured through the network of Relay-villages that would be the centers of services and commerce directly accessible from the surrounding villages.

The other localities of the rural world would experience a development based on diversification of their sources of income: besides agriculture and public

employments, it is necessary to reinforce trade, services, tourism and summer holidays activities.

IV.1.2 Urban structure in the North and Akkar

In the North and Akkar, the agglomeration of Tripoli has presently 48% of the population, whereas the small cities and villages of the area account for 52% of the population. The share of the agglomeration could increase in 2030, with the current growth of urban development, but the rural area will maintain almost half of the residents (the two Mohafazas combined).

Within the rural areas of the two Mohafazas of the North, some villages, being more important than others, will play the role of relay-villages. There are 14 “relay-villages” in the region, of which 9 are in the North, and 5 in Akkar:

- For the coastal area of Batroun: Batroun
- For the high area of Nahr el-Jaouz: Tannourine Tahta
- For Koura: Amyoun
- For the region of Qannoubine: Ehden and Besharreh
- For the region of Zghorta: Zghorta
- For the region of Danniyeh: Sir
- For the North coastal area: Minieh and Aabde
- For lower Akkar: Halba, expected to be the administrative center of the Mohafaza of Akkar
- For middle Akkar: Beyno
- For higher Akkar: Fnaydeq
- For the region of Qobeyat: Qobeyat
- For Wadi Khaled: Chadra

IV.1.3 Urban structure in Beqaa and Baalbeck-Hermel

The group Beqaa + Baalback-Hermel is today the area with the lowest urbanization rate: only 34% of the population of the Beqaa live in the two major agglomerations, Zahle-Chtaura and Baalbeck. This proportion of “city dwellers” is likely to increase because of tertiary activities and industrialization, but in reasonable rates. In 2030, especially with the strengthening of the metropolis of balance of Zahle-Chtaura-Qab Elias and the expected tourism boom of Baalbeck, the proportion of the inhabitants of major agglomerations could exceed 40%.

Despite the urban development, the majority of the population of the Beqaa and Baalbeck-Hermel will continue residing, in 2030, mainly in small cities and villages. These towns will be organized, for the local life, around 11 relay cities:

- For the region of Hermel-Qasr-Fissane: Hermel
- For the region of Ras-Baalback: Laboue
- For the region of Deir-el-Ahmar Yammoune: Deir-el-Ahmar
- For the Beqaa center West :Chmistar
- For the Beqaa center East: Brital
- For the region of Rayak: Rayak
- For the region extending from Bar-Elias to Masnaa: Majdel-Anjar¹
- For the region extending from Kamed-el-Laouz to Qaraoun: Joub-Jannine
- For the region extending from Aammiq to Aitanite: Saghbine
- For the region extending from Machghara to Maydoune: Machghara
- For the region of Rachaya: Rachaya

Among these different relay-cities, the development of Hermel in the North will be given particular attention, given the economic and social difficulties that the entire Caza is experiencing.

IV.1.4 Urban structure in the South and Nabatiyeh

The South consists of three major agglomerations: Saida, a harbor-city between the South and Beirut; Tyre, a patrimonial city with a remarkable natural and agricultural framework; and Nabatiyeh, the dynamism of which continues and is expected to play an even more important role in the future.

In total, these three agglomerations gather 44% of the resident population of the two Mohahafazas of the South². This proportion is expected to rise up to 48%³ due to the increase in tertiary works and industrialization.

The balance between the three poles of the South should be assured by a distribution of complementary functions: trade in Saida, tourism in Tyre and higher education in Nabatiyeh. It is also important to reinforce particularly the pole of Nabatiyeh in order to alleviate urban pressure along the coast. It would be more adequate to locate a major industrial zone of national interest, mid-way between these three poles, at Zahrani eventually supported by a commercial port.

Rural and summer holiday areas of the South will be organized locally around 12 relay cities:

¹ The city of Bar-Elias, which has been significantly developed the last few years, has become the most important on the Beirut-Damascus axis. Nevertheless, it is located in a flood prone area, in the middle of the agricultural plain: this is why Majdal-Anjar has been selected as relay city instead of Bar-Elias.

² This proportion is however around only 30%, if Palestinian camps should be excluded.

³ Around 33% Palestinian camps excluded.

- For the region of Hasbaya: Hasbaya
- For the region of Marjaayoun: Marjaayoun and Khiyam
- For the region of Kfarkila-Aadaysseh: Kfarkila
- For the region of Jezzine: Jezzine
- For the coastal zone between Saida and Tyre: Sarafand
- For the plateau of Nabatiyeh, between Nabatiyeh and Zahrani: Insar
- For the hinterland of Tyre: Jouaya
- For the region of Cana: Cana
- For the region of Bent Jbayl: Bent Jbayl and Tebnine
- For the region of Naqoura: Naqoura

IV.1.5 Urban structure in Greater Beirut + Mount Lebanon

Central Urban Area

The term “Central Urban Area” is used to designate an urban entity composed of 3 concentric spaces:

- The city of Beirut;
- The first ring: between Dbaye and Khaldeh, below 400 m of altitude; it is the remaining part of “Greater Beirut”;
- The second ring: it consists of the agglomerations of Jounieh, Bikfaya, Broummana, Aaley and Damour.

This urban entity constitutes, and will more in the future, an integrated functional unity requiring coherent solutions in all domains: transportation, sewage, solid waste, green spaces, etc...

Beirut and the first ring

The group of Beirut + First ring, which accounts nowadays 1.3 million residents, is indisputably the economic, social, cultural and political center of Lebanon. It is the main place where most activities are concentrated: commercial, financial operations, transport, industry, tourism, hotels, general and higher education services, cultural creativity, government administration, and headquarters of political authorities and diplomatic councils. It is also the center of transportation and transition in the country, due to the Port of Beirut, the Beirut International Airport located in the southern suburbs, and the highways to the North, East and South that link the center to all other Lebanese regions, to Syria and therefrom to all other countries of the region.

This “main region” will keep on playing a primary role in the forthcoming Lebanon, despite the efforts of re-balancing in favor of other regions. The objective would be to search for quality rather than quantity: organize the existing functions better, earn competitiveness among the major metropolis of the Near East, and enhance the structure and conditions of life.

The second ring

The main challenge for the Central Urban Area is to organize the second ring to accommodate the future demographic and urban growth of the whole Central Urban Area.

It would be convenient to strengthen the urban poles of this second ring to play a role of relay-cities in these half-urban and half-rural regions. This role will be allocated to the following cities:

- For the coastal zone of Kesrouane: Jounieh
- For middle Kesrouane: Ajaltoun
- For the upper northern Matn: Bikfaya
- For the upper southern Matn: Broummana
- For the region of Baabda: Baabda
- For the upper Aaley: Aaley
- For the coastal zone of Aaley: Aaramoun
- For the coastal zone of Damour: Damour

Small coastal agglomerations: Jbayl-Aamchit and Barja-Chehim

Beyond the second ring of the Central Urban Area, Mount Lebanon includes two other important agglomerations: in the North, the agglomeration of Jbayl-Aamchit and in the South the agglomeration of Barj-Chehim-Jiyeh.

The agglomeration of Jbayl can be considered as the gate that separates the central urban area from all the North of the country. Jbayl is also the chef-lieu of the area that plays an important role in its relations with the villages the Caza of Jbayl, as well as those of the neighboring Caza of Batroun; it is also a dynamic city, regrouping various activities and functions (trade, services, tourism, agriculture market, industry, etc.). It is thus, essential that the extension of the Central Urban Area towards the North would not affect the identity of Jbayl. This requires managing the urban agglomerations in the south of the city, by creating a natural separation zone to limit the city’s expansion.

The agglomeration of Barja-Chehim is less organized: it is the result of a quasi-continuous urban sprawl on the axis that starts from the coast up to Chehim, as well as the equally important expansion of Barja; the two tending to join along the coastal line as well as in higher areas. This agglomeration is currently being constituted. It

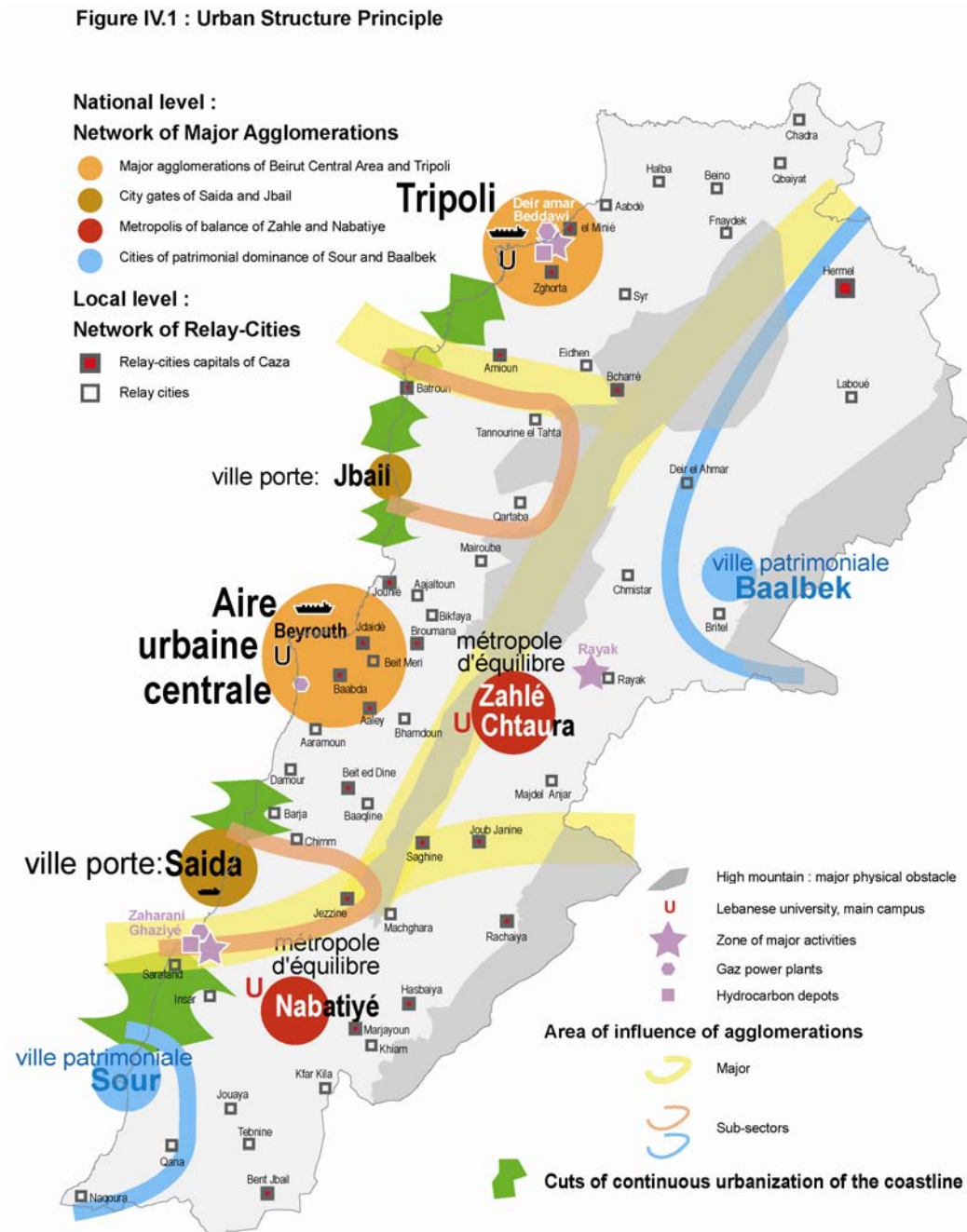
should get additional attention from the Authorities to encourage the establishment of new activities and structure the urban growth in a proper way.

Rural regions of Mount Lebanon

Rural regions of Mount Lebanon are located on the hills, overlooking the central urban area and the agglomerations of Jbayl-Aamchit and Barja-Chehim. They are the hills of Jbayl, Kesrouane, higher Matn, higher Nahr Beirut valley (Caza of Baabda), Bhamdoun (higher Nahr Damour valley) and higher Chouf. These regions are relatively less populated than others – their permanent residents represent less than 15% of Beirut + Mount Lebanon.

They would need specific policies to stabilize their population offering all year round activities and avoiding their transformation into “dormitories”. As in the other Mohafazas, this policy requires the support of many relay-cities, in terms of services and facilities. The proposed relay cities for these regions are five:

- For the upper or Nahr Ibrahim: Qartaba
- For the upper mountain of Kesrouane: Mayrouba
- For Bhamdoun: Bhamdoun
- For the upper Chouf: Beiteddine and Baaqline.



IV.2 INTEGRATING ALL REGIONS INTO THE NATIONAL ECONOMIC DEVELOPMENT

Since all sectors of the economy are currently confronted with international competition, the aim should be to integrate the activities of all cities and regions into the heart of the economic system.

This implies necessarily that strong service and industrial centers should emerge in different regions, other than the only Central Urban Area. Important agglomerations in the North, South and East, would have priority in benefiting from this policy.

Associating all the regions to the national economic development is valid not only for industrial activities, commerce, and office service activities, but also, for tourism, which still remains excessively concentrated within Beirut, Jbayl, Jounieh, Broummana, Aaley and Bhamdoun. A tourism project, covering the whole of the Lebanese localities, with all regions having something to offer and a benefit to gain, should also be put into action.

In general, the works on development of rural regions should be equal to that of large cities. Villages would not be able to compete with the cities due to the absence of certain economic and social functions that require the proximity of a large and dense clientele, or depend upon the concentration of enterprises acting in concordance with each other. However, villages can offer services that cities do not have, mainly those related to the quality of their life and their environment; thus villages should emphasize this advantage to attract additional income.

IV.2.1.Organizing the distribution of activities within the Central Urban Area

The Central Urban Area has the essential national and international tertiary functions of the country. It is also the place of concentration of industry and most of tourism activities. Within this important zone, the stake lies in organizing the distribution of those functions: financial center, business centers, port and airport activities, large scale trade, central administrations, hotel sector, industries, etc.

A moderate and mostly qualitative growth of these functions should be sought. But, in no way should the growth of this center be accomplished at the expense of other alternative territorial choices.

An organization to be completed

Organization of the central functions in the capital region has greatly progressed due to the projects launched in the 1990's, namely the modernization of Beirut Port, Beirut down-town, reconstruction of the airport, improvements of the road network and local developments as noticed in the peripheral centers, namely Jounieh, Zouk, Aaley and elsewhere.

Other projects can complete this organization. Some are already planned such as the development of the Hadath university campus or the development of public facilities at Bir Hassan or even the development of the touristic activities along the southern coast within the framework of the Elyssar project.

Establishing office centers

Other projects may also be usefully explored in the tertiary services sector such as the development of offices district at strategic locations that were identified by the National Physical Master Plan for the region of Greater Beirut: Nahr El Mot, Hazmiyeh, Khaldeh... Within this perspective, it is worth rethinking the concept of suburbs considering it as a central axis structuring the metropolitan area, rather than a passageway of the transit traffic.

Redeployment of industrial activities

Concerning the industries, an important work of putting things back in order is necessary to reduce the damages and dangers resulting from certain industries established within the heart of inhabited neighborhoods or in their immediate surroundings. This reorganization work should be an opportunity to modernize the industrial sector by creating new and modern zones of activities. However, abolishing certain old industrial areas might also help in adopting a policy for equipping surrounding neighborhoods as well as a more ambitious housing policy targeting young households.

Diversification of the activities in the second ring

Economic activities of the cities and villages of the “second ring” are strongly based on tourism and leisure: Aaley, Broummana, Bikfaya, Jounieh are important tourism and summer vacation centers. However, other activities, diversifying job offers and income sources are also present, such as industry (Zouk) or service in the sectors of education, health.... This diversification should be encouraged while avoiding the alteration of tourism potential in these regions, which remains their important economic asset.

Finding solutions for the transportation sector

Economic activities in the Central Urban Area might be seriously impeded by road traffic congestion problems. It is also important, in the interest of the economy of Beirut, to propose creative and modern solutions to this major challenge, particularly through reorganizing the outdated public transportation system, which currently accentuates the road congestion instead of reducing it⁴.

⁴ Multiplying means of public transportation of limited capacity has negative effects of the road congestion. The current service is characterized by its social effects (transportation at low prices, income distributed to a high number of personnel). A more efficient public transportations service should be based on vehicles (buses or trains) of greater capacity with less authorized stop points.

Controlled Development of Tourism in the High Mountains

At the periphery of the Central Urban Area, natural and rural regions of the high lands (high lands of Kesrouane, Matn, Baabda, Aaley and Chouf) can benefit from the proximity of the large pool of job opportunities offered by large agglomerations as well as from activities they could develop starting from their own potential, essentially in the fields of tourism (in all its forms: summer vacation, hotel industry, winter sports, cultural tourism, eco-tourism), services and local trades. They will also be able to continue to exploit their agricultural potential, whether it is the orchards in high mountains, garden vegetables in the lowlands, or intermediary agriculture where the diversity of the altitude levels allows a large spectrum of agricultural varieties.

Within these rural regions surrounding the Central Urban Area, the relay-cities will play an essential role in the services and trade sectors. These cities will benefit from the establishment of public administrations as well as educational and health facilities.

IV.2.2 Giving the North and Tripoli a place of choice in the maritime transportation, industry, tourism, international fairs and higher education

Most of public efforts over the coming years should be concentrated in the North and Akkar, to rectify an economical and social situation, which is among the most alarming of the country.

Naturally, the effort should be directed towards cities as well as villages. But the North will have fewer chances to benefit from a real economic take-off if its urban heart, the agglomeration of Tripoli, does not acquire in the first place sufficient dynamism.

A particular effort for Tripoli

The development of the agglomeration of Tripoli should be accomplished in an orderly way, tackling all sectors within a project framework .

The Port of Tripoli should not only be rehabilitated and modernized, but should benefit from a strategic decision to give it the exclusivity of transports of freight towards and from Iraq and Syria. By putting back in the railroad service to Syria (and later on to Beirut) which necessitate improving the roads towards the border on one hand and Beirut on the another, Tripoli might be able to develop an important function of freight transport. This function should be strengthened by the provision of warehouses and adequate logistic zones.

The industrial development of the capital of the North should also be a priority. It can benefit from the presence of the port and communication roads, the development of the power generation site, the competitive prices of industrial lands as well as the local industrial traditions.

However, Tripoli and its agglomeration should mostly rely on the development of its trade and services. And, in this context, Tripoli possesses real assets, which are worth

emphasizing. It is particularly convenient to insist on the development of the city's image of openness both on the symbolic and functional levels.

The activity of international fairs might be developed once again if the national will to give back the priority to Tripoli in this matter is regained. This development would require some investments and vigorous promotional action. This action could be centered on products of the manufacturing industry.

Tripoli also deserves, because of the demographic weight that the North represents, to become a complete university center. Faculties of the Lebanese University might be completely relocated there, hence receiving students coming from all over Lebanon.

Tourism might bring an additional noticeable income to the city and its region. Constructed around the exceptionally-built heritage of the city, its culinary traditions, crafts and musical traditions and the very beautiful sea façade of el Mina, and as a starting point towards the natural summer vacation destinations to all North Lebanon, the tourism project of Tripoli should ultimately lead to the development of the hotel management sector, at least for short stays.

The project of the overall economic development of the agglomeration of Tripoli needs to be followed-up by a local development agency. It should be conducted in parallel with the project of social development in Lebanon and raising the level of urban services in order to reach an equal standard to that of Beirut.

The expected dynamism in the North and Akkar

A renewed dynamism of Tripoli will give a new start to the entire economy of the North and Akkar. Rural regions, better connected with the capital of the North, and also with Beirut and the Beqaa, will be able to develop complementary activities to those of the Capital Beirut.

These regions have undisputed assets to do so: other than the agricultural wealth of Akkar and Koura, which might be the very basis for the development of modern food processing industries, the North has important and diverse assets related to tourism, which are mostly under-exploited: a valuable sea façade between Tripoli and Jbayl; Qornet Saouda's snow covered slopes (winter sports); forests and natural wealth of all the mountain (summer vacation, eco-tourism); pilgrimage sites (holy valley of Qadisha); striking villages and splendid landscapes; etc.

Emphasizing these assets needs local development projects, concurrently with what is taking place in the agglomeration of Tripoli, within the framework of "opportunities of life": the "Batroun countryside", the upper valley of Nahr el-Jaouz, the valley of Qadisha, Amioun and Koura, the region of Danniye, Halba and the Akkar plain, the upper Akkar, the region of Qobeyate, the region of Wadi Khaled...

IV.2.3. Giving a new boost to the two large metropolis of balance: Zahle-Chtaura and Nabatiyeh

Straight after the North and Akkar, the priority for economic development should be given to the two “**metropolis of balance**”, which are the agglomerations of Zahle-Chtaura and Nabatiyeh.

These two agglomerations have in common their geographic location; they both are in the hinterland of the East and the South of the country. Their development would allow reducing the pressure exerted on the coastline.

This development should be conceived based on the traditions of these agglomerations: agricultural, commercial and administrative. However, it should also include a part of voluntarism, which would allow them to have a higher rate of growth and development.

Giving these agglomerations the status of major centers requires strong measures: a new distribution of the branches of the Lebanese University, all faculties should be located only within the campuses of these two agglomerations; installation of several consular bodies (Syndicates, Chambers, etc.); lead projects, such as giving the label of the capital of food processing industry of the country to Zahle-Chtaura and the label of some other kind of activities, such as culture, publication, environment, etc., to Nabatiyeh.

In parallel, incentives should be given to the industrialists to encourage them to settle near these two agglomerations.

Zahle-Chtaura

The agglomeration of Zahle-Chtaura has strong assets. The required public intervention should be prospected towards space organization and decentralization of governmental functions. Road works, mainly the separation of local and transit traffic in Chtaura, urban planning (development of the North-East sector), logistic and industrial settlements, and regulations related to sewage and solid waste, would allow giving a new boost to this agglomeration that could be further supported by the existence of a university campus with complete faculties.

Additionally, establishing a modern industrial zone towards Rayak, half-way between Zahle and Baalbeck, and well linked to the road network and with a good access to the railroad to Damascus, would constitute a motivating project and would bring a real increase in job opportunities and wealth to this entire region.

The development of the central agglomeration of the Beqaa will bring further dynamism to all the Mohafaza. The rural regions would indirectly benefit from the development of Zahle-Chtaura by developing their own potential, generally founded on their exceptional quality of life – mainly in the West Beqaa and Rachaya. Support for summer vacation and tourism development, trade and local services, as well as agriculture will certainly follow.

The development of the large agglomeration should in-effect allow the preservation of the rural character of regions located in the periphery. West Beqaa could remain a peaceful region with its splendid sceneries of large agricultural lands and the Qaraoun Lake, where a moderate tourist activity could be developed concurrently with diversifying activities mainly centered in the important small cities of Machghara, Saghbine, and Joub-Janine. These small cities could host primary service industrial activities, health and education services, as well as small non-polluting industries. The group of cities and villages of this Caza should also benefit from job opportunities, which would be created in Zahle and Chtaura due to a more efficient transportation network.

The same logic should prevail for the region of Rachaya. Organized around the city of Rachaya, this region might witness a development and dynamism of its activities due to better road links with Hasbaya and the South on one hand, and with Masnaa, the Syrian border and Zahle-Chtaura on the other. Ultimately, Rachaya will be able to develop its major tourism asset, which is Mount Hermon.

Nabatiyeh

The agglomeration of Nabatiyeh, another “metropolis of balance”, does not benefit from similar assets, that exist in the case of Zahle-Chtaura. The fact of giving it the status of “metropolis of balance” is a voluntary decision, and it will take a lot of efforts to bring up this city to the desired level. Nabatiyeh has already the status of the administrative center of the Mohafaza. It is also an active commercial center, as well as medical (5 hospitals of which 1 is public), social (about 20 institutions), cultural and educational services center. Industries are still underdeveloped (mainly metalwork and BTP) as well as tourism and leisure. The development of Nabatiyeh requires diverse efforts aiming at attracting enterprises and improving the attractiveness of the standard of life. Urban planning and improvement of infrastructure facilities will be most decisive.

The establishment of a large industrial zone in Zahrani, at the crossroads between Saida, Nabatiyeh and Tyre, should be accompanied by launching housing projects in Nabatiyeh to encourage the settlement of the young industrial workforce in this “metropolis of balance” rather than the coastline.

The development of Nabatiyeh, in parallel to the development guidelines adopted for Saida and Tyre (discussed hereafter) will reinforce the economic situation of South-Lebanon as a whole. The improvement of the road link Zahrani-Nabatiyeh-Marjaayoun-Hasbaya-Masnaa, and the improvement of the secondary road links between Bent Jbayl and Nabatiyeh on one hand and Tyre on the other, will contribute to this objective.

Outside of the three major agglomerations of the South, the cities and villages will exploit at their best their own potential, based on local services, tourism and the offer of high standard housing near the centers of job opportunities.

The regions of Marjaayoun, Khiam, Rihane and Hasbaya will profit from the dynamism that would be created in Nabatiyeh, and from the substantial improvements

proposed by the road link between Nabatiyeh (in fact, starting from the coast) and Masnaa, going through Marjayoun and Hasbaya. Other than the local development projects conceivable within these regions (small food processing industries, diverse services, summer vacation...), they could also benefit from the flow of people and goods, which may develop on this itinerary. Ultimately, the reopening of links towards Qoneitra and Palestine would provide the region of Marjaayoun with opportunities for commercial development.

IV.2.4 Basing the economic activity of Saida and Jbayl on the flow of people and goods

Jbayl and Saida have a particular geographic position. They are near the Central Urban Area but not truly part of it. These two cities would act as “gate cities” that separate the Central Urban Area from the remaining parts of the country. Saida is the access point of Beirut towards the South and vice versa. Jbayl is the access point of Beirut towards the North and vice versa.

Each of these cities will be able to take advantage from this situation, which relies on the flow of people and goods at the entries of the Central Urban Area. The tourist and commercial functions could be supported by an important logistic role, such as vegetable production and storage, warehousing and transportation of industrial goods.

Saida

Saida has many assets: its status as the administrative center of the Mohafaza; and well developed commercial functions, sea front historical heritage, and culinary traditions, make it a major tourist destination. It is also accessible to the agricultural activities of South-Lebanon... However, the city might suffer from its proximity to Beirut (less than half an hour), both on the economic as well as cultural and leisure levels. Saida has therefore every interest to develop its specific assets, its tourist functions and, most importantly, its commerce, including fish and agricultural products.

This requires emphasizing the city’s assets: its sea façade, its historical heritage, souks, crafts, public services, agricultural plain, etc.

The industrial development of the agglomeration, mainly noticeable in the South of the city, should be better managed. The proposal of the National Physical Master Plan to create a national industrial zone of interest towards Sarafand might constitute an opportunity to reorganize the existing activities in Ghaziyeh.

Saida possesses also an important residential potential with its prime sites overlooking the sea and which already host important real estate residential developments. The preservation of this asset requires good management of the prospects and the scenarios, mainly the safeguarding of buffers between the hills and the lower city as well as a good regulation of the building heights on the foothills to preserve this beautiful view of the greeneries.

Saida hinterland, between the coast and Jezzine, can develop activities mainly linked with summer vacation areas. With the expected demographic growth in Saida, it is possible to conceive more ambitious projects in terms of leisure activities offered to the population over the foothills. However, above 900 to 1000 meters of altitude, it is less probable that activities other than summer holidays and local services might take place. The city of Jezzine would then be the main beneficiary, due to its administrative and commercial role.

Jbayl

Jbayl's situation is similar to that of Saida. Although, it has a smaller population, the city has stronger assets in tourism (Phoenician and Roman ruins, beaches, old neighborhoods...), and a zone of commercial attraction extending all over the Caza and beyond.

Jbayl's main threat is the even greater proximity to the Central Urban Area, which is extending northward. If the current urbanization rate continues, it would reach Nahr Ibrahim within the coming 20 to 30 years. Jbayl and its agglomeration, including Aamchit, should defend their identity and remain independent cities rather than parts of suburbs. To do so, Jbayl should more than ever develop its tourist and commercial functions, including that of agricultural products.

Jbayl's development should be accomplished through safeguarding its potential and highlighting its value: it needs to avoid the temptation of land reclamation whose damages are visible in many locations along the northern coastline: it needs to protect the sandy beaches, the sea view from the archeological site, the old port and the old town... This is what constitutes its assets, and its capital.

In the Jbayl hinterland, the industries on the near-by sites could be maintained and strengthened, while respecting the protection of groundwater. The distant villages can, on their part, develop activities related to summer vacations. The valley of Nahr Ibrahim could also conceive developing activities entirely related to tourism due to its impressive landscape value. However, this should be adequately controlled to avoid altering its important landscape asset.

IV.2.5 Developing Baalbeck and Tyre based on their universally famous heritage

The two cities of Baalbeck and Tyre host the two largest archeological sites of Lebanon, both cited on the world heritage list. This asset as well as the geographic location of the two cities allows their particular distinction as major heritage centers of the country.

Other cities are also known for their archeological and heritage wealth, particularly Jbayl and Saida, but also Tripoli and Beirut, and tens of other cities and villages. These can fully benefit from this wealth, even if they haven't been designated as "major heritage centers" of the country. In fact, this distinction of Baalbeck and Tyre should be the dominant orientation to the development of both cities, something which holds advantages but also constraints.

Baalbeck and its region

Baalbeck owes its international fame to its exceptional archeological site. This heritage wealth endows it with a considerable tourist attraction power. This should be well exploited to the benefit of the inhabitants of the city and the region. The goal should consist to make out of Baalbeck a hosting center for mass tourism, with short-term lodging opportunities allowing visitors to cruise from Baalbeck, towards the canyons of Aassi in Hermel, the sceneries and sites of Yammouneh and Ainata, the Cedars, the restaurants of Zahle and the caves of Ksara, etc.

For such a project to succeed, the city of Baalbeck should solve a number of problems related to urban services, be successful in developing links between the city and the archeological site, preserve the outskirts of the archeological site, efficiently manage traffic, parking and commerce – particularly the food commerce on public roads –, attract hotel investors, organize its promotion with the tour-operators and develop its image of openness.

All this should be conducted in parallel with strengthening of Baalbeck’s essential functions as a major trade and services center in all of the North Beqaa, and as the most important inhabited location in this entire region. Confirming its status as the administrative center of a new Mohafaza would contribute attaining these objectives.

Baalbeck and the region of Baalbeck-Hermel should also benefit from the project of establishing a large modern industrial zone around Rayak. The jobs, which will be generated in this zone, added to those of trade, tourism and agriculture, will allow keeping in the region the active youths who will soon find themselves in the work market.

Beyond the center of Baalbeck, North Beqaa remains marked by the agricultural activities that occupy a major status, an activity which should be further modernized and further supported with appropriate projects: developing irrigation while taking into consideration the soil’s fragility (drip irrigation being the most recommended in the plain around the Aassi), in addition to a better management of marketing activities related to agricultural industries management of pastures and resolving real estate issues (distributing properties in shares), etc.

At the same time, it is important to introduce in this region other activities to diversify and raise the income level of the inhabitants. Programs for local development of this region have been studied. They provide a primary platform for work but show at the same time the necessity of a stronger government commitment to help this territory to come out of the social crisis that resulted from the eradication of illegal cultivations, and whose effects persist. Development projects to be launched in the region should, in all cases, consider its characteristic risk of “desertification”, that is now aggravated by a poor management of natural resources caused precisely by the low level of incomes.

Tyre and its region

Tyre has tourist assets that are even more diverse than those of Baalbeck. Two internationally known monumental Roman sites, a Phoenician history, an important position within the history of Christianity, an open door to all heritage – Arab, Crusades, Roman, religious – disseminated all over South-Lebanon, immaculate sand beaches a preserved nature in the surroundings, a traditional picturesque port, etc.

All these elements endow Tyre considerable opportunities for tourism development. Like Baalbeck, exploiting this potential necessarily goes through a series of regulations to organize the urban environment and protect sites and increase investment in hotel, in addition to development of media. Concurrently, Tyre will be able to continue developing its other activities, particularly trade and services, in the context of its hinterland and its required services.

Tyre hinterland has precisely enough assets to benefit from results of reinforcing the economic activities of Tyre itself. Its historical remains are very numerous and some are gaining popularity such as Cana's or the citadel of Tebnine. Likewise, the preserved nature of the countryside of Naqoura and the characteristic landscapes of the "Hills of the South" are additional tourist attractions.

The South has also other assets, as demonstrated by the example of Bent Jbayl, a city of trade, industry and services, which has recovered its dynamism shortly after the end of the occupation. In the surrounding cities and villages, the irrigation water supply project through the conveyor 800 will allow the increase of agricultural income and the visible improvement of living conditions.

IV.2.6 Diversifying income resources of rural area

If the economic prosperity of the regions primarily depends upon the dynamism of its large agglomerations, it is equally important to conduct specific local development projects for the rural regions, where one out of three Lebanese resides all year long (and also one Lebanese out of two in summer weekends). The increase of the income resources of permanent residents in rural areas could be achieved through the diversification of those resources.

Knowledge of the history of rural areas and their evolution are essential factors for appropriate future planning.

Historically, rural areas were the dominating place of residence and work in Lebanon. The sources of income of this rural Lebanese society were essentially agriculture and crafts.

By mid of 19th century, cities began to prosper commercially due to improvement of communication means, and the increased opportunity of new services related to education, health, teaching, and leisure. The urban way of life started developing. The prosperity of cities, the attraction of their way of life and the reduction of the demand for agricultural labor due to mechanization led, as in many countries, to a massive rural exodus. This was slow at the beginning, but accelerated because of the important

difference in income between the agricultural world and the world of the large city – mainly Beirut. This was very well described in the IRFED mission reports at the beginning of the 1960's.

The rural exodus has undoubtedly reached its peak in the 1960's and the 1970's, with the economic growth and the prosperity of industry, services and trade in the large cities and in particular in Beirut. The war period had then a contradictive effect. On one hand, many displaced from the villages in the South and Mount Lebanon sought refuge in Beirut's suburbs along the North (Matn and Kesrouane) and South (Baabda and Aaley) and, on the otherhand, the battles in the capital favored some economic development in the peripheral regions.

The end results of that the period 1970 to 1997 showed a larger concentration of the population in the cities, as indicated in the following table.

Table 19: Resident population per size of agglomeration in 1970 and in 1997

Size of Agglomerations	1970		1997	
Less than 1 000 inhabitants	391 440	18.41%	259 840	6.50%
1 000 to 2 000	246 945	11.61%	285 730	7.14%
2 000 to 5 000	187 260	8.81%	481 830	12.05%
5 000 to 10 000	68 415	3.22%	313 730	7.84%
10 000 to 100 000	136 005	6.40%	330 830	8.27%
More than 100 000	1 096 260	51.56%	2 328 040	58.20%
Total Lebanon	2 126 325	100.00%	4 000 000	100.00%

Source: CAS, 1970 and 1997

In 1970, more than 30% of the population was still living (permanent residence – all year long) in localities with less than 2000 inhabitants. This proportion has fallen to less than 14% in 1997.

In 1970, 58% of the population was already living in localities of more than 10 000 inhabitants. This proportion has risen to more than 64% in 1997 (of which more than 62% in agglomerations of more than 40 000 inhabitants).

The rural area is now at the second phase of its history: rural exodus – in the classical meaning of the word – is now complete, and the ways of life of cities and countryside have become quite similar. However, the rural area has not yet found a replacement solution allowing it to ensure a sustainable economic and social development. Lebanese villages now live with modest resources that generally come from:

- Public servants, salaries (local public servants, teachers, employments in the army);
- “Mandatory missions” of people originally from the village but not residing in it: supervision of plowing and harvest, surveillance of construction sites, etc.
- Financial transfers from relatives living in the city or abroad;
- Retirement pensions;

- Regular sale of inherited real estate properties; and
- Accessorily: agricultural incomes⁵.

Some people in each village gain their income from specific service activities: the grocer, the taxi driver, etc. A small number of Lebanese villages benefit from more important activities: industries, hotels and others.

For the future, means should be devised to maintain the social structure of the Lebanese villages and to do so, sufficient income level should be ensured.

Lebanon isn't the only country to have known the rural exodus and the drop of income in rural areas. In many other countries, this evolution has occurred well before the second half of the 20th century, and new evolutions have since then taken place in which rural areas have found a new dynamism.

This new dynamism has been achieved through the passage to a new development phase, based upon the diversification of income sources. The most successful experiences are those where the villages have succeeded in:

- Attracting new residents who work in the city but would rather live in the nearby countryside, due to its proximity to major cities and to the quality of its living standard;
- Attracting retired persons who would rather live in the countryside than the city, due to its living standard quality;
- Attracting summer vacationers;
- Attracting tourists;
- Creating original activities totally related to the identity of the villages: artisanal or industrial productions from natural products of the region, labels of quality, etc.

Role of relay-cities in development of local and rural economy

The development of rural area cannot be considered independently from that of cities: it should benefit from the dynamism of cities while putting forward its own specific advantages.

⁵ While the rural world resident population represents a third of the population, agricultural income barely represent 6% of the country's gross income. Even more, the agricultural income only benefits a minor fraction of the permanent inhabitants of the rural world, since the major exploitations, which are well equipped and most profitable, are generally owned by persons residing in the big cities.

The diffusion of the process development will be conceived through the articulation, as per the hierarchy between the large agglomerations, a series of small cities or important villages (relay-cities) and other localities of the rural areas.

It is important for rural areas not to be entirely dependent, for employment, trade and services, on large agglomerations; but we should rather identify within each Mohafaza some ten important localities that can ensure an efficient relay for these functions.

This same concern had prevailed in the 1960's when the State had applied by decree the policy of "development centers" that were to host primarily administrative, health and education facilities.

The relay-cities as identified by the National Physical Master Plan should have priority in the policies of economic development in rural environment. Administrative and security functions, public services (including education and health) and trade functions should be developed at a coherent level as per the needs of the regions.

Diffusing tourism development in all the country, particularly in the rural regions

Facing the challenge of globalization will necessarily lead to in depth restructuring of the entire sectors of the national economy, with the threat of job losses accompanying productivity in gains. One of the most appropriate measures to respond to this threat is, undoubtedly, to develop tourism activities and income.

All Lebanese regions have, and that is a unique chance, a potential based on tourism, which should be put into value and exploited.

Obstacles that make, internal tourism particularly shy and western tourism almost inexistent, should be overcome. In fact, only Arab tourism (Gulf countries) and summer vacation of a part of the diaspora have developed.

The obstacles related to the development of local tourism are numerous: some form of a withdrawal inherited from the war, "territorial marks" closed on each other, insufficient information about boarding offers, water and electricity problems, waste problems and degradation of landscapes, etc. However, all these obstacles may be overcome and their disappearance will contribute in the emergence of hosting services corresponding to the demand, which would hence be freed.

As for the obstacles related to the development of occidental tourism, they are linked to two major factors: the image of insecurity of all countries in the Near East and the high level of costs (lodging, restaurants, transport, ...) of Lebanon in comparison to similar destinations. It is vital to tackle these problems of image and costs.

The development of tourism in all of the Lebanese regions, particularly in the rural areas, is particularly important in order to diversify the villages' and the small cities' resources and to increase the income of their inhabitants.

Succeeding in restructuring the Lebanese agriculture

The economic development of the peripheral regions depends upon successfully restructuring the Lebanese agriculture under the effects of international competition.

Contrary to a preconceived idea, Lebanon has an important agricultural potential, based on the quality of its soil, which is among the most fertile of the Middle East, on the availability of water, on the know-how of farmers and on Lebanon's commercial traditions.

At all times, Lebanese agriculture adapts to external constraints where a number of products managed to efficiently face competition. This is especially the case of industrial crops and “fine” products of high added value. Also, the sectors of citrus, fruits and market products face up to competition quite well.

Agricultural investments will naturally turn to more competitive products and will succeed through adequate support of government policies.

These policies will no longer be customs protection policies or quotas (agricultural calendar). They should be tackling more and more the general environment of agricultural activities:

- Credit to investors;
- Organization of marketing networks;
- Cost reduction of agricultural inputs;
- Organization of commercialization circuits and commercial surveillance;
- Preservation of high productive agricultural lands;
- Land consolidation;
- Mechanization and introduction of new varieties and techniques;
- Agricultural research and improvement technologic;
- Irrigation; and
- Guidance programs and technical assistance to farmers.

The National Physical Master Plan identified clearly the best agricultural lands that should be preserved as a priority for agriculture, while limiting the dilapidation of this national capital through less productive uses, such as housing estates. It equally brings coherence between the irrigation projects planned by the State and the lands that should benefit from these projects.

Developing means of communication

The regional development in the era of globalization requires a modern and largely diffused means of communication and information.

Lebanon should catch up on a major delay in this matter. The capital itself is still not equipped with adapted services, either for the digital communication through the internet or for televisual communication via cable or satellite.

The situation of the peripheral regions has visibly a lower standard. Many cities and villages do not possess the least of office equipment, photocopier, fax or computer, whether connected or not to the internet.

The diffusion of networks and tools of modern communication is no more a luxury. In today's world, it has become an indispensable mean for commercial promotion of local products, tourism promotion, communication between clients and suppliers, research and education, publishing, sharing information...

Lebanon should improve its technological means and the rapidity of access and diffusion of information. Progress has been made, but the essential remains to be achieved.

Figure IV.2 :Economic Development Principles

The national economic development of the country is based on the complementarity and solidarity of all parties of the territories, linked to each others and developed in function of their corresponding vocations

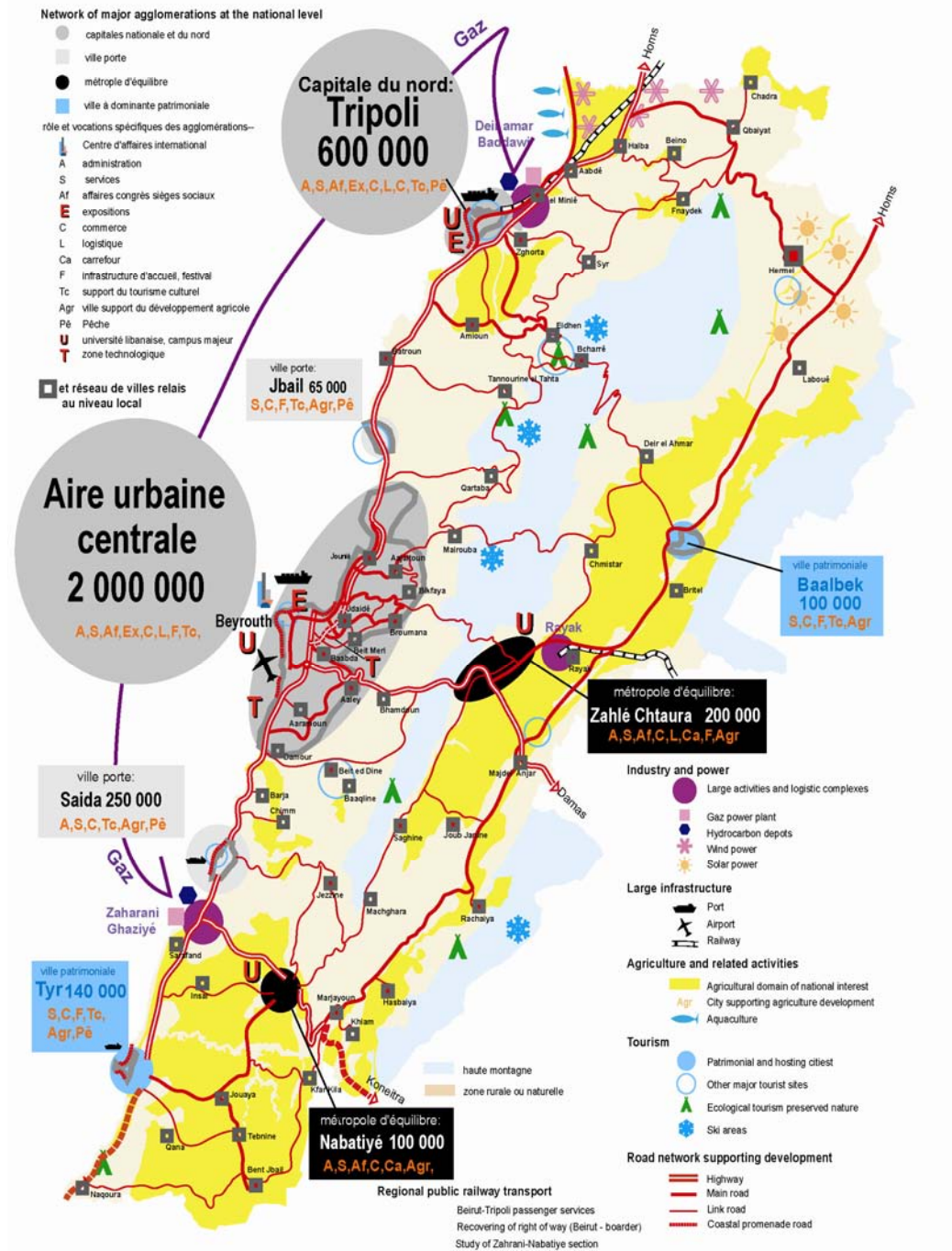


Figure IV.3 : Tourism Development Principle



IV.3 UNIFYING THE TERRITORY THROUGH AN EFFICIENT TRANSPORTATION NETWORK

Transportation plays a determining role in land management of the territory from two points of view: they are essential for the national as well as social economic development and they constitute a major factor of unification of the territory by shortening the distances between cities and regions.

The transportation network adopted by the National Physical Master Plan has been conceived to meet the above two objectives, taking into consideration the limited resources of the State and the Municipalities. The private sector could undoubtedly construct certain infrastructure and assure a number of profitable services, but the main efforts in this sector remain the responsibility of the competent public authorities. This demands going through a strict project selection procedure.

The Choices of primary importance in transportation

For many reasons, the choices in the transportation sector are of primordial importance in land management. First of all, the infrastructures have a very high cost: The Beirut-Damascus highway is estimated at US\$ 1 billion; the complete rehabilitation of the existing inter-urban roads is estimated at US\$ 1.2 billion; the project for the creation of a new deep seaport in the South would cost US\$ 400 million; the cost of the reconstruction of the Beirut Airport has been roughly US\$ 1 billion; and the reconstruction of the skeletal structure of Lebanon's railways (Tripoli to Tyre and Beirut-Damascus lines) could cost US\$ 2 billion, and more if a complete network is requested (coastal line, to the borders, Rayak line to the Syrian border in the North, etc..).

Moreover, the choices of the transportation sector involve the future for a very long term, for decades and even centuries. And even when transportation technologies change, original infrastructure lines are often reutilized. The duration of feasibility studies, decision process, necessary financing arrangements and duration of construction are also expressed with decades rather than years.

The third major characteristic of the transportation infrastructures is the fact that they play an important role in orienting the land use. Highway and railway lines have always attracted investors, oriented economic development, and guided migration flows. At a medium scale, the construction of inlet exchanges or railway stations guided the establishment of enterprises and urban expansion. At the local scale, the organization of road network, as well as the creation of bus stops for the public transport, constitutes a necessary and often sufficient condition for economic development and for construction.

IV.3.1 The main orientations of the transportation sector

The orientations adopted by the National Physical Master Plan in the transportation sector can be summarized as follows:

Five complementary and distinct aspects

The conception of the national transport network is based on the distinction between 5 different aspects:

- 1 . The means of **transport for export, import and international transit**: This aspect requires solutions adapted to the volume of goods and to the locations of exchange modes and places of destination.
- 2 . The inter-urban links: Efficient links must be assured between various town and agglomerations of the country.
- 3 . The specific situation of the Central Urban Area (Beirut + Mount Lebanon): With 2 million people, a port and an airport, a large concentration of tertiary services and industrial activities, plus an integrated plan for urban transport and transit is required. The main problem to deal with in this zone is the congestion of traffic.
- 4 . The level of service of the Lebanese road network as an entity that leads to the problem of rehabilitation and maintenance.
- 5 . The new local roads reserved for the expansion of cities and villages: Should we wish to limit the linear extensions cities and villages along the inter-urban roads, the offer for local roads is essential in order to orient urbanization around the established localities.

The measures considered by the National Physical Master Plan are detailed in accordance with the above-mentioned 5 aspects.

IV.3.2 Offering international services (import, export, transit, airport services) of high quality

The economic development of Lebanon passes through the conservation and the development of high-level logistic services at national and international scales. This concerns especially ports, international roads and airports.

Airport services for passengers

There are nine airport runways in the country. But only the Beirut International Airport (BIA) is in operation for civil services.

Created in 1954, the BIA had rapidly become the first in the region and succeeded in keeping this rank until the outbreak of the Lebanese war in 1975. Between 1954 and

1975, Beirut used to play a role of a hub for the Near and Middle East traffic, in addition to the traffic from and to Lebanon. In 1974, the BIA had recorded 2.75 million passengers, equal at that time to, the traffic in Atatürk airport in Istanbul (13.5 million passengers in 1999) or Oslo airport (14 million today), and overtaking Bangkok airport (25.6 million 1998). During the Lebanese war, the traffic of BIA decreased significantly, to a minimum of 0.5 million passengers in 1984 and 0.2 millions in 1989.

The traffic is in constant increase since the end of the war in 1990 (more than 5% per year during the last five years). In 2001, it has been slightly below the 1974 level (2.45 million passengers in 2001 against 2.75 million in 1974) and should regain 1974 level in 2003 or 2004.

Around 40 airlines serve the BIA. The transit however accounts only for 3% of the total passenger flow, while its share was 20% prior to the war.

The Beirut International Airport faces currently a tough competition in the region, with many Near East capitals having developed their airport infrastructures during the Lebanese war. Dubai has become the hub of the Gulf and Middle East. This airport is served by 100 airlines and is linked to 102 destinations. It has exceeded the 15 million passengers per year and nowadays deals with more than 0.7 million tons of goods. Damascus, a relatively modest airport, recorded 3.2 million passengers in 2000, and that of Aleppo 1.7 million. The airport of Larnaca in Cyprus (a country of less than 1 million people) counted 2.4 million passengers in 2000 and that of Amman 1.3 million.

After the war, in 1993, a Master Plan for the development of the BIA was prepared, projecting the expansion of its facilities in 4 phases at 6, 9, 12 and 16 million passengers per year, respectively.

The executed work since 1994 has resulted in an entirely modernized airport. A new marine runway has been constructed on the west side and the east runway has been rehabilitated, providing an overall capacity of 16 million passengers per year. The new terminal that has replaced the old one, has a capacity of 6 million passengers per year. Related facilities have been introduced, restored and/or extended.

The area between the new marine runway and the old west runway has been set for the possible creation of a free zone over 31 hectares with 150,000 m² of exploited area. The implementation of this project has been postponed.

In theory, the new terminal should be sufficient for the next 10 to 15 years and the runways for 30 to 40 years. The growth of the passengers' traffic will first rely on the tourist attractiveness of the country, in a large part on the local prices and on the regional crises and airlines fair tickets. If Lebanon looks forward to become again an important regional hub, many factors must be taken into account and this could take 2 to 3 decades.

As for the other runways of the country, the Government has considered the rehabilitation and operation of two of them, Qleyaat and Rayak.

The Qleyaat airport project, named the Airport of Rene Mouawad, in the North, consists of a runway capable of receiving 1 million passengers and 200 000 tons of freight per year. A free zone is planned over 45 hectares.

The Rayak airport project will have the same capacities, namely 1 million passengers and 200 000 tons of freight annually. Its free zone is planned over 36 hectares.

No specific schedule has been set for the above projects, and their feasibility (for both passengers traffic and freight issues) is not obvious.

The National Physical Master Plan recommends, in this matter, a conservative and rational approach: the traffic in BIA should reach a satisfactory level of 7 to 8 million passengers per year (triple of today's figure) before going into other civil airport projects in the country.

The airfreight

The airfreight is unlikely to play a major role (in volume not necessarily in value) before 2030 in the transport of merchandises. The BIA has a current annual traffic roughly above 60 000 tons, which is less than the traffic at the beginning of the civil war (100 000 tons). This represents 1/10 of the Dubai traffic. The free zones and freight airports projects of Qleyaat and Rayak, besides that their execution remains uncertain, have limited chance of increasing the demand for transport.

It is thus more judicious, to exploit completely the capacities of BIA, considering the amounts already invested in the airport (modernization of the east runway and construction of the marine west runway) and which are currently under-exploited.

The situation of the freight in the Middle East

Before the civil war, Lebanon has played a major role in the transportation of goods to the Middle East, benefiting from the advantages that were capitalized in capacity, know-how and quality of service. The transit corresponded to almost 40% of the Port of Beirut operations, and the export of goods by land and sea was almost half of imports.

Since then, the situation has significantly changed, especially with the improvements brought to transportation infrastructures and services (maritime, terrestrial and aerial) in Jordan, Syria and the Gulf States.

The growing shares of imports of goods of Asian origin to the region and the exponential increase of the Gulf States markets was translated by the use of the maritime lines towards the ports of the Gulf (mostly Dubai). In these circumstances, Lebanon receives often the goods conveyed to it specifically by land and which come through the Gulf platforms.

Iraq, the main client for the goods transiting through the Mediterranean ports, has been placed under embargo nearly since the end of the Lebanese war. The small

remaining traffic with Iraq has been divided within the framework of the Lebanese-Syrian agreement, granting the Lebanese ports 1/4 of the whole volume. The end of the embargo in 2003 allowed the resumption of exchanges with Iraq, but the new geopolitical situation put the Lebanese and Syrian ports in a very tough competition with other ports in the region.

At the land transport level, an overall look at the Near East map shows that goods transited between Europe and the large markets of the region have no interest in crossing Lebanon; It is more effective to make use of the interior axes, especially the North-South axis that crosses Damascus and Amman, and branches out towards the East (Iraq and Gulf), the West (Lebanon, Palestine, Israel and Egypt) and South (Saudi Arabia and Yemen), as well as the axis along the Turkish-Syrian border that heads towards Baghdad and then to other Gulf States.

The coastal axis, congested by urbanization, would not compete with these two main itineraries of international transit road network. It would rather have the vocation to assure access to final destinations.

Volume of imported, exported and transited goods in Lebanon

It is important to distinguish imported and exported goods on one hand, and transited goods on the other.

Lebanon produces few goods. The agriculture, water, energy and industrial sectors, in other words primary and secondary sectors, represented barely more than 21% of the Lebanese GDP at the end of the 1990's and it is difficult to expect a significant increase for the coming ten years. Hence, Lebanon imports much more goods than it exports. The imports/exports ratio has changed with time, but it has extremely degraded at the end of the civil war and its improvement is very slow. Currently, it is about 10 to 1, while it did not exceed 2.5 to 1 before the civil war.

At the end, this situation is not viable and it is likely – and hopefully – that Lebanon recovers rigorously its balance of trade to come closer to the pre-war ratio.

Currently, imports and exports of Lebanon represent (without the transit – insignificant today) around 6 to 7 million tons per year that cross essentially the port of Beirut. With the expected growth of GDP from 60% to 100% in 30 years, this traffic will at least double. The experience shows however that the volume of transported goods increases in general faster than the GDP. Hence, the National Physical Master Plan adopted a volume of 20 million tons of imported/exported goods in 2030.

As for the transit, the expectations are far less certain. It is important to remember that the transit constituted, in the mid-1970's, 40% of the volume of goods handled in the port of Beirut. It is unlikely to regain this percentage, because of the competition of the ports in other countries of the region and the increase of international land transport. Hence, an optimistic – but nevertheless reasonable – forecast would predict a ratio of 20% of overall transit in the whole country (of transit compared to the total

volume). The transited goods would reach, according to this hypothesis, 5 million tons, at its best, in 2030.

Taking into consideration the available capacities and those under development in the ports of Beirut and Tripoli, as well as in Beirut Airport, the volume of transit forecasted for Lebanon does not require any additional development in above ports until 2030. The need to increase the capacities of these infrastructures could only come from a massive and sustainable revival of transit, which seems unlikely today.

The ports of Lebanon

Maritime transport is the most economic (roughly 100 times less expensive than land transport per tons x km) and it should therefore constitute a priority. Its costs have nevertheless significantly increased by the introduction of terminal transportations, carried out in Lebanon exclusively by land. The idea of Lebanon having several large ports becomes interesting and realistic, in order to reduce the costs of the terminal transportation.

Furthermore, it is appropriate to consider that the Lebanese ports would be handling the main traffic of import, export and transit. Their cumulated capacity should allow a handling capacity of more than 20 million tons of goods in 2030.

The port of Beirut, the traffic of which varies considerably according to the economic situation, has a significant large capacity and is currently under-exploited (around 5 million tons of traffic). It has been recently rehabilitated and modernized (there are still ongoing works for US\$ 150 million). It possesses 10.4 hectares of free zone.

The port of Tripoli, which will be rehabilitated soon (for a relatively low cost: US\$ 50 million), should constitute a priority for handling the transit traffic from Iraq. This vocation is justified by the fact that land access from Tripoli towards other Arab countries is the easiest, due to the Homs passage, and that a railway is also expected between Tripoli and the Syrian and regional railway network. The current traffic of Tripoli port (0.7 million tons) could considerably increase, and this would contribute to the revival of the economy of the North.

The ports of South Lebanon could have opportunities for development due to the fact that they potentially control the roads towards Palestine and Jordan. Nevertheless, even in case of the Near East conflict resolution, the potential of these ports will be affected by the high competition of Haifa and Aqaba. Furthermore, the location of the ports for high tonnage vessels causes serious difficulties in Saïda as well as in Tyre. It will be more appropriate, in principle, to consider with caution the possibilities of increasing the ports capacities in the South. However, in case this increase is to occur, it will be appropriate to consider a new port mid-way between the two cities of Saida and Tyre, using the Nabatiyeh highway towards Qonaitra.

The port infrastructure facilities seem to have been extensively initiated in Beirut or being done in Tripoli. The main effort should be carried on **the quality of the offered services** in those ports, which implies:

- Simplification and speed of formalities (the time spent in ports constitutes a major part of the maritime transport cost);
- An improvement in the services offered to the vessels as well as to the carrier, especially relying on maximum automation;
- The development of containers service (which presumes equally an adaptation of trucks and eventually wagons if the railway is reconstructed) and “ro-ro” service (roll on - roll off); and
- Carrying out clearance tasks by a single agent for the whole chain from its starting point to destination.

The adoption of the above procedures would then allow the ports of Lebanon to compete with the neighboring ports of the region.

Land transportation of goods

Half of the Lebanese exports is currently carried out by land transportation, while import and transit traffic by land occupy a less important role. The international road traffic concerns first of all the Near and Middle East countries. Its development encounters, besides the weaknesses of the road network, the slow process of formalities at the borders and elsewhere. Its cost is very high, exceeding 18% (and up to 45%) of the transported goods value, while this ratio remains below 5% in the developed countries.

This high cost, the noise and the pollution generated by land transportation of goods as well as the deterioration of the road network (a truck causes damages to the pavement much more than a regular car), do not encourage this type of transportation. However, this latter is unavoidable in Lebanon for attracting the transit traffic towards Lebanese ports, an essential need for the economic development.

On the other hand, it is advisable to reduce to the maximum the transit of trucks, for which Lebanon is neither the origin nor the destination. This traffic presents all the above-mentioned inconveniences and does not bring any positive economic benefits.

Also, the responses that the road could provide to the needs of international transportation of goods consist, above all, in properly linking the Lebanese ports to the centers of consumption and production of the country (especially the large agglomerations), and optionally to regional road and railway networks.

Transportation of goods by railway

The development of a railway network could not be justified only for cargo transportation, except for specific point-to-point links, because of the competition of land transportation, which is purely more efficient and flexible.

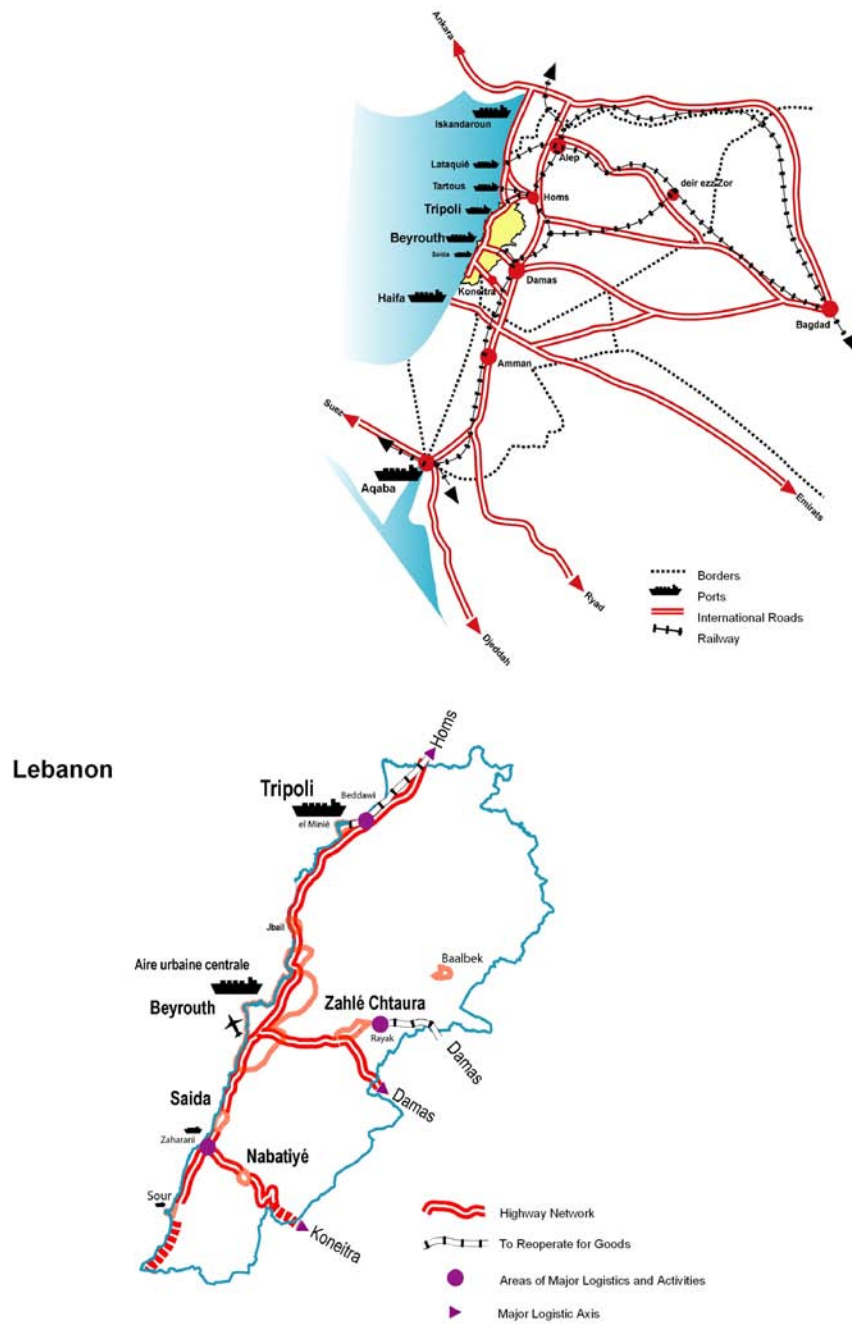
However, Lebanon has interest to put back into service a minimum of a railway network to assure specific cargo transportation. Despite the high cost of renovation of the railway network, the National Physical Master Plan considered this perspective, in particular for the connection between Tripoli and the Syrian railway network. In fact, this connection could reinforce the transit role expected for the Tripoli port and could be extended along the coast towards Beirut, and even beyond in order to serve passenger traffic (see section on mass transportation) and not that of goods.

The logistic centres for freight

The main logistic centres of the country are located within the ports and the airport premises. They allow to unload the commodities from the vessels into trucks and vice-versa, and to store them while waiting for their clearance.

Nevertheless, more modest centres are required, intended for loading/unloading of industrial and agricultural products in storage zones. The National Physical Master Plan proposed, to that effect, the creation of a logistic centre connected to the three major industrial zones planned in Tripoli-Beddaoui, Zahle and Zahrani, that could equally serve as storage and unloading zones for the agricultural products of Akkar, Beqaa and the South.

Figure IV.4. Principles of transportation of goods



IV.3.3 Secure strong connections between cities

Economic efficiency and reinforcement of unity of territory require a network of inter-urban connections capable of assuring the best means of movement possible in adequate conditions of security and respecting the environmental concerns.

The National Physical Master Plan has set up the objective that in 2030, no important locality (relay city) would be more than 100 minutes away from Beirut, no secondary agglomeration would be more than 60 minutes away from Beirut, and no relay city would be more than 30 minutes away from a major agglomeration.

Taking into consideration these objectives, as well as the financial constraints, the considered road plan for 2030 is presented as follows:

1. **A highway connection between Beirut and Tripoli, extended to the northern border and tangent to Halba:** this highway should be absolutely protected from any construction along its sides. In this case Tripoli would be at 60 minutes or less from Beirut. The access to Halba has the objective of reducing the time-distance between Tripoli and Akkar as well as Tripoli and Hermel. The highway must be placed at the foothill between the plain and the hills of Akkar, and not in the middle of the plain. It might be extended afterwards towards Aabboudiyeh to be connected to the Syrian and regional highway network.
2. **A highway connection between Beirut and the agglomeration of Zahle-Chtaura-Qab Elias, extended to the eastern border.** This “Arab highway” is a priority, given the fact that it resolves the capacity problems of the Aaley and Dahr el-Baydar road, and connects the capital to the city of Zahle in less than 40 minutes, and the Lebanese highway network to the Syrian and regional network.
3. **A highway connection between Beirut and Tyre:** it is already constructed until the city of Saksakiyeh and is being extended to Tyre. Due to this highway, it will be possible to connect Beirut to Tyre in less than 60 minutes.
4. **A highway connection between Zahrani and Marjayoun:** this link is currently assured by a high-speed road to Nabatiyeh, the borders of which should be managed in order to secure total fluidity of traffic. Its extension should be planned beyond Nabatiyeh towards Marjayoun, and subsequently towards Qoneitra and the regional highway network. In fact, this connection should assure not only rapid access to Nabatiyeh, but also traffic of goods from and towards the ports of the South and the industrial zone of Zahrani.

5. **High speed connections (in general 2 x 2 roads) to complete the main network.** This type of link is proposed for:
- The connection Zahle-Hermel passing through Baalbeck: This should connect Zahle to Hermel in 60 minutes and Zahle to Baalbeck in 35 minutes. It would take the existing road until Rayak, then, instead of continuing along the current itinerary in the middle of the agricultural plain, it would continue until Saraaïne el-Tahta. From there, a completely new high-speed road will assure connection with the entrance of Baalbeck and its ring road, then it will continue straight, once more in a new road, until Rasm el-Hadath (avoiding the plain), and finally along the existing road until the bifurcation towards Hermel.
 - The connection Marjaayoun – Majdal Aanjar – Baalbeck from the east side of the plain of the Beqaa: This road will follow the existing roads, widened and managed as a high-speed road. It will allow linking Nabatiyeh to Masnaa in 50 minutes and to Chtaura in 60 minutes, and it will also assure faster connections with Baalbeck, Majdal Aanjar, Kamed el-Laouz, Joub Jannine, Rashaya and Hasbaya.
 - The Halba – Qobaiyat connection, to be managed as a high-speed road, will facilitate the access from Tripoli towards the north of Akkar, Wadi Khaled and Hermel. With the execution of the Tripoli – Halba highway and the transformation of the Halba – Qobaiyat road into a high-speed road, the time-distance between Tripoli and Hermel should be reduced to around 60 minutes.
 - South connections from Shehabiyeh. The improvement of the roads between Tyre and Marjaayoun, as well as between Bent Jbayl and Nabatiyeh is a matter of substantial importance. It should be possible to link Nabatiyeh to Bent Jbayl, or Tyre to Marjaayoun in 30 minutes.
6. **Strong Non-highway connections towards certain localities of the Central Urban Area and of the agglomeration of Tripoli:** These connections concern on one hand, the itinerary Tripoli – Ehden – Tourza – Amioun – Chekka, and on the other hand, the links between the coastal highway and Ajajaltoun, Bikfaya, Broummana and Aaley (from Damour). They are intended to reduce congestion and help provide rapid access to the towns located at higher altitudes.
7. **Priority improvements of connections to relay-cities:** it concerns the completion of the main network by selecting itineraries allowing a total coverage of the territory and distance reduction between localities. The majority of these links exists already. Therefore, priority rehabilitation works are required. Nevertheless, several new connections must be constructed, namely from Sir Dinniyeh towards Akkar and Ehden. The connections of the relay-cities are represented on the general organization map of the territory.

8. **Connections between relay-cities and surrounding localities:** these connections must be rehabilitated and maintained on a regular basis.
9. **Inter-urban railway connections** could be considered towards the end of the 2000 – 2030 period, especially on the Beirut – Tripoli axis. The passenger traffic intensity does not justify the re-instatement of this railway section in the short and medium terms; its concept should however be maintained as its feasibility may be justified in the future. In general, the National Physical Master Plan recommends the preservation of the railway right of way, which is likely to be of great benefit in the future, when circumstances permit.

IV.3.4 Establish an integrated transport system for the entire Central Urban Area

In Lebanon, it is only the Central Urban Area (Greater Beirut and adjacent agglomerations) that is at a scale that imposes the selection of strategic choices for urban transportation. The difficulties rise therein in terms of capacity, and not in terms of availability or connections.

An important growth in motorized trips

The number of motorized trips of the residents of the Central Urban Area will roughly double between 2000 and 2030, from 1.3 million trips per day up to 2.5 million⁶. Displacements within this perimeter carried out by non-residents should be added; they are estimated, at more than 400 000 additional trips⁷ in 2030. **In total, the Central Urban Area will record most likely 2.9 to 3 million motorized trips per day in 2030, against 1.6 million in 2002.**

Table 20: Population growth and motorized trip forecasts in the CUA

	Resident population 2000	Resident population 2030	Number of motorized trips per day and per person 2000	Number of motorized trips per day and per person 2030
Beirut	400,000	430,000	0.68	1.06
First ring	900,000	1,000,000	0.87	1.37
Second ring	300,000	500,000	0.90	1.40
TOTAL	1,600,000	1,930,000	0.83	1.30

⁶ The values of individual mobility had been measured in the Metropolitan Region of Beirut (RMB) in 1994 (CDR, Transportation Plan for Greater Beirut) in a Beirut / Suburbs division. The individual motorized displacement growth hypothesis considered in the framework of the current study is 1.5% per year.

⁷ In 2002, recorded traffic at the entrances to the CUA counted roughly 360 000 passenger trips per day (NPMPLT Transportation survey). The part induced from residents out of CUA in this traffic is evaluated at 75%, or 270 000 passenger trips. With a progression ratio of 1.5% per year, this number will increase to 410 000 in 2030.

From the transportation planning point of view, it is most important to determine, amongst these trips, those following radial paths and susceptible to increase traffic saturation at the Beirut entrances. It is thus, important to evaluate daily flows and deduce the required capacity at peak hours.

The Transportation Plan for Greater Beirut⁸ constitutes, to date, the most recent and accurate document concerning transport over different types of paths. By projecting this “ventilation” in 2030 (3 million daily trips), it is possible to obtain:

- 1.6 million motorized daily trips within the Greater Beirut (Beirut and its first ring), against roughly 1.1 million today;
- 0.8 million motorized daily trips between the second ring and the Beirut Metropolitan Region (Beirut and the first ring), on radial lines, against 0.5 million today;
- 0.6 million motorized daily trips within the second ring, bypassing Greater Beirut (tangential lines in the second ring), against 0.4 today;
- 0.05 million motorized daily trips in transit in the Central Urban Area (that cross the zone without a stop), against 0.03 today.

The number of central trips (1.6 million) and radial trips (1 million) would be thus 2.4 million, which means about 50% growth in comparison with 2000.

However, this growth will not be homogeneous along all the radial paths. In fact, the main demographic and urban growth will occur in the north and the south of the urban area, between Maameltein and Nahr Ibrahim in the North and between Khaldeh and Damour in the South. Elsewhere, only the individual mobility growth will increase the demand.

Hence, it is logical to think that the traffic growth will be significantly higher along the northern, southern and southeastern radial axes (it would be reasonable to predict an increase of demands by a factor of two) than along intermediate radial axes, such as Bikfaya or Broummana (that could be effected by a 25% or 30% growth).

Settle the critical situation of the large axes at the entrances of Greater Beirut

Taking into consideration the existing situation for infrastructure, the perspectives reveal a critical situation along the northern coastal axis and along the Beirut – Damascus axis, while the South highway seems to stay unsaturated until 2030.

Southern highway: The Southern highway assures today, until Khaldeh, the crossing of 25 000 to 30 000 vehicles per day and in all directions, and about 2,500 vehicles per direction at peak hour. It functions at 40% of its capacity at peak hours and thus possesses, theoretically, enough margins in case of a double-sized flow, provided that **its highway characteristics remain preserved**. If this highway is “encroached” by

⁸ Transportation Plan for Greater Beirut, 1995, CDR, Team international – IAURIF - SOFRETU

ribbon constructions and commercial activities, its efficiency will decrease and will not be able to satisfy the demand.

Beirut – Damascus axis: The situation is already critical on this axis. Until Jamhour, the records of the traffic volume show that the axis is saturated, necessitating already a double capacity (2 x 4 instead of 2 x 2 roads). This situation will certainly worsen with the reconstruction of Aaley and its region, and the increase of mobility. For the horizon 2030, it is necessary to project a four times increase of the existing capacity, which can not be realized without the execution of the missing section of the **Arabic highway**, that is at least a connection between “the airport axis” and Laylake until Bhamdoun for a start.

North axis: The northern axis, which functions currently at its maximum capacity, will face the hardest problems for the coming decades. It assures today crossing (at Dbayeh) for 80 000 vehicles per day and per direction, and about 6 000 vehicles per direction at peak hours, with an occupancy rate of 2.1 persons per vehicle. The perspective of a double-sized traffic volume in 2030 would require the construction of 5 additional highway lanes in each direction. At the crossing between Zouk and Jounieh, it would be necessary to pass from 2 lanes per direction to at least 5 or 6 lanes, which corresponds to another 2 x 3 or even 2 x 4 highway.

Such perspectives must lead to a more global and prospective analysis of the problem. In fact, in case these additional lanes are executed, what will happen later on if growth continues? Will it be possible then to construct more highways in an area facing topographic constraints? Apparently, it is important here to initiate collective public transportation.

The National Physical Master Plan recommends, on these bases, to conceive a double response to the problem of the coastal axis: **one related to private motorized vehicles and the other to public transport.**

A double response: road and public transport

This response must be carried out in 3 phases:

Phase 1: It is appropriate, at a first stage, to increase the transport capacities along the northern axis, between Qarantina and Dbayeh. The new road offer must provide the opportunity to an integral recuperation of the ancient railway lines to use it for public transport in a reserved corridor. At the road level, a 2 x 2 road would be created along the coast between Qarantina and Antelias. At the public transport level, buses (with a capacity of more than 50 passengers) would be set up only to take the path of the coastal railroad, after rehabilitating it for this purpose only. These buses would start from the foothills (Antelias, Jal ed-Dib, Zalka, Fanar, etc. axis), where they will collect the passengers; then they would join the coastal road, where bus stops would be certainly less (2 or 3 between Dbayeh and Beirut); and finally, they would enter Beirut, preferably along reserved corridors for their paths only.

Phase 2: As a second stage, the widening of the road between Nahr el-Kalb and Maameltein would have started, following a course to be defined in the framework of

complementary analyses, taking into consideration the important insertion constraints. This new path should be connected to the existing path at Dbayeh on one hand, and Maameltein on another (where the two infrastructures would be established): the new road would be designed to be used for transit only. In parallel, the main public bus network would be extended, according to **Phase 1** principle, to the north-south itineraries (Jeita, Shnaniir, etc.) and to the eastern and southern suburbs (Hazmiyeh, Aaramoun, Damour, etc.). At the same time, bus corridors would be developed in the southern suburb (Borj Barajneh / Ghobeiry / Beirut) and the eastern suburbs (Sin el-Fil, Dekouaneh, etc.) and within Beirut.

Phase 3: The roads network would be improved again by the creation of two sections of the ring road (A2): on one hand, between Nahr al-Mott and Nahr al-Kalb, and on the other, Hazmiyeh and Khaldeh. With the operation of these road sections, a restructured collective transport offer would replace the displacement of the bus itinerary from the railway corridor towards a corridor along the “old Tripoli road” in the north and the “old Saida road” in the south, as well as the rehabilitation of the railway for an inter-urban service, between Tripoli and Beirut, and between Zahrani and Beirut.

After 2030, other developments will be considered, especially the completion of the ring road between Hazmiyeh and Nahr el-Mott (this section is postponed till after 2030, due to services provided by the Hazmiyeh – Qarantina highway), and the establishment of an urban transport, heavier than buses (a “light” metro or a modern tramway) for the connections between Beirut and the near suburbs.

Establish a single authority to manage the transport sector in the Central Urban Area

The reflections initiated by the Ministry of Transportation have, for many decades, recommended the establishment of a unique authority organizing the transportation in Greater Beirut.

The National Physical Master Plan recommends the establishment of this extremely important authority, at the scale of the entire Central Urban Area, starting from Jbayl in the North to Damour in the South, and from Beirut until Aaley in the East.

This authority should have jurisdiction to take every decision that concerns the transportation sector in this area, whether it is public road investments and collective transport, or regulation of transporters’ activities, circulation maps on the main network, and even traffic signals.

This authority must be endowed with financial abilities corresponding to the level of its task. The Funds that it must manage could be supplied from various sources, to be defined later, eventually part of which would be from the Ministry’s budget, municipal contributions, and even from specific tax revenues (fines, parking, even oil products).

IV.3.5 Improving the quality of the road network across the territory

The general situation of the Lebanese road network is rather unsatisfactory, and more efforts are needed in order to improve its quality.

This requires important and more consistent investments in the rehabilitation and maintenance of the network.

The service level of the roads sector is essential for the fact that it unites the territory and reduces the distances between towns and agglomerations. The existing network assures services for the largest number of inhabitants and activities. Its situation is vital for public safety and the financial savings in the cost of cars and spare parts.

An optimal method for the distribution of credits for road extensions, rehabilitations and maintenance has been defined in the framework of a recent study (Road User Charges) financed by the State. The National Physical Master Plan recommends using this study for future planning.

The rehabilitation and the maintenance of the Lebanese road network require the investment of roughly US\$ 1 billion until 2030.

IV.3.6 Releaving inter-urban roads from local functions

The inter-urban road network suffers from dense linear constructions, causing a slow-down of traffic and deteriorating public safety. Thus, it is important to find the adequate means to reduce this “intrusion” along inter-urban roads whose functions are not limited to urban / local activities.

One of the main reasons that lead people to build along these roads, and expressways, is the shortage of lands for construction appropriately served by roads and infrastructures at the immediate surroundings of cities and villages. This is why linear extensions are often noticed between villages that end up joining with each other.

Hence, the National Physical Master Plan recommends the establishment of a national plan for the development of municipal roads within the nearest perimeter of the extension of existing urbanizations, and avoiding inter-urban roads.

Such an ambition could not be achieved by municipalities alone. It should be strengthened by a national approach.

The efficacy of the national road network could not be guaranteed without such an action, along with a more severe restriction on habitat and trade along these infrastructures, especially along expressways.

Figure IV.5 : Principle for Defining Road Network

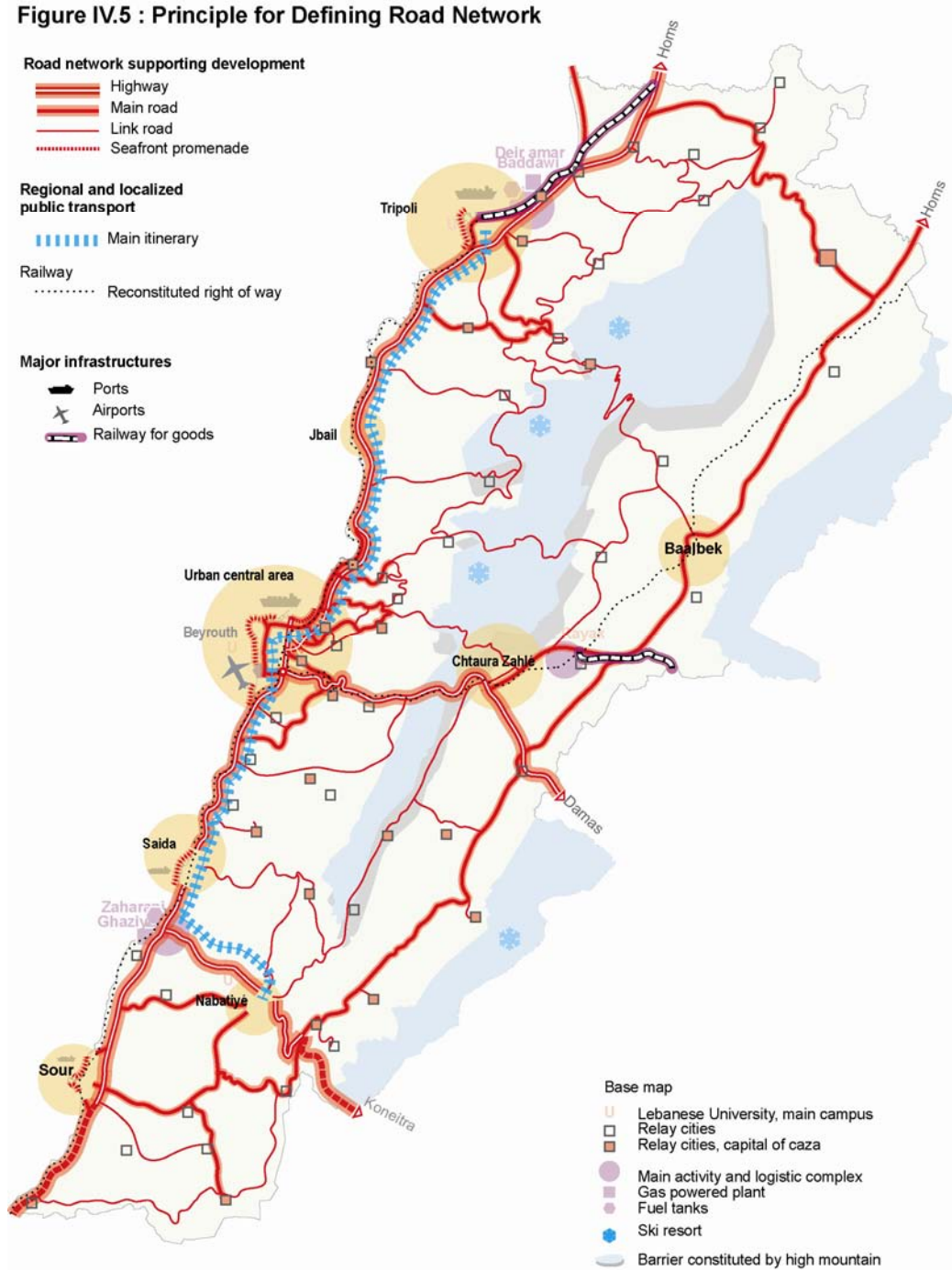
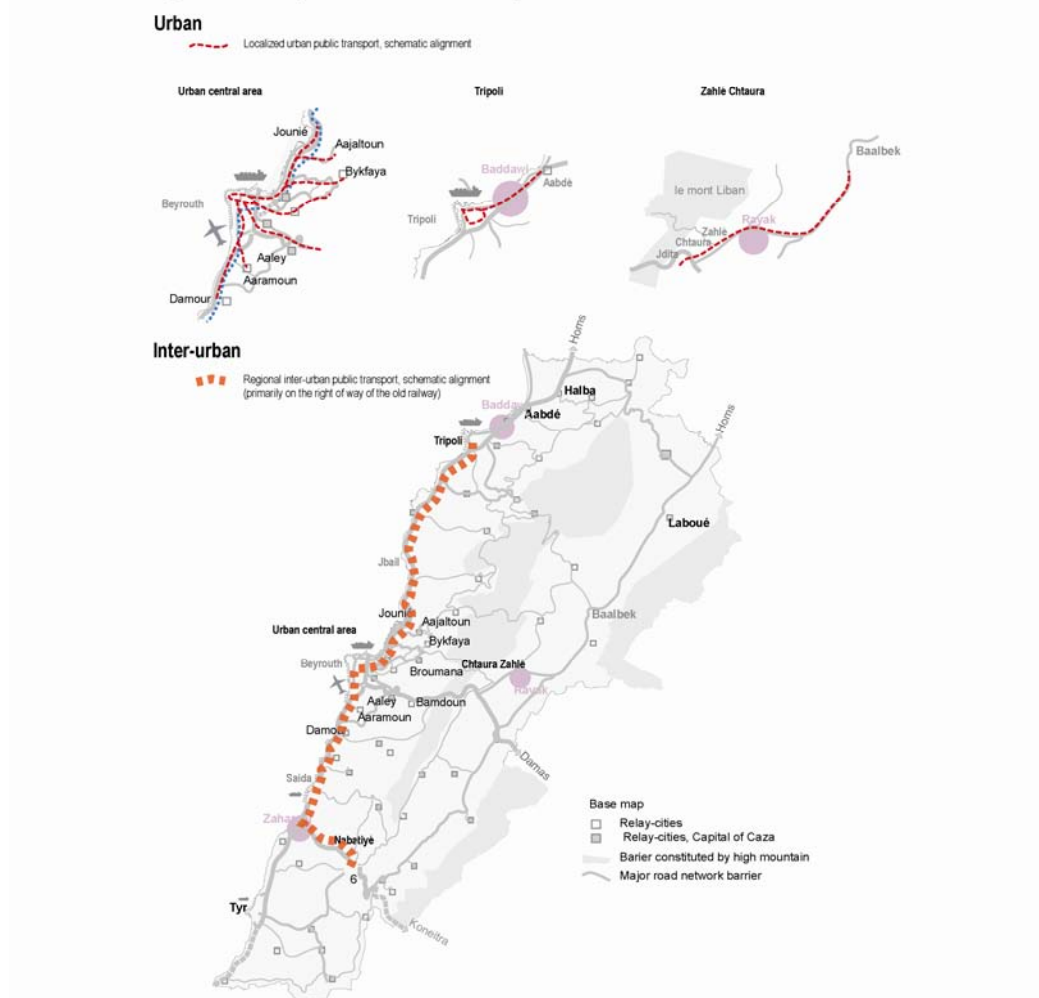


Figure IV.6: Principle for Public Urban Transport



IV.4 TARGETED DISTRIBUTION OF MAJOR PUBLIC FACILITIES

The distribution of health, education, sport and administrative facilities in the cities and regions of Lebanon have significantly improved. Nevertheless, numerous zones of the territory could be better equipped, in terms of quantity, and especially in terms of quality of services offered by these facilities.

IV.4.1 A modern concept for the location of public facilities

It will be more convenient in the future to avoid mistakes of the past that have led, in the name of balanced development or simply in the name of equal distribution of public loans between the regions, to the creation of under-exploited facilities in the argument that funds (often in the form of loans) were available.

A just and reasonable definition of balanced development would consist in guaranteeing perfect equality among the regions for basic services like supply of water, distribution of energy and coverage of telephone network; executing adequate wastewater treatment works that go necessarily through different solutions for agglomerations and for small villages; and executing solid waste management facilities as at the convenient scale and in the framework of cooperation among neighboring municipalities. Other services go with objectives like allowing less than a 10 minute period for reaching an emergency service or a maternity hospital or a healthcare center, or permitting less than 20 minutes period for reaching a primary and elementary school, etc.

Relying on school and medical distribution or location maps that would become public is a determining element for setting up equality among regions, based on objective criteria.

IV.4.2 Education facilities

Universities constitute a major concern of the National Physical Master Plan, due to the fact that the University represents a structuring factor for land management.

The distribution of universities must abide by academic criteria, but they could as well contribute to the National Physical Master Plan objectives, especially the will of national unity, balanced development and rationalization.

The National Physical Master Plan recommends respecting the plan of the education authority, such as regrouping firmly their faculties, and creating synergies with the economic activities and social life of the surroundings.

These orientations are interpreted by the recommendation to regroup the Lebanese University in 4 campuses, each having specific faculties: the pole of Hadath in the Central Urban Area, the pole of Tripoli in the North, the pole of Zahle-Chtaura in the Beqaa and the pole of Nabatiyeh in the South.

Regarding technical and vocational education, the National Physical Master Plan recommends a larger grouping of public technical high schools to create units with an acceptable critical size from an academic point of view and to promote the intermingling of youth.

Technical and vocational high schools should therefore be distributed, in priority, on one hand in major agglomerations, and on the other hand in certain relay cities (maximum one per Caza, excluding major agglomerations).

As for the public schools, it would be appropriate to review their plans based on the following criteria:

- To take into consideration the fact that over the entire territory, the population between the ages of 4 and 17 years will become stagnant and even decrease in absolute value;
- To take into consideration the complementarities between the offered student seats by the private sector and the public sector. In certain towns, the additional offer by the public sector will be of no value if the demand is directed towards the private sector and if no increase in demand is registered for the existing public school;
- To target for planning purpose in terms of “number of student seats” to offer rather than “number of schools”, which doesn’t have much meaning;
- To review investment programs for establishing public schools once every five years in order to adjust supply to demand;
- To settle as a priority the problem of old, over-crowded, inadequate, or rented schools. The choice of replacing schools should be a priority over offering new ones;
- To rely on the school map, with a minimum of 75 students per school; and
- For any new offer, especially for the secondary schools, to privilege the “relay cities” and districts of large cities.

These orientations will allow setting a rational and coherent network of educational establishments, which would serve the entire territory in equal quality and level of service.

IV.4.3 Healthcare facilities

In the healthcare sector, the National Physical Master Plan recommends focusing the efforts on access to health services for maximum benefit, rather than on the quantity of new facilities.

Lebanon possesses currently enough health care centers and hospitals, even more than needed. Moreover, these facilities are distributed all over the country. The number of advanced technological equipment is more than needed in comparison with international standards.

At present, the challenge is the quality of services and improvement of access to existing health care centers and hospitals.

The improvement of the quality of the road network and a more efficient management scheme for transporting patients to required health facilities, represent adequate solutions for the current and future needs of the country.

In parallel, Lebanon will focus on the technical advances that will allow henceforth developing home-care methods and remote medical follow-up.

The complementarity of the offer between the private and public sectors must be better defined. As long as health care is being funded by the social security systems, the Ministry of Health subsidies and the private insurance companies, the public sector should abstain from competing with the private sector on similar services addressed to the same population. It should concentrate its supply only in regions deprived of sufficient supply by the private sector.

In the future, the issue of the public/private complementarities in healthcare offers should be the central concern of the state strategic reflections in health matters.

IV.4.4 Electrical power

Power supply has to be considered as an essential public service. Its role in the economy is unarguable, but it is also a determining factor of life conditions.

Lebanon's needs for energy in 2030 are estimated at 4 200 MW, that is around 800 W per person⁹. The following table presents the projection of needs for 2030, taking into consideration the hypotheses of the closure of the Zouk power plant by 2010 (loss of 600 MW) and the execution of the regional interconnection of 400 KV in 2005 (which allows reducing the reserve of the margin of excess capacity from today's 30% to 10%).

⁹ The evolution of the consumption per capita (including the needs for industrial and other economic activities) is estimated at 3% per year between 2002 & 2015, then at 2% per year between 2015 & 2025, and at 1% per year between 2025 & 2030.

Table 21: Projections of the energy demand for 2030

Year	Population	Need per capita	Safety margin	Total need	Existing power plants capacity in 2002	Necessary additional capacity
		(W/capita)	(%)	(MW)	(MW)	(MW)
2002	4,080,000	430	31	2,300	2,300	0
2005	4,200,000	470	18	2,300	2,300	0
2010	4,400,000	545	10	2,600	1,700	900
2015	4,600,000	630	10	3,200	1,700	600
2020	4,800,000	700	10	3,700	1,700	500
2025	5,000,000	770	10	4,200	1,700	500
2030	5,200,000	800	10	4,600	1,700	500

The expansion of power generation is therefore unavoidable and important, and around 3,000 MW is needed in less than 30 years (taking into consideration the closure of the Zouk plant).

The investments required for the increase in power generation, energy transmission and distribution will be significant, about US\$ 3.5 billion over this period.

It is then important to adopt in this sector a strategy with clear objectives and phases.

The objectives to accomplish are:

- Satisfaction of needs;
- Reduction of generation costs;
- Safety of transport;
- Safety of supply; and
- Control over the environmental impact of installations.

These objectives lead to strategic choices based on:

- 1 - The use of gas as a main consumable, taking into consideration its lower cost compared to oil and diesel, and its lower impact on the environment, without however neglecting the possibility of energy production using petroleum products, for reasons of securing adequate supply, and without omitting the possibility of other means of power production with renewable energy sources;
- 2 - The interconnection of Lebanese transmission network with the Syrian network to improve the safety of transmission;
- 3 - The reduction of the number of power generation plants. When the interconnection is accomplished, the majority of the Lebanese territory could be supplied with power from 2 or 3 national sites uniquely

chosen amongst the most modern ones. The other sites could be used for purposes other than energy production, and this will reduce their pressure on the environment and will allow some savings in production cost. Production must stop as soon as possible at Jiyeh and Zouk, as well as at many small thermal plants throughout the country. Hydroelectric plants could be maintained but these resources could primarily be used for irrigation purposes.

- 4 - The adoption of adequate phasing of investments as follows:
 - a) In 2005: Installation of gas conveyers to Deir Amar;
 - b) - In 2005: Building a new power plant at Deir Amar, with an eventual capacity of 1,500 MW with the installation of 500 MW in the first phase. This option is better than that considered by EDL in Selaata, for reasons related to cost of gas transmission and environmental impact.
 - Dismantling the Zouk power plant.
 - c) In 2010: Building the second phase of the new plant at Deir Amar.
 - d) In 2015: Building the third phase of the new plant at Deir Amar.
 - e) In 2020: Doubling the capacity of the Zahrani plant. This option would not be adopted unless an economic study of gas conveyance confirms its feasibility. Otherwise, it will be necessary to increase the capacity in the North, given its proximity to the source of supply and consequently its lower investment costs.
 - f) In 2025: To build a new power plant or to expand an existing one to a capacity of 400 MW. The Deir Amar plant being close to the gas supply sources, it would be more appropriate to build the new plants in the North. However, for the security of refueling sources with reasonable prices, the production capacity could be distributed between the Deir el-Amar and Zahrani power plants.
 - g) The distribution network, where development must accompany production, would then consist eventually of almost eight 220 KV aerial and underground lines as well as 20 sub-stations.
 - h) The distribution network, aerial and underground, should be increased as well.
- 5 - The experimentation at a large scale the use of suitable alternative energy sources. It is worth testing in the plain of Akkar aeolian power production. Likewise, it is worth testing the solar energy production in the Beqaa valley. Experimentation for local use of solar energy could be carried out in the Beqaa valley.

IV.5 ENSURING A DISTINGUISHED URBAN DEVELOPMENT RESPECTING THE CHARACTERISTICS OF EACH REGION

The social and economic development will be accompanied with a growing demand for space and real estate for housing, activities and facilities.

Therefore, it is important to offer to the large agglomerations, as well as to smaller cities and villages, enough space to secure that they expand on lands well equipped with all infrastructures, without threatening the natural and agricultural national asset of the country.

This demand must be developed in a way that does not jeopardize the country's most important resource, which is its territory. Land use must be in the utmost manner adapted to the physical characteristics of different regions, taking into consideration the inherited realities of the past and the future needs.

IV.5.1 Determine the preferential uses (vocations) of different parts of the territory

Based on objective scientific analyses, the National Physical Master Plan determined the preferential uses of the territory's various parts in 4 categories:

- **Urban regions:** These are the regions where large cities have been historically developed and where urban expansion should be extended in the future. They are essentially constituted of buildings and managed roads, as well as numerous “open” spaces that are organized either as urban green spaces or used provisionally as car parks or for agricultural productions, or left in their natural state.
- **“Mixed” rural regions:** These are the regions that accommodate small cities and villages that are not attached to large agglomerations, as well as agricultural areas of unequal quality in addition to natural spaces that are not part of the important agricultural and natural entities of national interest. Thus, they are the most adequate regions for a “mountainous” or “rural” housing, and many of them possess important assets for tourism and summer holidaying.
- **Agricultural domain of national interest:** The regions classified in this category include the best agricultural lands of the country where irrigation networks either exist or are planned. The use of these lands for agricultural production purposes is a stake of national interest. Some of these regions are threatened by urbanization, but generally they are inadequate for housing as many of them are prone to flood risks.
- **Natural sites of national interest:** They are the regions that constitute a national importance for the conservation of water resources, forests and

biodiversity. In general, they include the higher mountains, the great valleys and some places – in the North and in the South – that are vital to secure biological continuities for the flora and fauna. These regions, which contain several villages and some agricultural lands, are essential for the natural environment that constitutes one of Lebanon’s major assets for tourism and quality of life in nature.

Identify the agricultural domains of national interest

The identification of the regions of agricultural vocation has been made using the maps of soil classification and irrigation perimeters.

The analyses carried out, in the framework of a joint research program between the National Center for Scientific Research and experts in charge of the National Physical Master Plan, have taken into consideration multitude of criteria to produce the soil classification map, including: soil nature (pedology), soil depths, acidity, slope, irrigation possibilities, etc.

The soils have been classified into 5 classes, according to their suitability: Unsuitable for agriculture; Mediocre; Average; Good; and Excellent.

The National Physical Master Plan has adopted the 3 best classes (average, good, excellent) for the selection of the core of the agricultural domain of national interest. Lands of lower quality, but capable of being improved by future irrigation projects have been added to these regions.

Identify natural sites of national interest

The components of the regions with natural vocations are:

- The mountain peaks, generally above 1 900 m: These areas are important for the quality of water resources; they are also characterized by their vulnerable flora and fauna;
- The Cedars, Fir and Juniper Forests: These zones are in general located between elevations 1 500 and 1 900 m. Among them is the “Cedar and mountain trees corridor” isolated on the western slopes of Mount Lebanon;
- The Pine domain, which covers a considerable part of the western slopes of Mount Lebanon, between the coastline (outside of the agglomerations) and 1500 m elevation;
- Valley beds and slopes: These constitute of riverbeds and a rich vegetation on the side slopes of the valley; they play a major role in biological continuities, biodiversity and water resources quality; and
- Areas of continuity in plain and hilly zones: Such places are important in order to connect natural entities to each other, such as in the North between Mount

Lebanon and Anti Lebanon or in the South between Mount Lebanon and Jabal Aamel.

These regions with natural vocation also include specific sites, the preservation of which is a national duty, given their importance for the environment, the heritage or the tourist attractiveness of the country. The majority of these sites have been identified: they are elements of the geological heritage, natural wonders, natural areas of major biological (fauna and flora) interest and remarkable coastal sites.

Arbitrate land use conflicts

The designation of urban regions on one hand, rural regions on the other, then agricultural regions, and finally natural regions, shows many overlapping areas.

Land use conflicts are induced by these areas. Within the framework of the National Physical Master Plan, these conflicts are solved in accordance to the following criteria:

- Urban extensions of agglomerations represent an unavoidable imperative. In the case of a conflict with other vocations, urban regions take precedence first over rural regions, then over agricultural regions and finally over natural regions.
- Agricultural regions then take precedence generally over rural and natural regions (except in high mountains and steep valleys).
- Natural regions take precedence over mixed rural regions.

Hence, the general map of “vocations” for the different parts of the national territory is elaborated with a classification into 4 categories: Urban, Rural, Agricultural and Natural.

This map is one of the most important tools set by the Master Plan to control land use for the coming decades.

IV.5.2 Promote urban quality

The urban developments that will take place until 2030 provide an opportunity of a substantial improvement of urban quality.

In fact, over this long period, it is estimated that around 400,000 new dwellings would be built and at least 50,000 old ones would be destroyed, without counting thousands of various enterprises and facilities sites, and hundreds of kilometers of new roads, streets, avenues, boulevards and expressways. The cities and villages will extend from 40% to 50%. In a word, major evolutions are expected.

It is important to grab this opportunity to improve on what has been done in the past, practically on all fronts.

Architecture deserves a particular effort, including the joint efforts of architects, their Syndicates, municipalities and the State to ensure the progress of architectural quality in terms of form, material, style, harmony vis-à-vis the natural surrounding or built areas.

Legislation must evolve in order to improve the quality of urban centers and their insertion within their landscape environment.

In the cities, the rules of order and alignment must be researched. The juxtaposition of buildings could give good results, especially in flat urban sites (in the plane or along the roads following the contour lines).

In the countryside, the height of buildings must be better defined and harmonized. The height of a middle-aged pine tree must be the rule wherever it is possible throughout the western sides of Mount Lebanon.

The built-up heritage must be protected and esteemed. The protection of what has been finally preserved in the downtown of Beirut has shown that this heritage is endowed with a considerable attraction that recent buildings have not acquired yet. As heritage is the memory of the city, it is important to build cities that identify themselves through their history and their roots, instead of forgotten cities.

Last but not least, urban quality is mainly represented by the quality of public places. Sea front Cornices have an undeniable success in every coastal city. Similar cornices should be developed in mountains in order to open the view over great landscapes. The ordinary street, a major public place, must be the subject of a special attention, especially as far as pedestrian pathways and location of trees are concerned.

IV.5.3 Organize urban developments in large agglomerations

The elaboration of local land use plans in an urban area should be more often an opportunity to analyze, propose and implement complementary policies for the following features of the city:

- Archeological and historical heritage to be preserved totally or through its fundamental characteristics; this preservation should be conceived within the framework of both limited and extended perimeters, with appropriate rules for both;
- The “known” city that does not pose a particular problem and that should evolve in continuity with the existing development;
- Large opportunities on lands that can be recuperated from undeveloped lands and on which it is possible to conceive ambitious projects;
- The city “to be reconstituted”, namely the districts that are poorly structured, badly equipped and need restructuring efforts by means of new roads, public places, facilities and even amendments of existing buildings; and

- The extensions, the coherence of which must be assured, by designing the basic skeleton network of roads and infrastructures, by adequate regulations capable of generating an urban planning that is not excessively expensive for local communities, and by defining the front lines that will separate the future city from the surrounding major agricultural and natural areas.

IV.5.4 Limiting scattered and linear developments

Between the years 2000 and 2030, urban sprawl will cover between 250 km² to 300 km², a growth of 42% to 50% compared with the current situation. The share of the Central Urban Area in this expansion will be 50 to 60 km², and similarly that of the other large agglomerations. Therefore, two thirds of the population currently living and who will live in the future in the large agglomerations will require 100 to 120 km² of extensions, which in 30 years will be between 40% and 50% of the urbanized lands. The other third of the population that live in rural regions will use as much land, if not more, to extend its cities and villages.

The fact that rural areas consume more land is understandable, the densities therein being less than urban zones.

But if this reality is understandable and acceptable, it is important that this need for land would not take forms that require uncontrolled expensive infrastructure.

The construction of infrastructure for lands to be urbanized in thousands of towns away from each other represents already a significant financial challenge. If the land in question is to be constructed in several thousand locations rather than in a thousand, the cost will be greater and the hopes for high quality would disappear. Thus, scattered construction is precisely the form of urbanization that increases to the extreme the number of localities (that need infrastructure). It is not only costly but is also responsible for the degradation of landscapes and sites as well as dissecting vast agricultural areas.

It is appropriate therefore to introduce serious measures for limiting scattered construction.

Moreover, it will be convenient to control linear developments along roads that provide inter urban connections. Linear development is the cause of decreasing traffic efficiency, increasing road accidents and thus deteriorating the quality of life. The best way to face this phenomenon is undoubtedly the development of municipal road networks in the immediate surrounding of cities and villages. In this context, a general national program to control this linear development phenomenon is necessary and would have useful effects.

Figure IV.7. The four dominant Land Uses

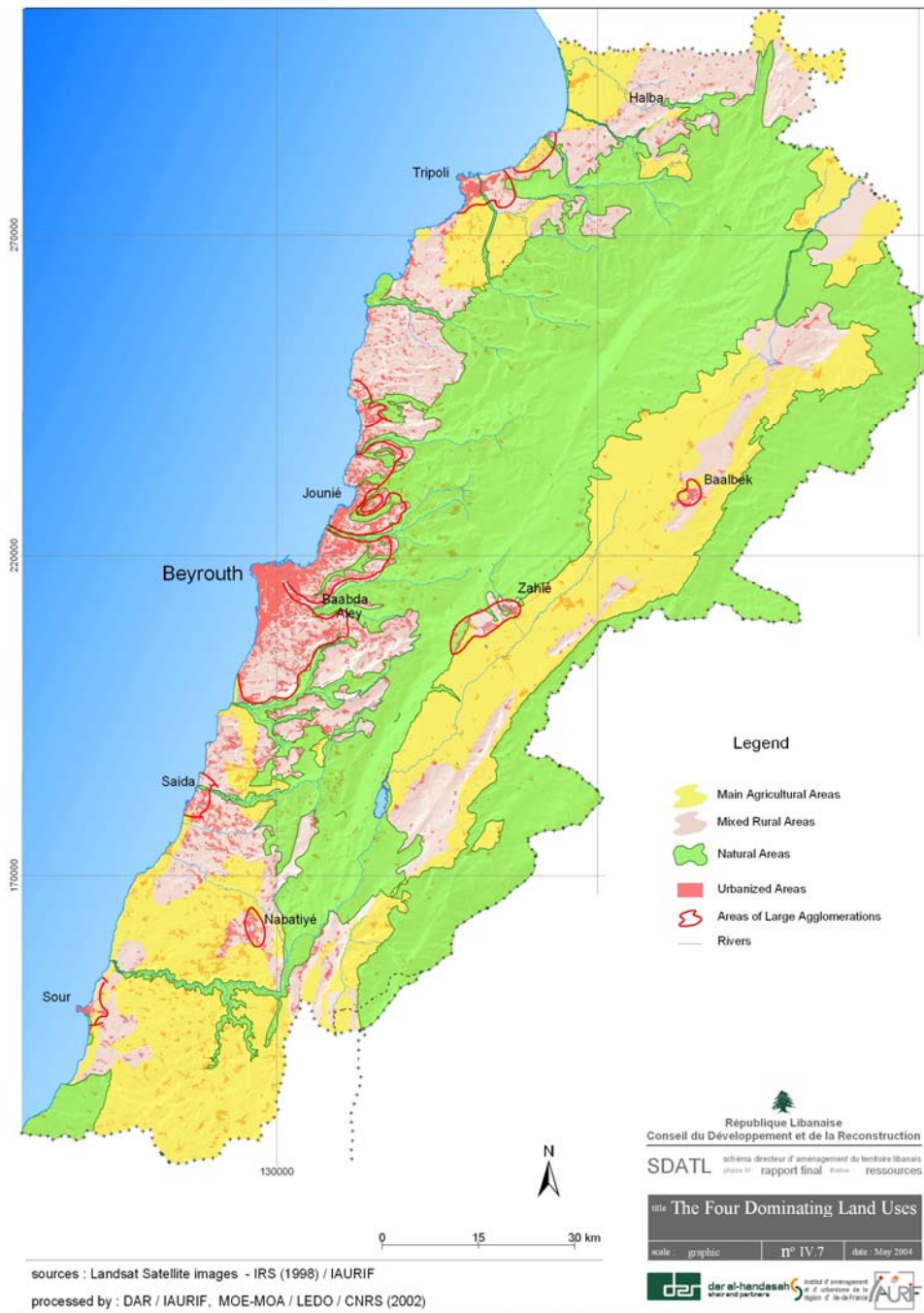


Figure IV.8: Principles for the Growth of Agglomerations

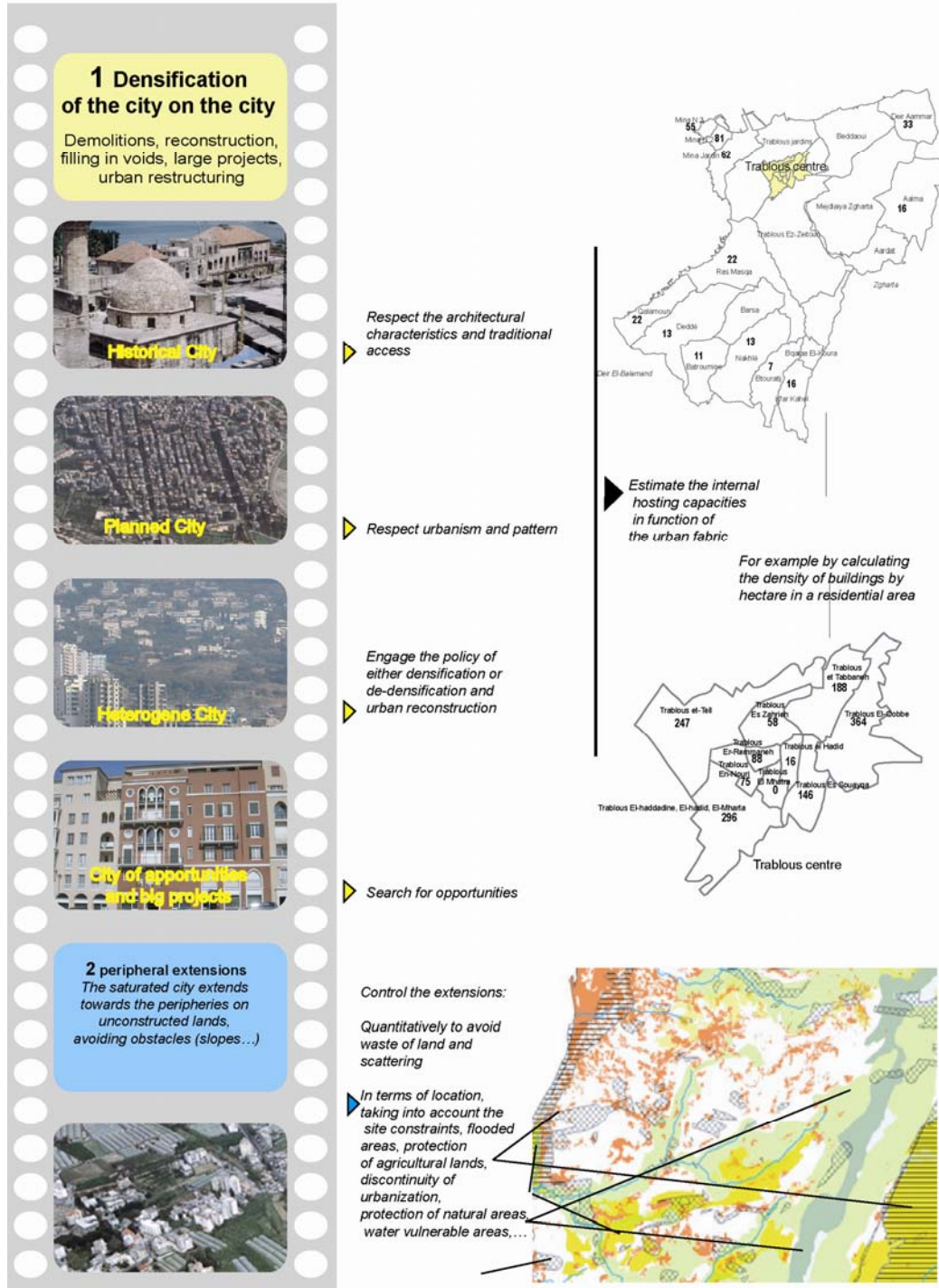


Figure IV.9: Central Agglomeration, Management Stakes



Figure IV.10: The Agglomeration of Tripoli, Principles for the Development of the Urban Area

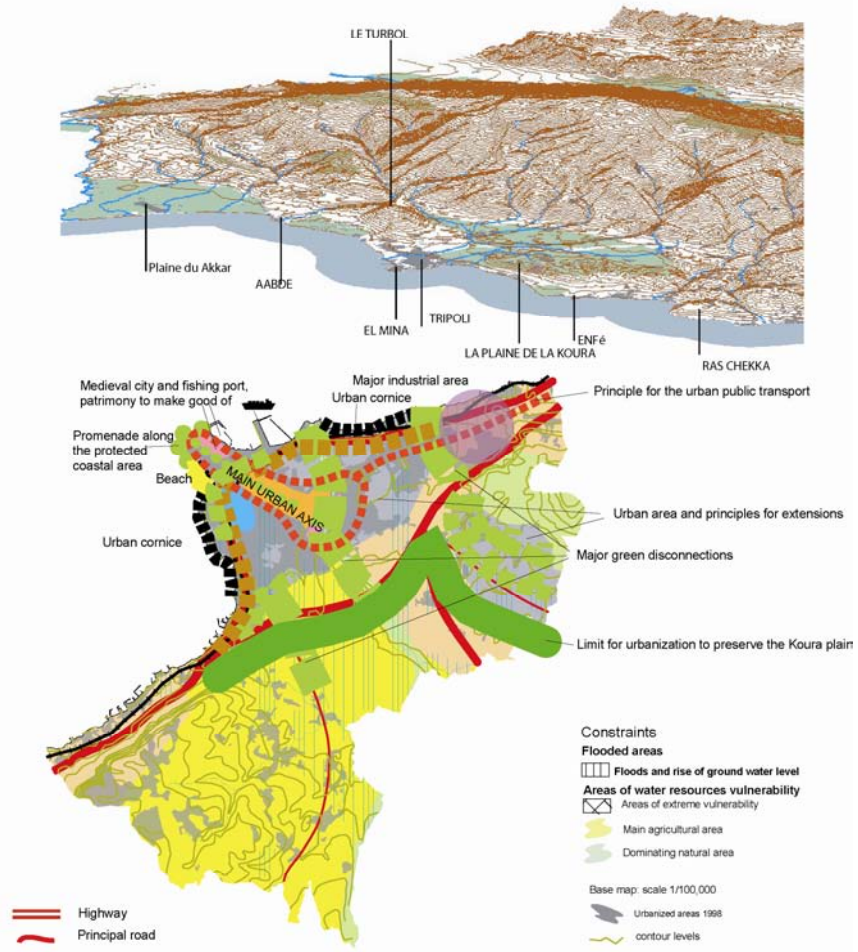


Figure IV.11 : The Agglomeration of Saïda, Stakes of Urban Development

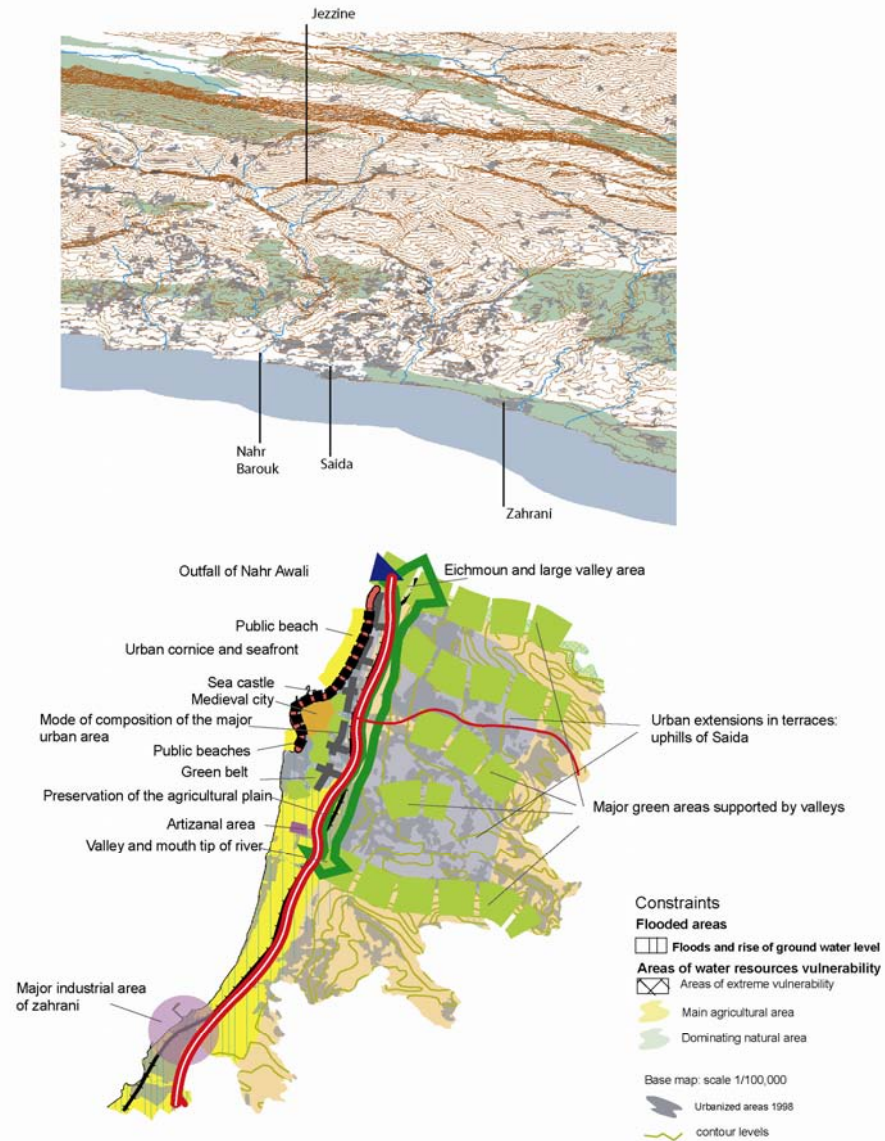


Figure IV.12: Agglomeration of Zahle, Stakes of Urban Development

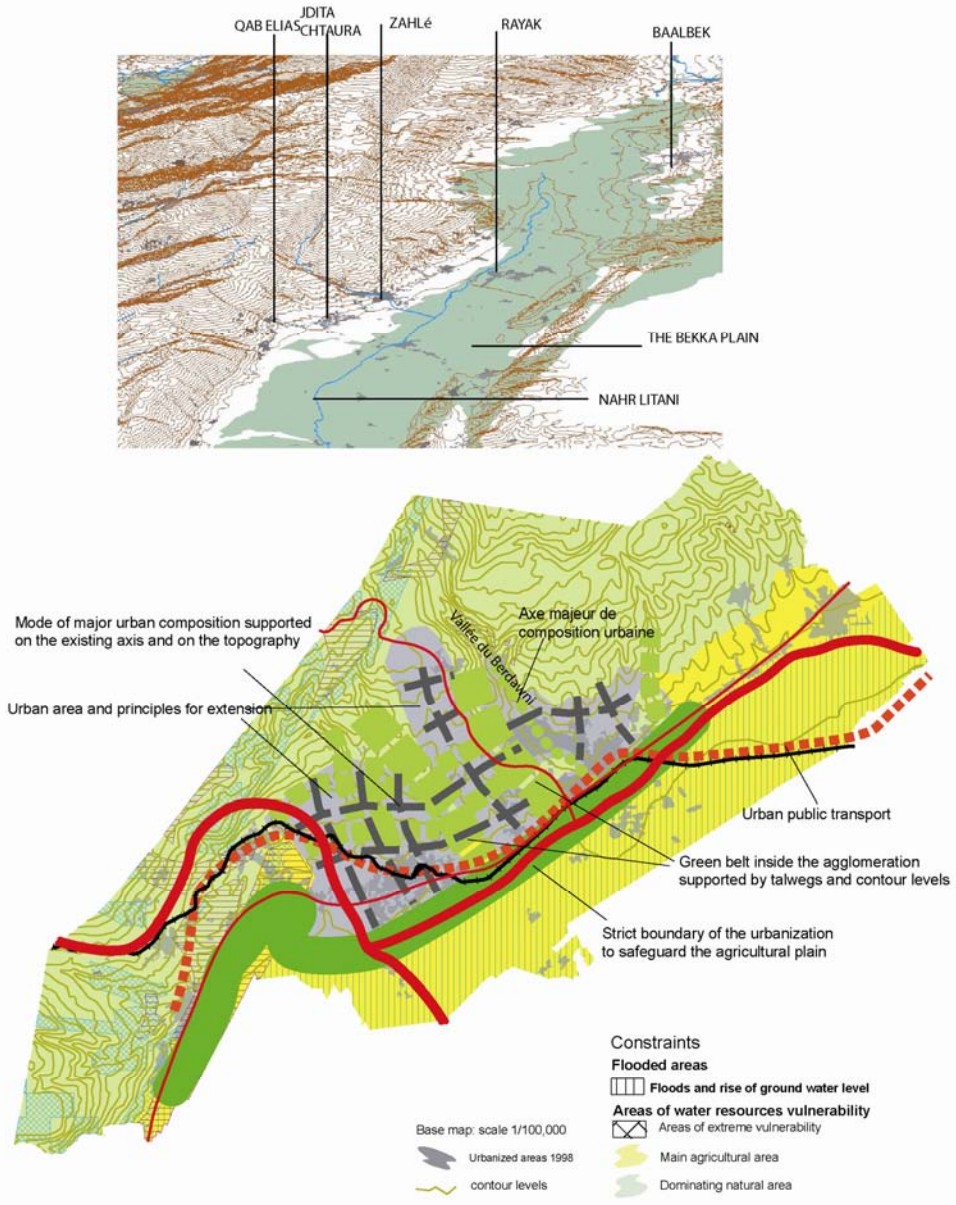


Figure IV.13: The Agglomeration of Baalbeck, Stakes of Urban Development

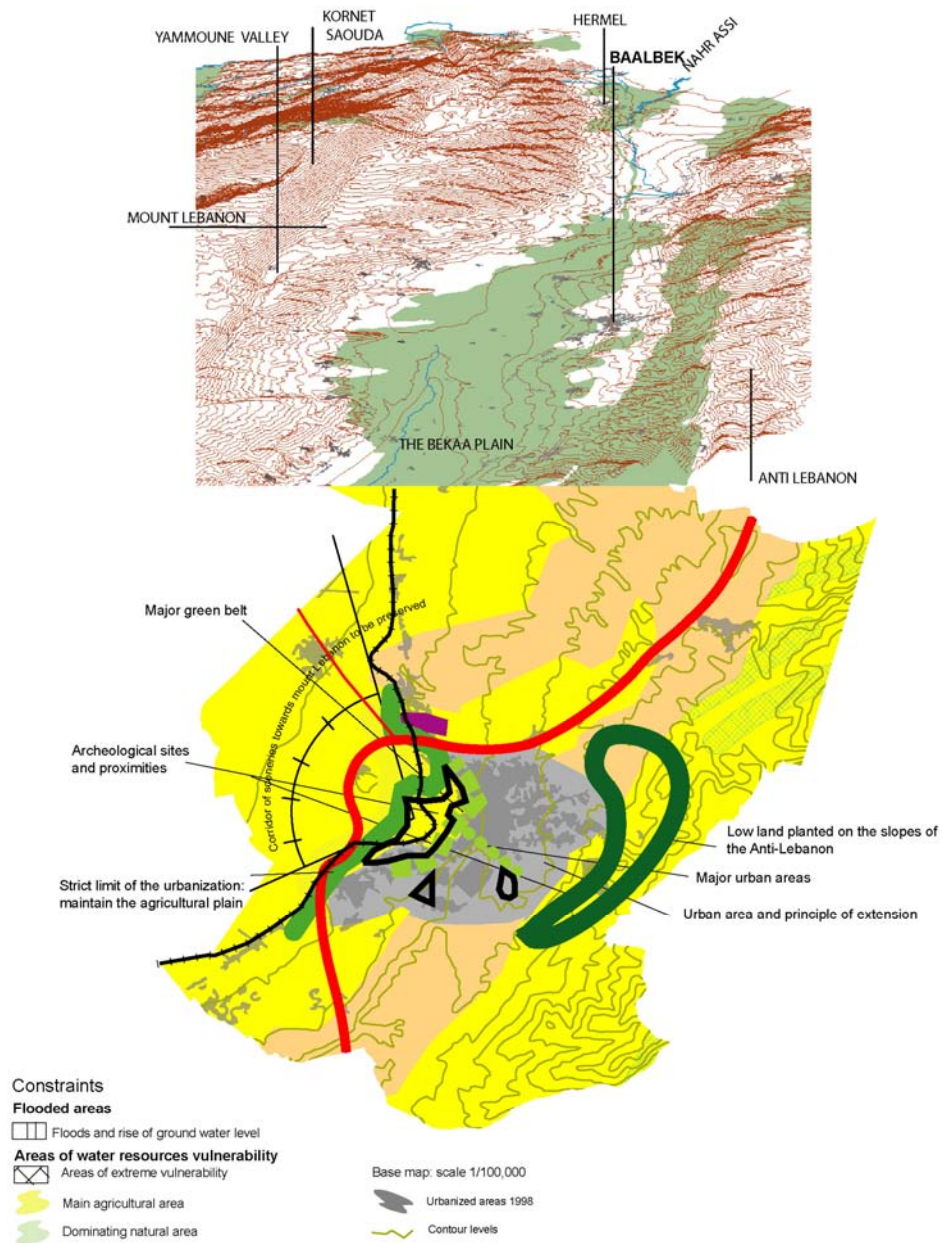


Figure IV.14: The Agglomeration of Nabatiyeh, Principles of Urban Development

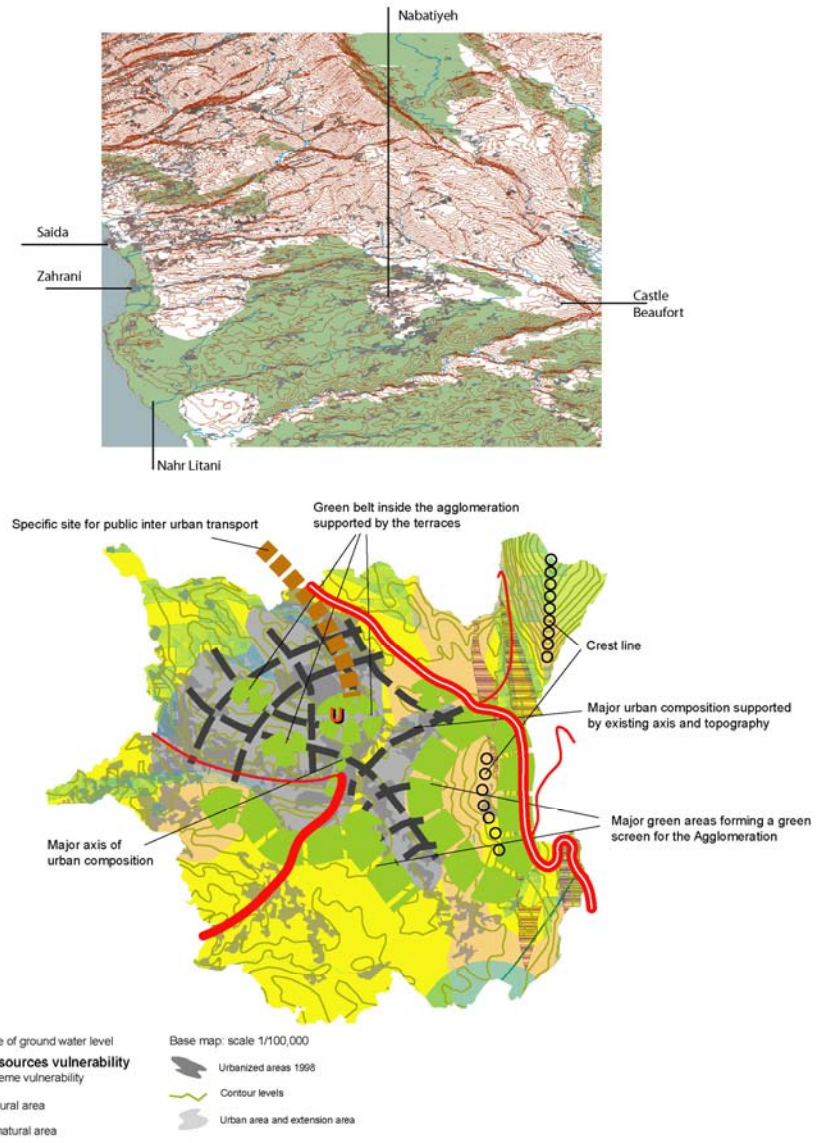
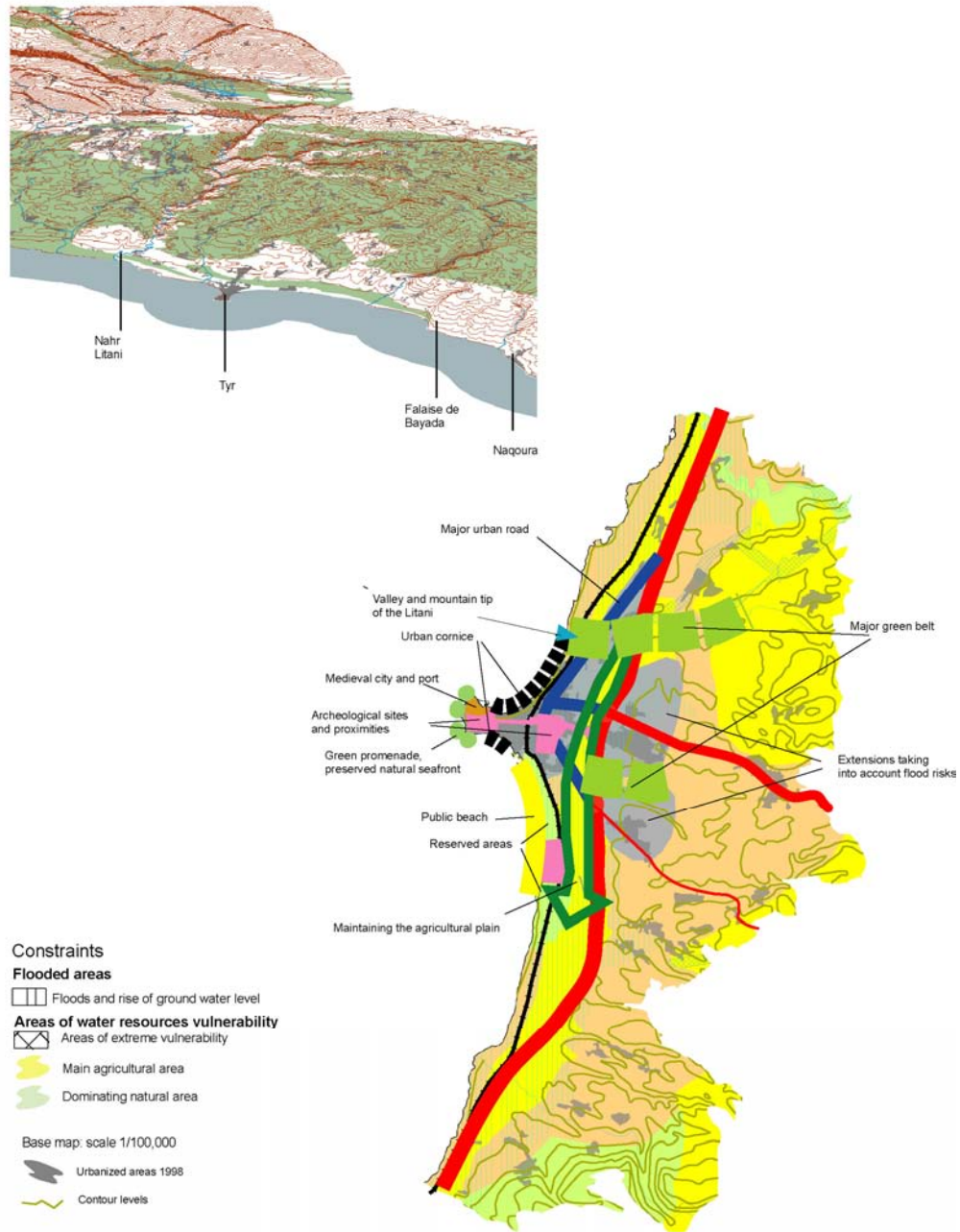


Figure IV.15: The Agglomeration of Sour, Principles of Urban Development



IV.6 RE-EVALUATION OF THE NATURAL WEALTH OF THE COUNTRY

The question of putting good use the natural resources is not an issue of principle or an ideological one, nor a matter of esthetics. It is first and foremost, a social and economic issue, in view of the importance of the natural resources in human life activities.

IV.6.1 The “green and blue network”, a notion of natural space continuity

Lebanon possesses numerous places, whose destination is precisely to remain in their natural state, for many reasons.

The first of these reasons is the protection of the most important natural resource of Lebanon, its water resource, which requires the protection of the mountain peaks (Lebanon’s water tower), rivers and valleys.

The second reason is the need to stabilize the steep slopes from excessive erosion risks by maintaining and developing their vegetation covers or at least by reducing the aggravating factors. This issue is highly important in the mountains, extending not only to the limits of vegetation, but also to the abandoned agricultural terraces, and most importantly to the slopes of the valleys.

The third reason is the need to conserve the remarkable biodiversity that characterizes the natural areas of Lebanon. This biodiversity constitutes a universal heritage and a great wealth that induce positive effects on the quality of life and health.

The fourth and the last reason is the need to protect what represents one of the major tourist attractions of the country, namely its forests, vegetations and natural landscapes.

Hence, the “green and blue network” project lies on the establishment and implementation of a global scheme for areas of natural vocations, which organizes their continuity and the profit attained there on, from the peaks down to the coastline.

The proposed scheme includes:

- Distinguished “specific” natural sites to protect: Inland, this concerns essentially geological heritage, fossil zones above Jbayl, natural bridges, natural wonders and astonishing rock formations, cliffs, grottos, caves and water falls. Along the coast, there are around twenty remarkable sites that should be preserved: sandy beaches, a certain number of rocks and cliffs, sweet water springs, more or less large bays (*Grotte aux Pigeons* the smallest, and the Bay of Jounieh the largest), etc.
- The zone of peaks, beyond elevation of 1 900 m, is to be preserved because of its importance in water resources and its fragility. This zone is unsuitable for

dwelling and due to rough climatic conditions, its fauna and flora are relatively poor and excessively fragile.

- The zone of Cedar and Juniper, between elevations of 1 500 and 1 900 m, is to be protected because of the quality of these species, coupled with a determination to develop them. On the western side of Mount Lebanon, this zone includes “Cedars and mountain Orchards”: efforts should be undertaken, so that it regenerates the Cedar and assures biological continuities between existing isolated Cedar woods, without omitting the possibility of a sustainable balance between the objective and the agricultural practices on one hand, and the creation of ski resorts on the other.
- The area of the Fir of Cilicie, a rare and endemic species of the Middle East that grows only in North Lebanon between the altitudes of 1 200 m and the level of the Cedars. This fir is often accompanied with other conifers. In this region, forests are still relatively very developed and act as a “welcoming place” for various animal species, especially large mammals.
- The land of Pines: It is the zone just downhill from the Cedars zone on the western slopes of Mount Lebanon. In these areas, construction overlaps with the natural environment. This is what makes the charm of Matn, Baabda, Chouf and Jezzine. A quality to be definitely preserved.
- The great valleys: The steep side slopes of the valleys make these zones unsuitable for construction. They are however very important for biological continuities, water and landscape qualities. It is therefore essential to free them from their current status as places for disposal of solid waste and wastewater, and re-establish their natural quality.
- Green incisions along the coast: There are two entities still well preserved on the coastal front, Ras Chaqaa and the southern zone between Bayada and Ras Naqoura. They represent the last witnesses of a landscape that was aggressively damaged by urbanization. Besides, there are other small scattered beaches or rocky witnesses (Enfeh, *Grotte aux Pigeons*) free of constructions that are worth protecting and rehabilitating. In the most urbanized parts of the coast, river mouths offer the possibility to avoid a linear urban expansion and it is appropriate to grab this opportunity in order to create green incisions that will contribute to the quality of life of each person.
- Access to the seashore and preservation of remarkable coastal sites: The National Physical Master Plan recommends a coastal management that secures public access to all the beaches and preserves the remarkable natural sites.

**The coastal zones to preserve from all changes
or to rehabilitate in their original status**

The National Physical Master Plan recommends the preservation of a group of coastal sites from all changes according to their natural configuration (coastal line, essential characteristics, etc.). These sites and zones are as follows (from North to South):

Coastal dunes of Akkar plain
Salinas and wetland of Qlayaate
Palm Island
Seashore cornice and fishing harbor of Al Mina
Beach of southern Tripoli towards Qalamoun
Salinas, wall promenade and the phoenicien wall of Enfe
Promontory cape and cliffs of Ras Chaqaa
Fishing harbor of Batroun
Beaches of Kfaraabida
Beaches in the south and north of Jbail
Fishing harbor of Jbail
Archeological site of Jbail and its maritime façade
Maameltein promontory
Bay of Jounieh and its promenade Cornice
Seafront Cornice of Ain Mreisseh in Beirut
The rock and the small bay of Grotte aux Pigeons in Beirut
Sandy beach of Ramlet el-Baida in Beirut
Sandy beaches of Jnah
Beaches of Damour
Ras es-Saadiyat rocky cape
Sandy beaches of Rmeileh and Jiyeh
Beaches north and south of Saïda
Coastal promenade Cornice north of Saida
The Sea Castle of Saida
Sea façade of the old city of Saida
Mhayleeb scientific reserve
Tyre cape
Archeological site, old city and sea facade of Tyre
Fishing harbor of Tyre
Sandy beaches in the south of Tyre
Ras el-Ain springs
White cliffs of Bayada
White cliffs and bay of Naqoura

IV.6.2 A national natural park reserve in the North

The National Physical Master Plan recommends the establishment of an ambitious project of a national natural park in the North, including the mountain block of Qornet es-Sawda and the natural and forest areas of the North in the perimeter of Karm Chbat, Qammouaa and Fissane. This project that the authorities should support is based on the exceptional quality of the natural areas of this region, the preservation status of this zone and its very low urbanization rate. Classification of this area as a National Park must be accompanied with an active policy supported by the Government in order to support and revive the Park. It can generate important economic income for the concerned localities. In return, it requires the respect of very strict regulations in the matters of urban and road developments. North Lebanon and Hermel, both of which facing economic difficulties, can profit considerably from this project, the adoption of which should naturally be the jurisdiction of the Ministry of Environment.

The creation of this national park does not contradict a reasonable exploitation of the northern slopes of Qornet es-Sawda for winter sports. However, this type of development projects should take into consideration, in a very strict manner, severe environmental constraints to be implemented within the park.

IV.6.3 Numerous regional natural parks

The grouping of natural, landscape and heritage assets in a number of places justifies the elaboration of regional natural park projects. The concept of regional natural parks differs from the concept of a national park by the larger flexibility in the equilibrium to be established between nature and economic development.

A regional natural park is designed as a joint project with several neighboring municipalities, agreeing on a moderate and high quality urban development plan and on the conservation of the natural environment. It is based on this chart and on human and financial means that the municipalities would have planned to realize their projects, that the Government could classify the region as a natural park. This label provides to tourists and visitors a series of guarantees on the quality of life and the absence of disturbances. It is therefore a very important tourist argument. In other countries that have implemented such policies, many regions have been trying for years to acquire this label that constitutes a powerful factor for their development.

In Lebanon, the regions that are best prepared for regional natural park projects are the valley and the high circus of Qadisha, the valley and the high circus of Nahr Jaouz, the high valley of Nahr Ibrahim, the high valley of Nahr Beirut (“valley of Lamartine”), Barouk mountain range and the valley of Barouk, Bisri and Awali (Chouf reserve included), eventually extended towards West Beqaa, over the foothills of Aammiq and the lake of Qaraoun, the hinterland of Naqoura, etc. Other regions could claim such projects, like the region of Hasbaya-Rashaya-Hermon, or the region of Ayshiyeh-Rihane.

Figure IV.16: Green and Blue Sections

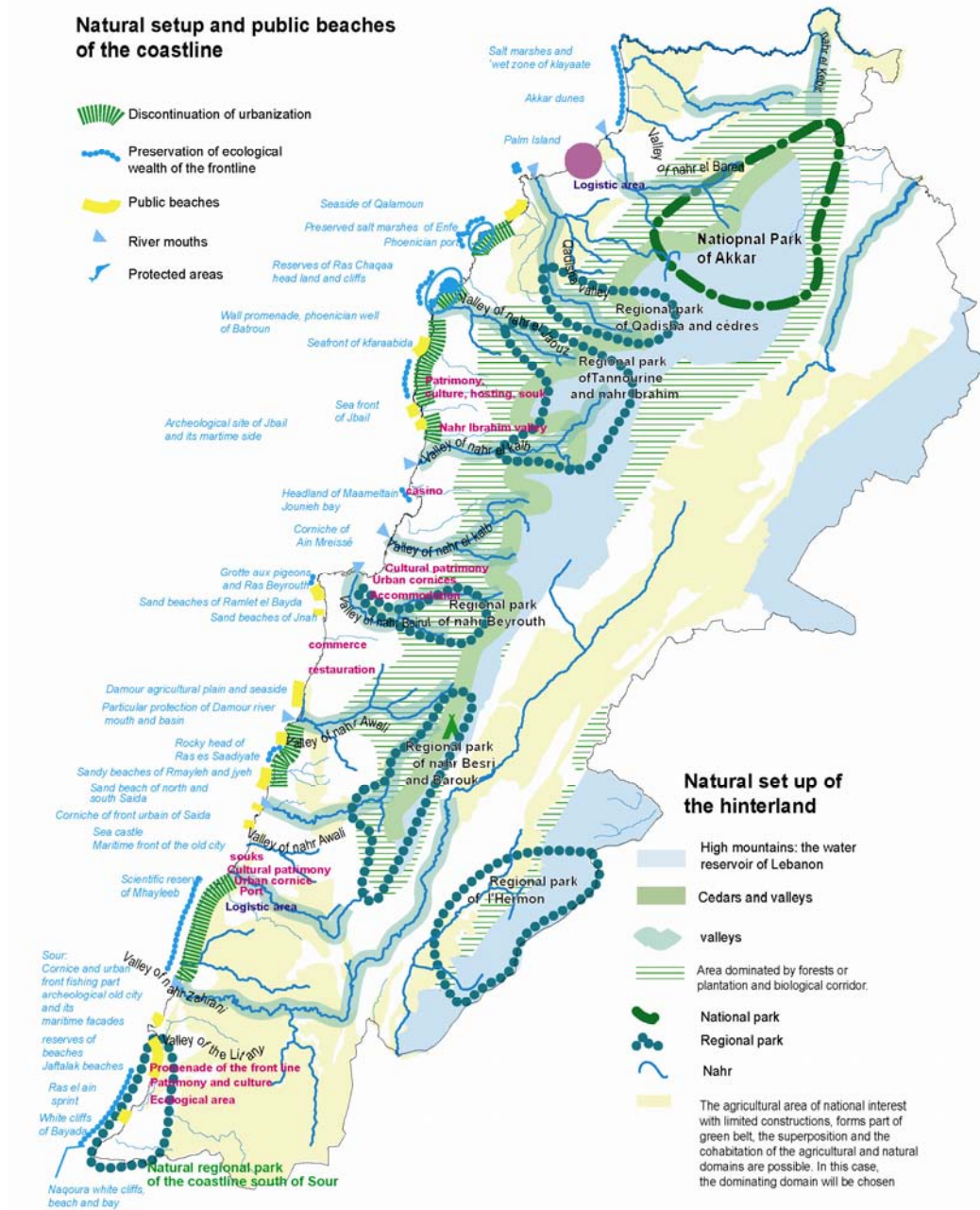
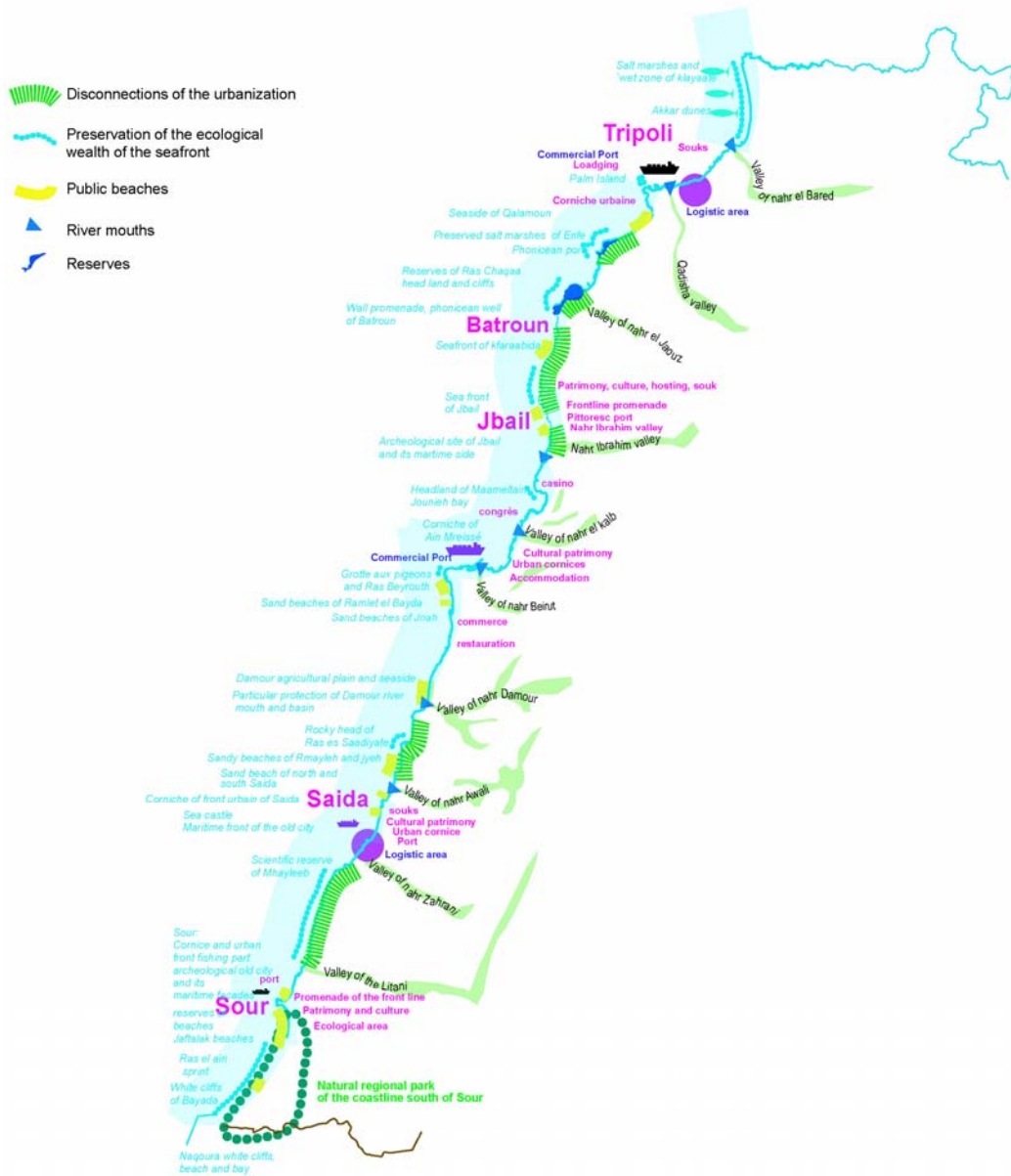


Figure IV.17: Principles for Making Good of the Coastline



IV.7 A SUSTAINABLE DEVELOPMENT OF WATER RESOURCES

IV.7.1 An efficient development of water resources

Lebanon is endowed with hydraulic resources that, after evaporation and evapotranspiration, are limited to less than 5 billion m³ per year. The exploitation of this resource is very difficult because of the morphology and the geology of the country, as well as the limitation of the rainfall season over 5 months per year, against 5 months of dry season and 2 months of limited rainfall.

Therefore, according to the unanimous opinion of experts, Lebanon could never exploit more than an annual average of 2.2 billion m³.

Presently, Lebanon exploits around 1 billion m³ of water through the Water Authorities¹⁰, and probably 250 million m³ from private wells. 60% of this volume is generally used for agricultural purposes and 40% for domestic and industrial (the industrial share being negligible), with however significant system leakages in the public distribution systems (roughly half of the pumped volume).

The future water demands could be divided between domestic, agricultural and industrial demands.

The National Physical Master Plan gives the **priority for domestic supply**, given the critical situation of this part of the demand.

The satisfaction of domestic water demands in Lebanon in 2030 will require around 420 million m³ (220 l/d/c x 365 d x 5.2 M people), namely an annual volume of 525 million m³ to pump and distribute, with a system loss rate of 20% (against more than 50% today). This volume represents roughly 24% of the maximum exploitable resources.

Irrigation projects should be developed to the maximum allowed by corresponding public budget.

The irrigation sector mobilizes today around 650 million m³, that is between 1/4 and 1/3 of the maximum exploitable resources.

The use of available water resources for agriculture, after satisfying the domestic and industrial demands, would mean the activation of around 1.6 billion m³ for this sector in 2030. This would allow the irrigation of practically all the exploitable lands of Lebanon. This objective will be however very difficult to reach before 2030, given the constraints of public finance.

¹⁰ Estimates vary between 900 and 1 350 million m³ of water distributed by the Water Authorities.

Table 22: Current and future use of water resources

Sector	Current use (million m ³)	Future Demand in 2030 (million m ³)
Domestic water	195 – 405	525
Irrigation	670 – 875	1,600
Industry	35 – 65	140
Total	900 – 1,345	2,265

Source: For the currently used resources, compilation of different available studies.

IV.7.2 Water reservoir projects reconciling objectives with potentials

The financial difficulties of the State lead to giving more importance to reducing water system losses. In fact, maintaining a leakage rate of 50% would entail a 50% loss of investment.

However, the reduction of losses and leakages alone will not be enough to cover the demands and there will be a need to mobilize new resources.

Aware of the situation, the Government of Lebanon has developed a plan of surface water development, through the construction of 18 dams and 23 lakes, as well as 2 regulation weir in the Beqaa that would serve as spillways, rather than storage work. The capacities of the proposed dams vary between 4 and 128 million m³, while those of lakes vary between 0.35 and 2 million m³. The planned lakes are distributed evenly all over the country, especially on the eastern slopes of Mount Lebanon. From the 23 lakes, the locations of 17 are known, and 5 lakes are to be located in the Cazas of Marjaayoun, Bent Jbayl, Hasbaya, Nabatiyeh and Tyre.

This plan, if executed, would allow mobilizing an annual volume of 1.1 billion m³, bringing the exploited amounts (current and future) up to 2 billion m³, which is very close to the maximum volume possible. Such a perspective could obviously resolve the problem of domestic water supply and assure irrigation water for the effectively irrigable lands of Lebanon (this is around half of the currently cultivated lands).

Nevertheless, it is unlikely that the Lebanese administration and public finance could accomplish this project in less than 30 years. The cost of the dams alone could exceed US\$ 2 billion. There are also the distribution and irrigation networks to finance, which are evaluated in billions of dollars as well. Hence, this project should be perceived more as a development scheme, rather than a finalized and scheduled program.

Table 23: Proposed dams of the MoEW scheme

Proposed dams	CAZA	Capacity (million m³)	Catchment	Spring	Notes
Shabrouh	Kesrouane	8	El-Kalb	Shabrouh	Under execution
Aassi	Baalback	37	El-Aassi	El-Aassi	Started / should irrigate 6000 hectares
Bisri	Chouf	120	Awali	Awali	In current detailed study
Boqaata	Matn/Kesrouane	7	El-Kalb	Boqaata	Feasibility study started / Promised for 2003
Dar Beashtar	Koura	55	Abou Ali	Abou Ali	To review feasibility
El-Hasbani / Ibl Saqi	Hasbaya	50 – 100	El-Hasbani	El-Hasbani	Feasibility study started
Bared	Akkar/Minieh Danniyeh	40	El-Bared	El-Bared	Feasibility study started
Qarqaf	Akkar	20	Aarqa	Deviation Aarqa+Wadi Jamous	Feasibility study started
Nahr el-Jaouz/Qalaat el-Msailha	Batroun	9	El-Jaouz	El-Jaouz	Feasibility study started
Younine	Baalbeck	5	Aassi	Deviation from Wadi Nahle	Feasibility study started
Janneh	Jbayl	30	Ibrahim	Ibrahim	Feasibility study started / Unsuitable Technical conditions
Noura et-Tahta	Akkar	70	El-Kabir	El-Kabir	Promised for 2005/ Only a part would be allocated to GoL
Azzounieh	Aaley	4	Damour	Safa	Unsuitable Technical conditions
Massa	Zahle	8	Litani	Litany	Study not yet launched
Damour	Chouf	60	Damour	Damour	Study not yet launched
Iaal	Zghorta	10	Abou Ali	Deviation Abou Ali + Iaal	Study not yet launched
Khardali	Marjaayoun	128	Litani	Litani	Study not yet launched
Kfarsir	Tyre	12	Litani	Litani	Study not yet launched

Source: Ministry of Energy and Water (MoEW) – CDR, 2002

Table 24: Proposed lakes of the MoEW scheme

Proposed lake	CAZA	Capacity (million m³)	Catchment	Spring	Notes
Yammouneh	Baalbeck	1.5	Yammouneh	Yammouneh	Under execution
Qaissamani	Baabda	0.55	Beirut	-	Under execution
El-Habash	El-Matn	0.55	El-Kalb		Draft accomplished / Promised for 2005
Qammouaa	Akkar	1	El-Aarqa		Feasibility study accomplished
Qatlab/Otlab	Akkar	1	El-Ostounae	-	Feasibility study started
Kouashra	Akkar	0.35	El-Ostouane	-	Feasibility study started / existing dam 0.12Mm ³
Sbat	Baalbeck	0.70 – 1	Litani	Sbat	Feasibility study started
Jriban	Baalbeck	0.70 – 1	Litani	Jribane	Feasibility study started
Balaa	Batroun	1	El-Jaouz	-	Feasibility study started / Sensitive natural site
Laqlouq	Jbayl	0.80	El-Jaouz	-	Feasibility study started
Azzibe	Chouf	0.70	El-Awali		Feasibility study started
Maaser Chouf	Chouf	2	El-Awali	-	Feasibility study started
Brissa	Minieh/Danniyeh	1.2	El-Bared		Promised before 2005
Rashaya	Rashaya	< 1	El-Hasbani		
Lebaa	Jezzine	0.96	El-Awali		
Kfarhouneh	Jezzine	1.20	Litani		
Unknown	Tyre				
Unknown	Nabatiyeh				
Unknown	Hasbaya				
Unknown	Marjaayoun				
Unknown	Bent Jbayl				

Source: MoEW – CDR, 2002

Priorities proposed by NPMPLT for lakes and dams

The National Physical Master Plan proposes to grant the priority for implementing the planned works (dams and lakes) based on 4 criteria:

- The capacity of the establishments to satisfy the domestic water demands. This criteria is twice as important compared to other criteria;
- The improvement that the work would bring to the irrigated lands;
- The possibility that the project could bring improvements to other objectives, especially tourism and protection against floods, and that it does not harm the environment; and
- Finally, the degree of progress of feasibility studies and implementation.

Concerning **domestic water**, priority is defined according to the quantities of potable water distributed by water authorities and per capita and per day, in peak periods, that will profit from this additional water amounts. Grades are hence distributed: (0) when current distribution quantity is higher than 250 l/d/capita; (2) between 150 and 200 l/d/capita; (4) between 100 and 150 l/d/capita; and (6) below 100 l/d/capita.

The priority for **irrigation** water, by increasing order, is defined as follows: (1) new irrigation networks have to be constructed; (2) provision of additional amounts of water would allow the improvement of the existing irrigation; (3) the region is currently a non-irrigated agricultural zone; and (4) when the primary infrastructure exists or is under construction and it would be necessary to associate the project with secondary and tertiary infrastructure development investment.

Concerning the **other uses of the works**: (1) touristic; (1) protection against floods; and (0) undermining remarkable sites.

Concerning the status of project progress: (0) some projects are technically not feasible or are not yet defined; (1) feasibility studies are to be launched or are ongoing; (2) detailed studies are under execution or the projects are planned for the coming 3 years; (3) the projects are already planned for the current year; and (4) the projects are under execution.

The grades obtained are added establishing the priorities shown in Table 25.

Table 25: The investment priorities of NPMP/LT for the proposed dams and lakes

Dams	Priority	Lakes	Priority
Noura et-Tahta	High	Yammouneh	High
Bared	High	Qammouaa	Medium
Iaal	High	Qartlab / Otlab	Medium
Younine	High	Kouashra	Medium
Shabrouh	High	Sbat	Medium
Massa	High	Jriban	Medium
Al-Hasbani / Ibl Saqi	High	Azzibe	Medium
Aassi	Medium	Maasser Chouf	Medium
Jenne	Medium	Brissa	Low
Boqaata	Medium	Balaa	Low
Azzounieh	Medium	Laqlouq	Low
Damour	Medium	El-Habash	Low
Bisri	Medium	Qaissamani	Low
Khardali	Medium	Rashaya	Low
Qarqaf	Low	Lebaa	Low
Dar Beashtar	Low	Kfarhouneh	Low
Qalaat el-Mseilha	Low	Other un-identified r.	Low
Kfarsir	Low		

IV.7.3 A significant development of irrigation

The last plan for the extension of irrigated perimeters had been issued in 1972 for the period 1972-1977. It stipulated that an additional 81 500 hectares would be irrigated in addition to those already irrigated. Potentially irrigable surfaces have been evaluated at 74 000 hectares by the MoEW in 1991. A study on the agricultural potentials of Lebanon in 1980 (UNDP – FAO, 1980) has shown as well that 85 500 hectares are potentially irrigable, distributed roughly as in the 1972 decree.

At present, the MoEW and the Litani River Authority (LRA), the two major actors in this sector, have planned numerous irrigation projects for the coming years. These projects could be classified into two categories:

- Projects that allow improving and organizing the existing irrigation, especially in the Beqaa, where the LRA planned irrigating the entire plain; and
- Projects that aim at creating new irrigation systems.

The projects actually engaged are those of Aassi, Noura et-Tahta, Hasbani and South Lebanon (Conveyer 800), and priority should be granted to these already engaged 4 projects. Given their cost (around US\$ 15 000 per irrigated hectare), these projects could be considered as major socio-agricultural development, i.e. their main vocation is essentially social.

The Noura et-Tahta and Aassi projects are being carried out under agreements signed with the Syrian Government for sharing the Nahr el-Kabir and Aassi waters.

The Hasbani project is important in order to revitalize the region and to encourage the farmers to return to the fallow lands abandoned during the Israeli occupation.

Detailed studies and the project of the Conveyor 800 are also being prepared.

The execution of these projects would only be useful if integrated into a global agricultural development strategy that organizes production and commercialization, and opens the markets to export. Besides, these projects require the adoption of a land related policy, concerning 2 issues: cadastral coverage of the potential irrigated land and the reduction of construction on the irrigable lands.

Current irrigation projects

The projects of rehabilitation of irrigation perimeters, chosen according to feasibility studies funded by the World Bank, are either accomplished or under construction. Other projects are already running such as South Beqaa, Qasmiyeh, Nahr Ibrahim, etc. However, the management of these irrigation systems remains questionable. A higher importance must be attached to the creation of committees of users as well as to the awareness of the farmers to improve the efficiency of irrigation and to make use of modern agricultural and irrigation techniques, to reach a sustainable and profitable production.

The most ambitious project currently under execution aims at irrigating 15 000 hectares of lands in South Lebanon. However, the present project is limited to the main pipelines. In order to benefit from this important investment, studies and construction of distribution systems for concerned perimeter should be a priority.

In the framework of the development of South Lebanon, following the liberation from the 20-year Israeli occupation, a socio-economic support is planned by the government to contribute to the stabilization of the population and to encourage the displaced population to return and to re-establish the agricultural, industrial and artisanal activities. Priority should be given to irrigate useful agricultural land.

The other irrigation projects, especially those associated with the dams of Aassi and Nahr el-Kabir, depend on the construction of the dams. The construction of Aassi dam has been recently confirmed.

Table 26: The large irrigation and drainage projects planned or currently under consideration by the Lebanese Government

	Project	Surface (ha)	Spring	Cost M\$
MoEW	Aassi	6 000	Aassi (Aassi dam)	50 ¹¹
	Noura et-Tahta	5 000	El-Kabir (Nour et-Tahta dam)	50 ¹²
	El-Bared	750	El-Bared (El-Bared dam)	8 ¹³
	Younine	1 545	Younine dam	15 ¹⁴
LRA	Conveyer 800 South Lebanon	14 700	Litani (Qaraoun)	210 ¹⁵
	Water supply – Anane Nabatiyeh	3 500	Litani (Qaraoun) via Anane	35 ¹⁶
	South Beqaa – Left bank Phase 2	6 700	Litani (Qaraoun) + Aquifers + Springs Anjar and Chamsine	45
	South Beqaa – Right bank	9 200	Aquifers	55
	South Beqaa – North zone	5 600	Aquifers + Springs Anjar and Chamsine	30
	South Qaraoun ¹⁷	865	Litani (Qaraoun)	5
	Project of sewage and drainage of Beqaa	5 000	--	12 ¹⁸
	Qasmiyeh Phase 2	2 100	Litani (Kfarsir dam) + Aquifers	7 ¹⁹
	Khardali	13 000	Khardali dam – Middle Cretaceous aquifers pumping	95 ²⁰
	Maissa – Yahfoufa	1 750	Wadi Yahfoufa (Litani tributary)	7 ²¹
	Saïda Jezzine	1 200	Litani (Qaraoun) via Anane	6
	Hasbani	5 000 – 15 000	Hasbani	50

¹¹ Source: MoEW. This price does not include the cost of the Aassi dam, estimated at US\$50M.

¹² This cost is an estimate. It does not include the cost of the dam, estimated at US\$50M.

¹³ This cost is an estimate. It does not include the cost of the dam, estimated at US\$50M.

¹⁴ This cost is an estimate. It does not include the cost of the dam, estimated at US\$5M.

¹⁵ Source LRA. This cost includes the water supply that has a double use (irrigation – potable water), but does not include the cost the management and equipment per parcel, estimated at US\$ 220M.

¹⁶ Source Dar al-Handasah. The price of Anane reservoir capacity increase is not included. The cost of the conveyer is of double use (irrigation – potable water) and does not include the cost the management and equipment per parcel, estimated at more than US\$ 30M.

¹⁷ Source LRA. This project includes irrigated lands in rehabilitation and a part in extension.

¹⁸ Source LRA. This cost does not include the drainage per parcel at the farmers charge.

¹⁹ Source LRA. This cost does not include the cost of Kfarsir dam, estimates at US\$ 12M.

²⁰ Source LRA. This cost does not include the cost of Khardali dam, estimates at US\$ 145M.

²¹ Source LRA. This cost does not include the cost of Massa dam, estimates at US\$ 16M.

Figure IV.18: Priority Projects of Dams and Lakes

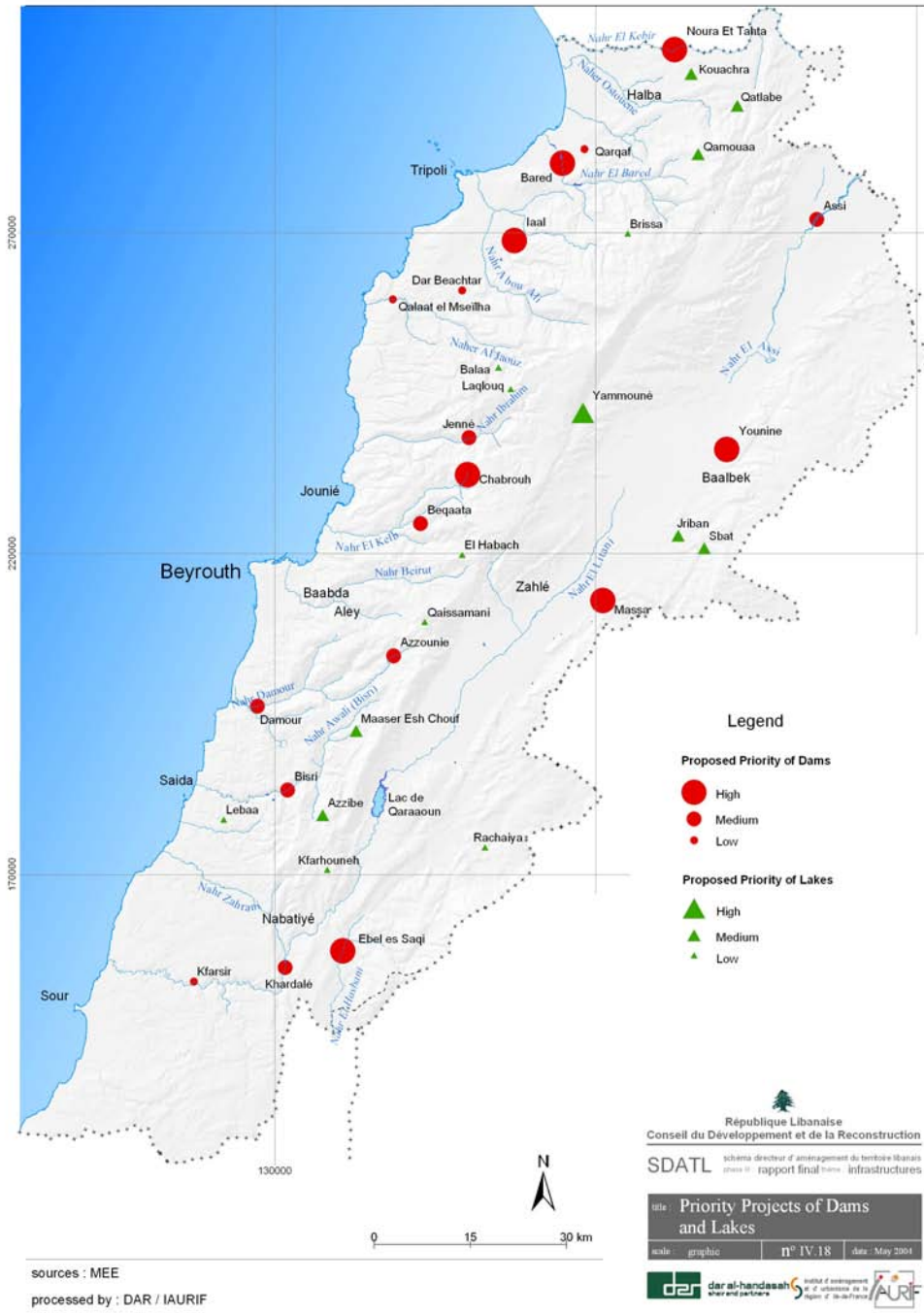
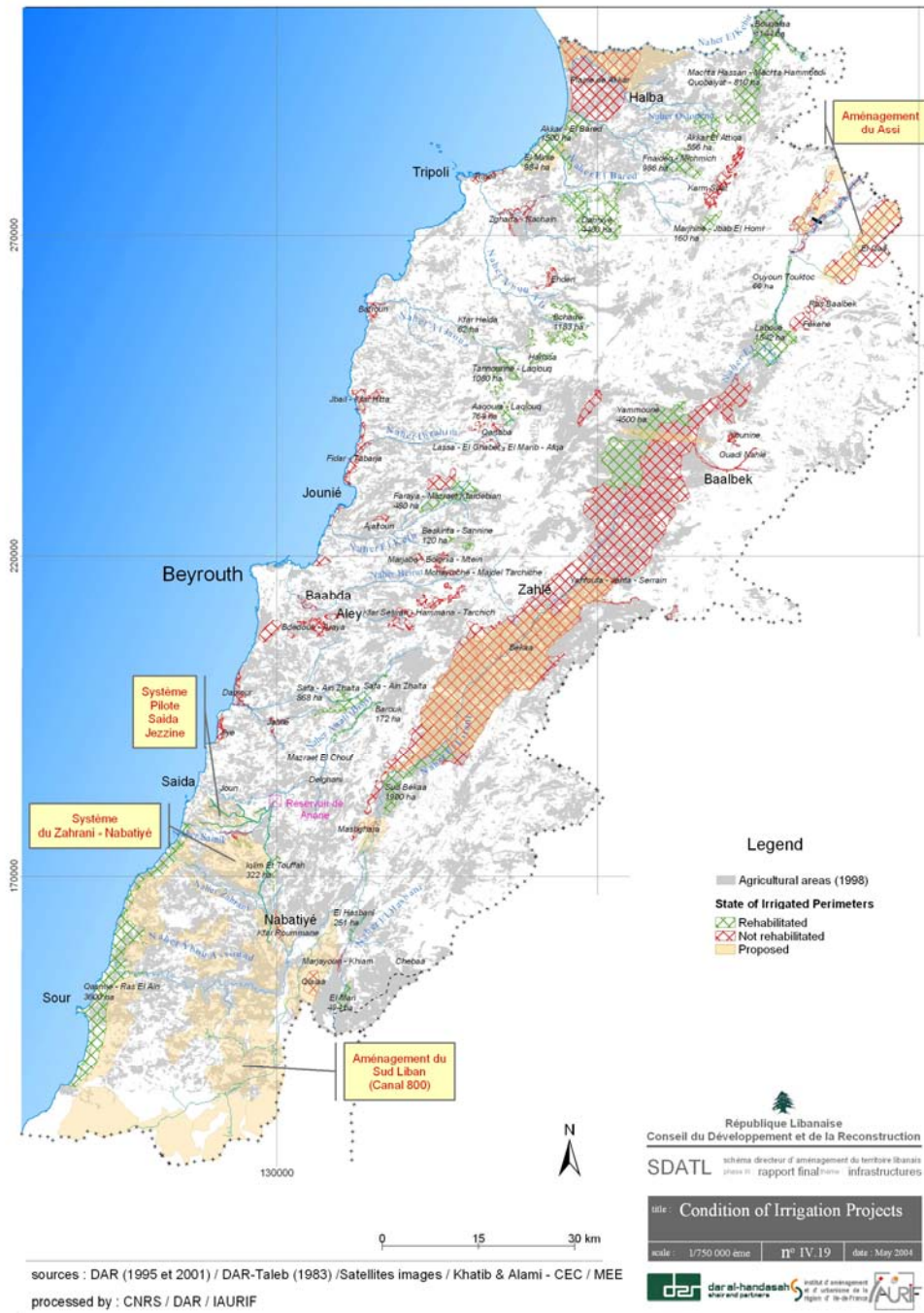


Figure IV.19: Condition of Irrigation Projects



sources : DAR (1995 et 2001) / DAR-Taleb (1983) / Satellites images / Khatib & Alami - CEC / MEE
processed by : CNRS / DAR / IAURIF

IV.8 EFFECTIVE SOLUTIONS TO THE PROBLEMS OF QUARRIES, WASTEWATER AND SOLID WASTE

The quarries, the sewage systems and the solid wastes constitute three major problems in Lebanon that are still not resolved. The stakes of these three issues are considerable for the public health as well as for the quality of life of the population.

IV.8.1 Extracting building material without endangering the quality of life

Lebanon requires 3 million m³ of aggregates every year (in general, 70% of gravel and 30% of sand), without counting exceptional demands linked to large projects. The extraction of these materials requires the mobilization of roughly 50 hectares per year for rock quarries and 20 hectares per year for sand quarries.

The solutions applied to date to reduce the environmental damages of these activities have often failed.

A Master plan for the management of quarries (especially gravel quarries) was prepared in 1995 and 1996; it delineated the exploitable deposit sites based on a number of economic and environmental criteria. But the Lebanese Government did not succeed in establishing a consensus on this plan.

The Government decided afterwards to restrict gravel extraction to several sites located on the Anti-Lebanon Range. However, access and transportation difficulties have hindered the implementation of this decision.

Many illegal quarries continue to operate in the country. Police operations have allowed the closure of certain sites, without guaranteeing that activities will not restart due to increasing demand for material.

Material import, presented as an alternative to quarries, has faced the opposition of quarry operators and building and public works professionals.

In the absence of a satisfactory solution, the prices of materials have increased significantly. The reasons for this increase could not be determined (retention of stocks or actual scarcity of resources).

It is important therefore to learn from previous management efforts in this sector and to propose a coherent policy for the future.

Thus, the National Physical Master Plan proposes the following principles and measures:

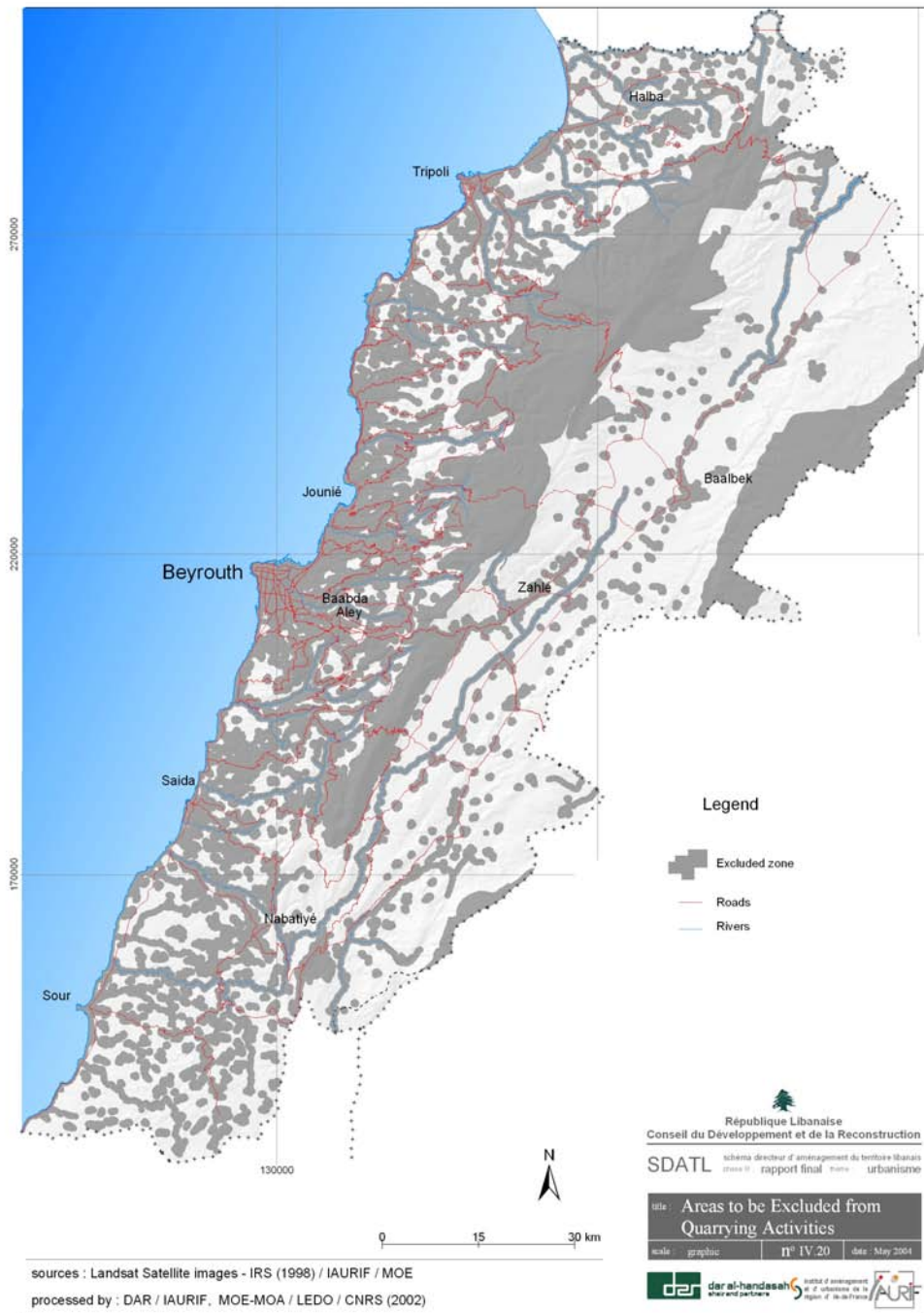
- Lebanon should, as much as possible, satisfy its own demand for construction material. This is a concept of sustainable development. Transferring the problem to other countries ought to be considered as a last resort.

- It is appropriate to define the regions where all sand and stone for gravel (other than decorative stones) extraction activities are strictly forbidden. These regions should be defined according to simple criteria: Banning should be implemented within a perimeter of 500 m all around classified natural reserves, as well as protected sites and monuments, inhabited zones, coastlines and rivers. It should also be implemented to dense forest areas, mountain peaks (above 1,900 m) and Cedars corridor.
- Quarries should be considered as classified industrial activities, and they should be submitted to complete environmental impact assessment studies. These studies should be as stringent as the planned extraction areas are important.
- Obligation to rehabilitate the sites should be reinforced: Operators should submit enough financial guarantees for site rehabilitation. The rehabilitation plans should be agreed upon previously.
- Legislation concerning extraction activities, whether it is for exploitation or for improvement of agricultural lands, should be homogenized, modernized and completed.
- Penalties in the case of regulation infringements should be strengthened. For sand extraction, legislation should highlight the absolute necessity to preserve the vegetation soil that must be spread again on the site after exploitation.
- Applications for the authorization of exceptional land and real estate development projects, especially landfills, dikes and jetties, should include designs and specifications concerning the materials to be used, including precise designation of the requested extraction sites, quantities, type of materials and roads for transportation of such materials. This information should be part of the contract between the applicant and the relevant authorities. These applications should also include economic studies and environmental impact assessments, concerning not only the project sites, but also on the extraction sites and the roads to be used for the transportation of material. Hence, the authorities should be able to generate a global opinion with full knowledge of the facts.

It is possible that, with these measures, Lebanon will lack sand, particularly due to the protection of the large forests of the country. The imports and the shipments of sand, e.g. from Egypt, could help stabilize the market prices.

It is also possible that future land reclamation projects become too expensive, on the environmental and infrastructure levels, to allow authorizing new large scale landfill projects of private nature. The crisis of the quarries should limit landfill practices to only unavoidable public projects (ports, terminals, etc.).

Figure IV.20: Areas to be Excluded from Quarrying Activities



IV.8.2 Adapted solutions for sewage treatment

The main criterion for sewage treatment plants recommended by the National Physical Master Plan is the preservation of public health through the protection of water resources.

Priorities of Facilities

The rate of connections to sewer networks and the individual practices of wastewater disposal still remain below the expected levels in almost all the country. The ultimate objective would be to attain a total coverage of the entire territory, whether by sewage systems or by individual solutions, with the guarantee of an adequate treatment before their discharge into ground water, streams or into the sea. This should be accomplished in phases, because of high costs and management problems:

- 1- In the short term**, the priority should be given to 2 categories of “localities”:
 - On one hand, mountainous regions located in areas of extreme vulnerability of water table, tapped by downstream villages and cities for domestic supply: For these regions, the works should encompass collection of sewage water as well as treatment;
 - On the other hand, in large agglomerations, where rehabilitation and extension of networks is needed, treatment should be of second priority, except for interior agglomerations (Baalbeck, Zahle-Chtaura and Nabatiyeh), where they must constitute a priority.
- 2- A second phase** will consist of endowing the isolated towns with more than 5 000 permanent residents (that represent altogether around 17% of the localities) with collective treatment plants for groups of localities.
- 3- The last phase** that will probably come at the end of what would be possible to do until 2030 will concern towns with 2,000 to 5,000 permanent residents (25% of the localities).

With the execution of the plan on the long term, almost 80% of the urban surface would be covered.

Until then, it is important to refrain from executing collection networks when the collected wastewater would be released into sites presenting a danger for downstream water use for potable water or food supply (contaminated agricultural produce or fishing).

Priorities of treatment plants

The Sewage Master plan adopted by the CDR, as a guideline for the investment in this sector, was established in 1982, and updated in 1996.

The planned wastewater treatment plants (WWTP) are currently 34, of which one is already built and eight are in the pipeline for construction. It is therefore possible to refine the criteria for the selection of the remaining 25 plants proposed in this Plan.

By adding the groundwater and surface water protection criterion to the other criteria (the number of persons served, the possibility to reuse the effluent and the existence of funds), it appears that the priority plants, in the CDR scheme, should be those of Saghbine-Joub Jannine, Qaraoun, Hasbaya, Hrajel, Zahle, Jebayel, Bent Jbayl, Mishmish and Bakhoun, all of them located in the hinterland, characterized by high risks of groundwater and surface water pollution.

The construction of these WWTP should be followed, in a second phase, by those of Hasroun, Besharreh, Khenshara, Jbaa, Laboueh, Mazraat ech-Chouf, Qartaba, Anjar, Amioun, Shaqra and Hermel, and then in a third phase, by those of Tyre, Tabarja, Daoura, El-Aabdeh and Ghadir.

However, it is possible that additional investigation regarding the impact of wastewater on the water table could lead to **identifying other sites to be treated in priority**. Such a careful examination should be carried out essentially in the *Cazas* of Chouf, Aaley, Matn and Kesrouane, characterized by important areas with high water resources vulnerability. This investigation should lead to refining the CDR sewage scheme, and deduce other priorities, particularly to protect the water resources of Greater Beirut.

The construction and operation of domestic WWTP must be accompanied by the implementation of MoE decision concerning industrial wastes, as well as article 39 of Decree-law 444, dated July 29, 2002, concerning the protection of the environment.

The treatment of industrial wastes released into the Litani watershed should have a high priority. Particular attention should also be granted to chemical and food-processing industrial wastes in the rest of the country. It would be convenient as well to allocate particular attention to car workshops illegal disposal of waste, especially in high and medium mountain areas, where they could pollute the groundwater and springs.

Management of the sewage sector

Management of the treatment plants is the responsibility of the 4 newly-created Water Authorities, established in 2002. They are also responsible for the studies, construction, operation and the maintenance of these plants and networks. This would have a better consequence on the integration of the water sector.

Problems of expropriation and the disagreements of local population as well as the divergence of opinions between various ministries have blocked many projects for which funding had already been secured. In the future, it would be appropriate to eliminate the overlaps of responsibilities that lead to these obstructions. The responsibilities of the municipalities, the new water authorities, the Ministry of Environment and the Ministry of Interior should be properly defined. In the same

way, the need for skilled staff should be identified and technical and administrative capacities reinforced.

Economic feasibility of the various projects must be judiciously studied. The adopted level and technique of treatment should be closely linked to the construction and operation costs. Many villages and municipalities could be regrouped, in most cases, in order to decrease costs. It is important to study the issues of taxes, charges and cost recovery mechanisms capable of assuring a balanced account of the sewage sector.

The amount allocated by the CDR for the construction of sewage projects for the period 2003-2005 is around US\$ 750 million. That is a significant amount, the funding of which is obtained at 30% from external sources (and expected at 80% from the same sources). However, the availability of external funding should not be the determining criterion for identifying projects: On one hand, the external funding can concern projects of less priority than others, and on the other hand, it can disappear if the problems of local expropriation or acceptance by the population are not resolved.

IV.8.3 Solutions for solid waste treatment adapted to the local contexts

Similar to the sewage treatment sector, the main criterion for the solid waste sector recommended by the Master Plan is public health, to which other concerns are added, such as economy, preservation of environment and tourist attractiveness.

Domestic wastes

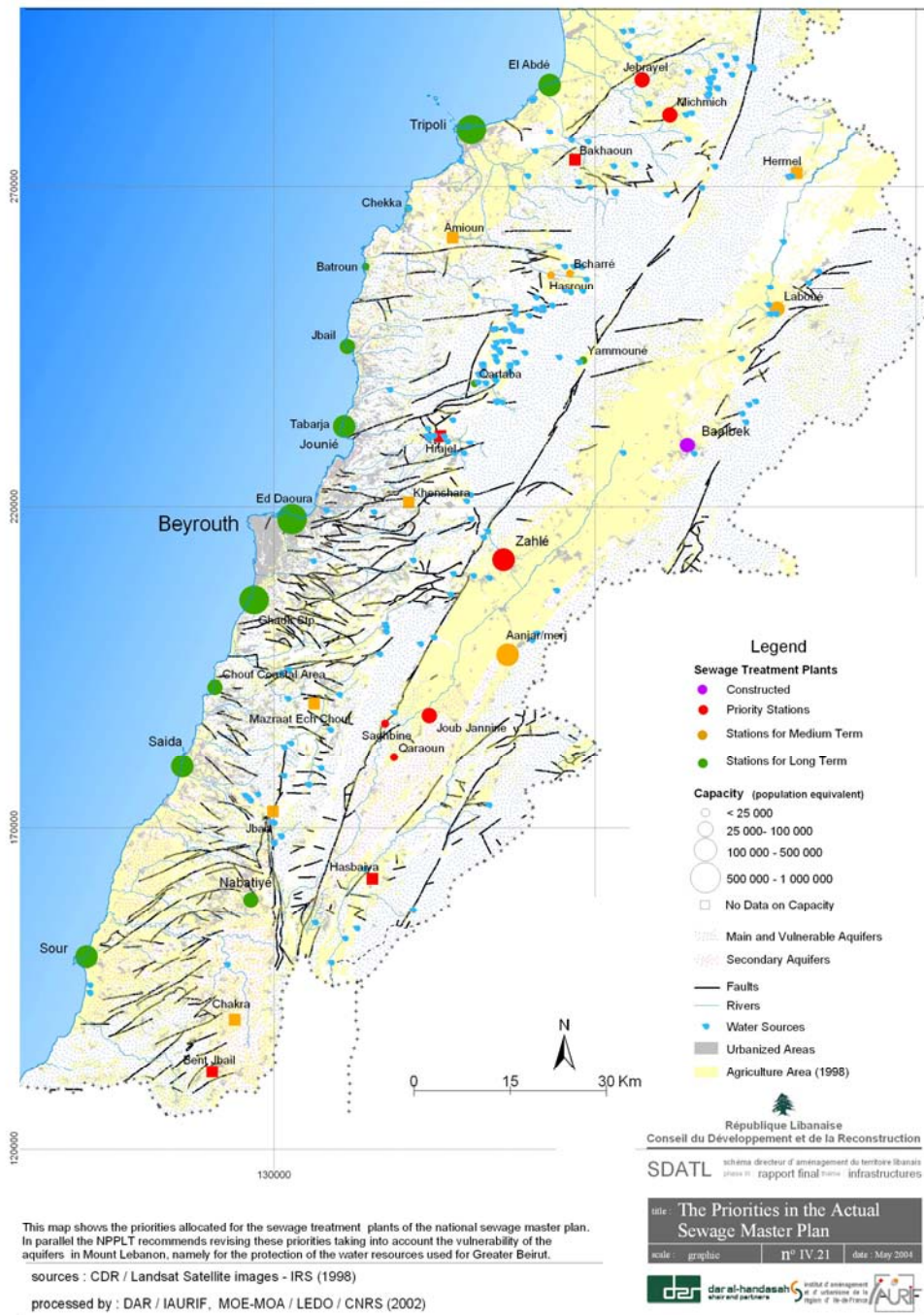
The domestic wastes issue concerns essentially disposal sites, whether they are controlled dump sites or landfill sites coupled with sorting and recycling.

Optionally, the waste issue concerns treatment processes before disposal. Incineration has been put aside for financial and environmental reasons. Recycling must be encouraged, without forgetting that their development will certainly face financial obstacles for a long time.

In the short term, it is crucial to remedy, as an emergency, the critical situation of large agglomerations, especially Tripoli, Saida and Beirut, by mobilizing necessary lands and by rehabilitating degraded sites. Together with this effort, it is important to plan short-term solutions for the cities of Tyre, Nabatiyeh, Baalbeck and Jbayl, followed by the rest of the country.

For the medium and long terms, a complete sorting, recycling and treatment plan should be established and implemented.

Figure IV.21: The Priorities in the Actual Sewage Master Plan



This map shows the priorities allocated for the sewage treatment plants of the national sewage master plan. In parallel the NPPLT recommends revising these priorities taking into account the vulnerability of the aquifers in Mount Lebanon, namely for the protection of the water resources used for Greater Beirut.

sources : CDR / Landsat Satellite images - IRS (1998)

processed by : DAR / IAURIF, MOE-MOA / LEDO / CNRS (2002)

The major factors to consider in the conception of landfill sites are the following:

- 1- The quantities received by these sites: they should be diminished; therefore, it is important to reduce them at the source, to recycle and to transform the wastes. The main aspects taken into consideration are:
 - Reduction at the source, mainly by reducing wrapping material (that could be taxed) or by using recycled, recyclable or biodegradable materials.
 - Selective sorting, at the source (which improves the quality of recoverable materials) or at the plant (material recovery).
 - Recycling: The main issue to discuss in this matter lies in the widening of the markets for recovered material and the encouragement/support of recycling industries. At present, recycling is carried out at small scale; more encouragements are needed to create a large scale operation.
 - Composting: Currently, the Coral composting plant of Greater Beirut and several small local plants are operational. The major problem is that, due to bad sorting at the beginning, the quality of the compost is not accepted by the farmers. Another problem is the low capacity of the plant, incapable of treating all the organic materials produced in Greater Beirut. The composting plant should be preferentially located near the sorting plants, and close to major “consumers”.
- 2- Transportation distances: the sites should be located the nearest possible to the waste sources or they should include a transfer facility in an appropriate location. Their access should be always easy through the roads network.
- 3- Meteorological and hydro-geological conditions: These are important environmental aspects to take into consideration. All the adequate technologies for the monitoring and the reduction of environmental pollution should be established. They include the selection of leachate management (collection and treatment), the selection of gas monitoring (collection and treatment) that include as well, if feasible, the transformation of gases to energy, and finally the selection of environmental monitoring facilities (air and groundwater quality, as well as monitoring of gas and liquid contents of the vadose zone).
- 4- Selection of sites: The unions of municipalities, assisted by administrative and technical support, from MoE and MoI at the *Caza* or *Mohafaza* level, should unite their actions to select landfill sites and locations for sorting and composting facilities. This should be carried out in the framework of a pedagogic effort and public consultation, the omission of which could induce trouble. The management and operation of the landfill sites are very important as well. A private company could be hired for carrying these activities on behalf of the municipalities, if these lack the technical and administrative

competencies. The municipalities should be encouraged to sub-contract the operation rather than counting on the CDR or other central administration.

- 5- Collection: The collection of waste is functioning relatively well; municipalities have either commissioned private companies for the collection or are collecting the waste by themselves especially in rural regions.
- 6- Rehabilitation of old dumpsites: Especially those of Saida, Tripoli and Beirut. These dumps are causing major environmental problems and generate important public turmoil. The introduction of new controlled landfills is unavoidable in the Cazas, because the existing ones have reached their capacity limits. The problem of Naameh landfill site is more than evident. It is essential to examine the operation and control criteria to improve the present situation.

Hospital and hazardous wastes

Hazardous waste dumpsites should be located away from residential areas, in areas with suitable hydro-geologic conditions. The precautions to avoid environmental pollution should be strengthened (transportation, emission, leachate, etc.). A hospital waste treatment central incinerator has been planned, but no adequate site has been identified yet. Four hospitals have their private incinerators, but their conformity with environmental standards is unknown. The new public hospital of Beirut has installed an incinerator with a capacity of 1.5 tons / day. Nevertheless, due to public pressures, the hospitals have interrupted waste incineration and have replaced this practice temporarily with autoclaving, until a permanent solution is selected.

Industrial wastes

Industrial wastes should be treated *in situ* according to their type, then transported to the landfill sites. The MoE has already defined the criteria for the release of industrial effluents into the public sewer systems as well as for conditions where pre-treatments are required. These conditions are supposed to be immediately applicable for new industries and a 5-year grace period is granted for existing industries.

Selection of dump sites

Lebanon should mobilize annually around 40 hectares of land for solid waste landfill sites (with an average depth of 20 m), of which more than half is required to serve Greater Beirut and Mount Lebanon. Nevertheless, this area could be reduced to 10-15 hectares, with an adequate compacting.

The selection of sites must be viable from the political, social and technical points of view. Technical and administrative criteria must constitute the basis for the selection procedure that, later on, has to account for political and social considerations.

The factors to be analyzed for determining the suitability of landfill sites are, in particular, hydro-geology and groundwater, topography and environmental impacts. Appropriate hydro-geologic conditions consist of a complex combination of type and

depth of soil and distance between groundwater and the surface. As for potential environmental impacts, the most critical is the degradation of water resources.

The sites, however, must be close enough to residential areas to reduce transportation costs and time, but at the same time, distant enough to reduce land prices and to find land parcels sufficiently large to accommodate those sites.

An overall analysis of the Lebanese territory, on the basis of these two fundamental criteria (distance from urban areas and vulnerability of water resources), allows to draw a map indicating the zones where establishment of landfill sites would be best avoided (see the following map).

The sites with moderate or poor adaptability conditions, however, should not be necessarily excluded, but it is noteworthy that these sites are more expensive to manage (need for surface pavement and leachate collecting systems, etc.).

Several old quarry sites could be used as landfill sites, but this perspective should be subject to specific case by case studies, measuring the risks for water and air pollution, as well as the impact on public health, landscapes and sceneries.

Ongoing projects

Two projects that serve the Cazas of Jbayl (Hbaine: 120,000 m³) and Baalbeck-Hermel (Taybeh: 151,000 m³) are under construction. The Hbaine project includes a landfill site and equipment at a cost of US\$ 7.2 million, funded by the World Bank. The Taybeh project includes a landfill site, a transfer station in Hermel, the rehabilitation of the uncontrolled dump site at Kayyal and the purchasing of equipments, at around US\$ 3.9 million also funded by the World Bank.

The CDR 5-year plan proposes the construction of controlled dumpsites in the Cazas of Akkar, Tripoli-Zghorta, Besharreh-Koura-Batroun, Tyre-Bent Jbayl, Nabatiyeh-Hasbaya-Marjaayoun and West Beqaa-Rashaya. This plan includes the construction of transfer stations in Bent Jbayl and Marjaayoun-Hasbaya, as well as treatment plants in Besharreh-Koura-Batroun, Tyre, West Beqaa-Rashaya, Saida, Tripoli and Zahle. It also includes the rehabilitation of uncontrolled dump sites in the major cities of Tripoli, Saida, Baalbeck and Tyre. It is important to allocate a site for Saida-Jezzine, while Minieh could be connected to Tripoli-Zghorta.

The majority of the required works is already planned. They are essential for an adequate management. Their execution depends on the financial feasibility study.

The approximate cost of these projects is roughly US\$ 115 million (80% from national funds): This cost does not include the possible site of Saida-Jezzine, but includes the feasibility study for the transformation of wastes into energy in “uncontrolled” dumps sites. The execution of this process in Bourj Hammoud could be revealed very soon, as international funding is secured, but conditioned by the contribution of US\$ 3.5 million from national resources.

However, environmental monitoring is still not considered in the budget of the new dump sites.

USAID had allocated US\$ 15.3 million for local waste management projects. They would serve 446 000 persons in the 185 villages in Chouf, Jbayl, Jezzine, Hasbaya, Hermel, Nabatiyeh and West Beqaa. They include staff-training projects. This type of projects could be extremely beneficial for the towns, provided that the municipalities participate actively and take control of the management later on.

Administrative aspects

The Ministries of Environment and Interior should work together for an adequate management of this sector. The participation of the MoE in the choice of sector strategy, in the selection of sites according to technical and environmental criteria and in monitoring of the operation would be crucial for a sustainable management. The participation of the MoI in identifying potential sites, expanding administrative and financial know-how and every other support to the municipalities constitutes the critical aspect of the success. The reinforcement of technical and administrative capacities in these two ministries is essential for a successful and sustainable management.

The financial situation of the municipalities is definitely the major constraint that hinders the correct functioning of the waste management sector. Theoretically, the municipalities have the right for taxes and remuneration from 35 different sources, but they face major collection problems, without counting the retention of one part of their revenues by the Government (that are allocated against expenses carried out by the GoL on their behalf).

In order to change the situation, there are two reform aspects to be considered: either a fixed allocation for waste management, regularly paid by the GoL to the municipalities, or a real decentralization of responsibilities that would give the municipalities more clear control over tax collection related to solid waste management. This solution would be preferable, but it has to be implemented in an inter-municipal framework (federations or union of municipalities).

Figure IV.22: Guidelines for Excluding Areas from Sanitary Landfills

