

CHAPTER 3

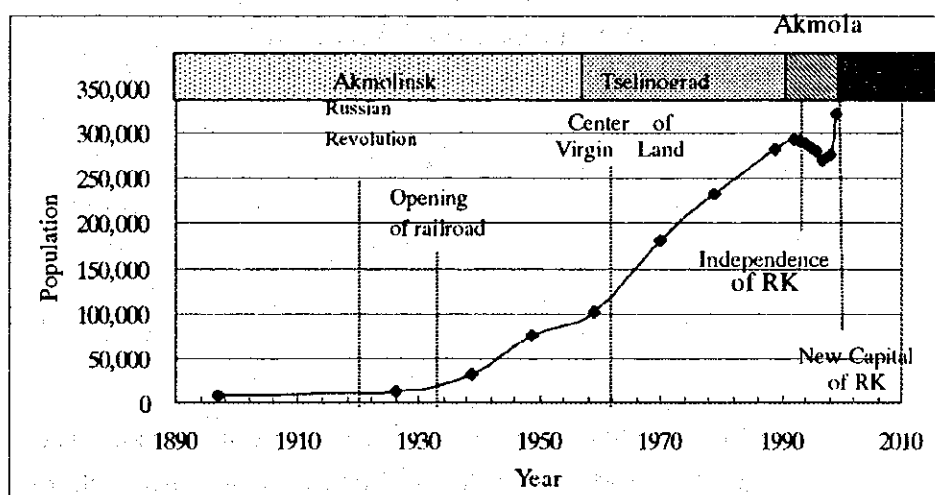
MASTER PLAN OF URBAN PLANNING

CHAPTER 3 MASTER PLAN OF URBAN DEVELOPMENT

3.1 Historical Background of Astana City and Capital Development

Astana has a history spanning more than three centuries. This Section describes the history of the city which is called Astana today, focusing on the formation and transformation of the physical characteristics of the city through its birth as a remote township called Akmolinsk, growth of the city as the center of the Virgin Land scheme and finally as the new national capital of RK.

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Historical Changes in Population

3.1.1 Brief History of City and its Urban Structure

(1) Origin of the City (Akmolinsk)

The history of Astana City today traces back to its foundation as a town named "Akmolinsk" in 1824. Construction of a fortress was launched in the area of Kalautkul around 1830, shortly after its foundation. In the first thirty years of its existence (1830-1860), the population of Akmolinsk was merely a trifle more than 2,000. By 1890, the population of Akmolinsk tripled to 6,428. The city was developed mainly on the right bank of the river as the grounds were on a higher elevation and were not affected by the recurrent spring floods.

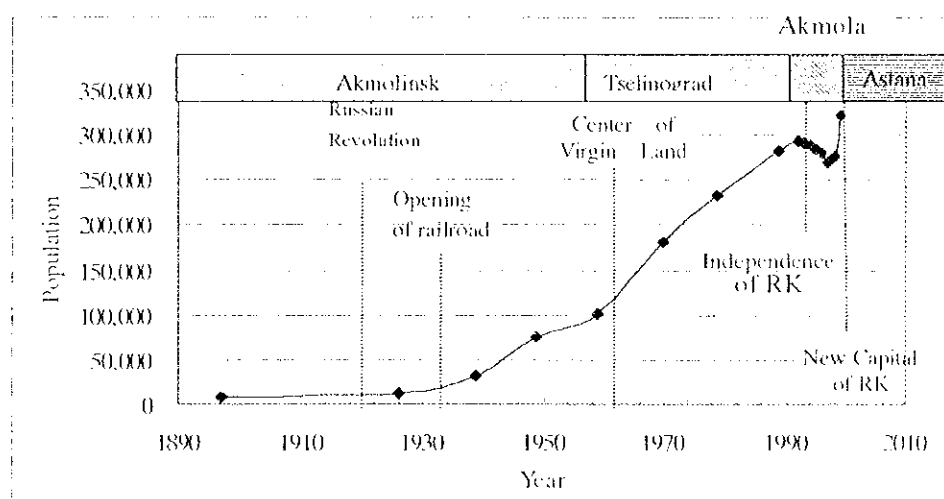
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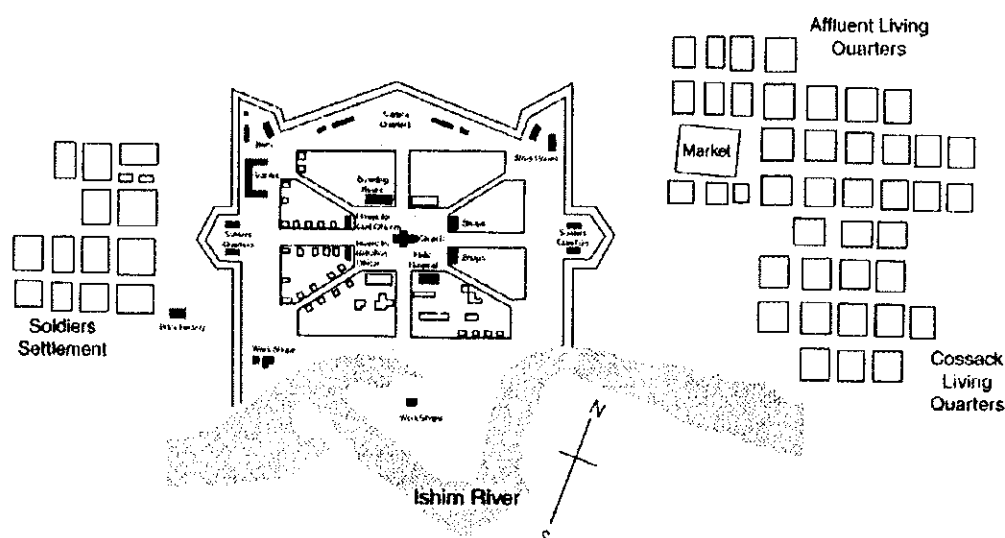
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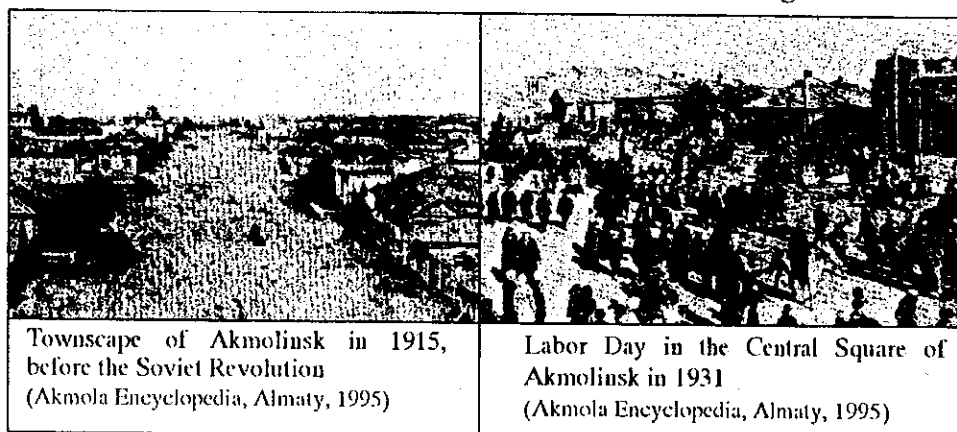
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pumps, cast-iron products, gas equipment, construction materials and other goods started to be produced here. The population of Akmolinsk reached the 100,000 mark at the end of this period, as the population of the city in 1959 was 102,300.



Akmolinsk - First Settlements established outside Fortress - 1850

The railroad connection boosted construction in the city. The city started to grow from two locations; the original city center expanding northward and the areas around the station going southward, which was soon to merge. Three-storied houses started to be built in these two centers of growth.

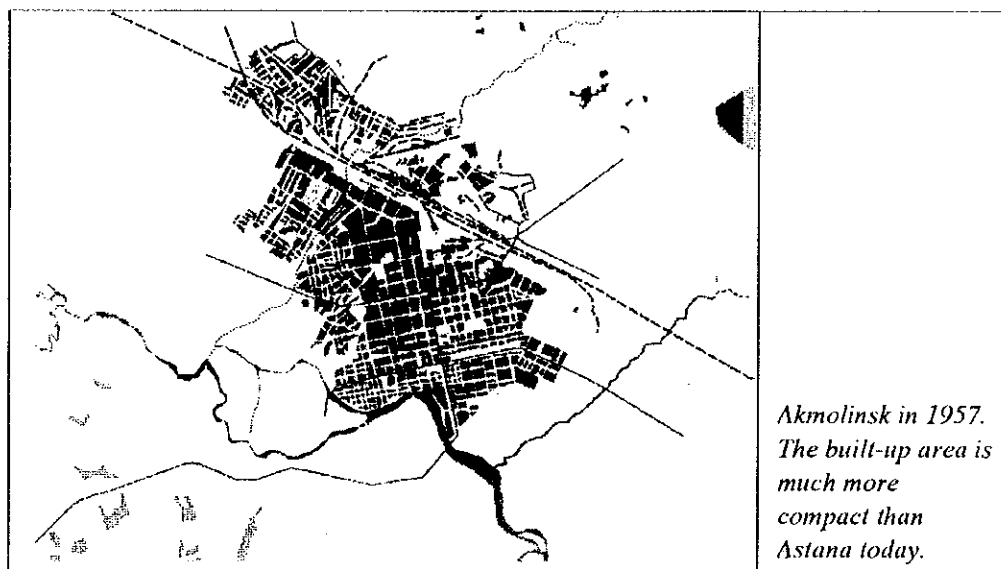


(2) Development of the City as the Center of Virgin Lands (Tselinograd)

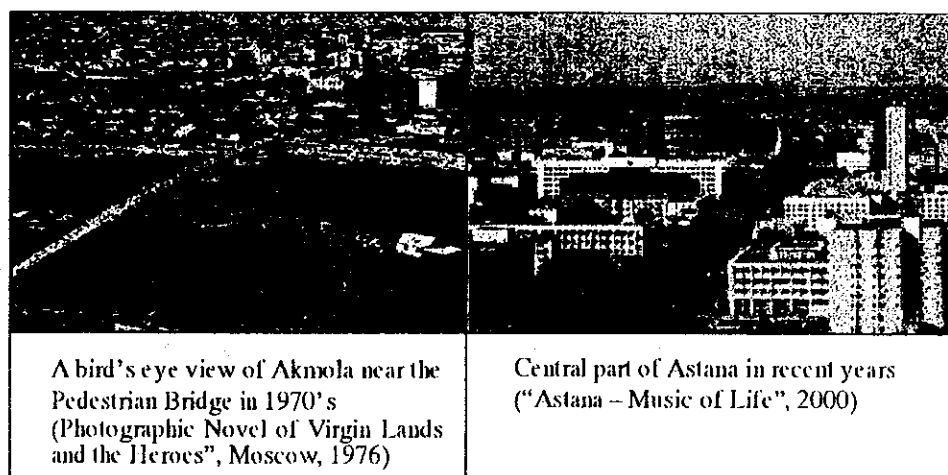
In 1954, the Soviet leader Nikita Khrushchev launched the Virgin Lands campaign and a large number of Russian population, reportedly around 800,000 in all, were resettled in these regions mainly to work on farms. In December 1960, Akmolinsk was designated as the center of the Virgin Lands

scheme, and was renamed in March 1961 to Tselinograd, which literally meant “Virgin City”.

The Virgin Land scheme brought in a large number of new people and industries, and the Virgin City flourished. Most of the major urban roads, which are now main avenues and streets, were constructed in the Tselinograd days.



Most infrastructure was constructed during the Tselinograd days for industrial production. Thermal Power Station (TETs) No. 1 was put in operation around 1963. Vyacheslavsky Reservoir was constructed 50 km away from the city to increase water supply to the city for domestic, industrial and agricultural needs. By 1970, the population of the city reached 181,300.

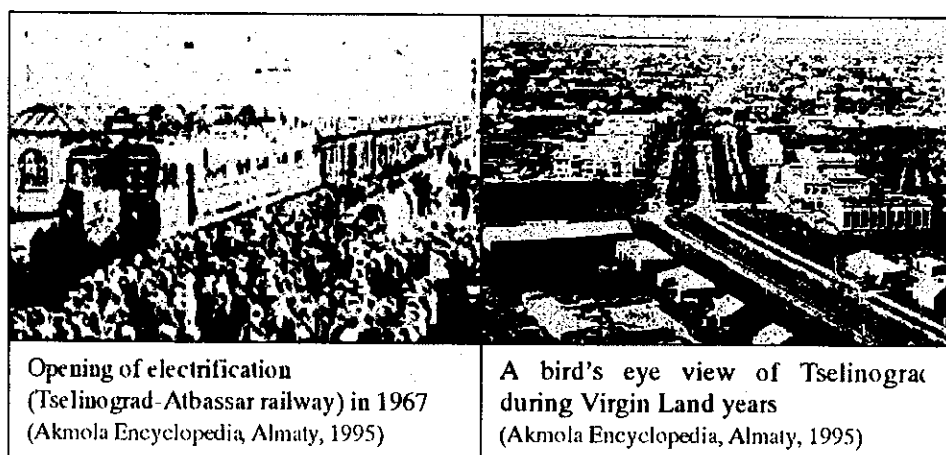


Tselinograd was dismantled from the center city of the Virgin Land scheme in 1971. Nonetheless the expansion of the city continued as a regional industrial center. Thermal Power Station (TETs) No. 2 was constructed in 1976. Factories producing various commodities such as bread and threads were newly constructed. The population of Tselinograd in 1979 counted 233,600, and the growth of the city was continuing. In 1989, the population reached 282,500 and was further approaching the 300,000 mark.

In the last years as Tselinograd, the city further expanded, accommodating the increasing population. New residential areas were developed in formerly unused terrain south of the Old City on the right bank of the Ishim (Micro District Molodyozhny) and beyond the Akbulak River. The industrial city expanded further to the north, reflecting increasing industrial output.

(3) Rename of the City (Akmola)

With the independence of the Republic of Kazakhstan in 1991, Tselinograd was once again renamed as Akmola after its original name. In 1992, the population of Akmola counted 293,500, which was the largest population this city had ever achieved. The first years after the independence were difficult for the nation as well as for Akmola. The population stopped growing, with an apparent tendency towards decline. The economic conditions in Akmola were not in good shape, with declining demand for industrial goods and a high rate of unemployment. Population decrease

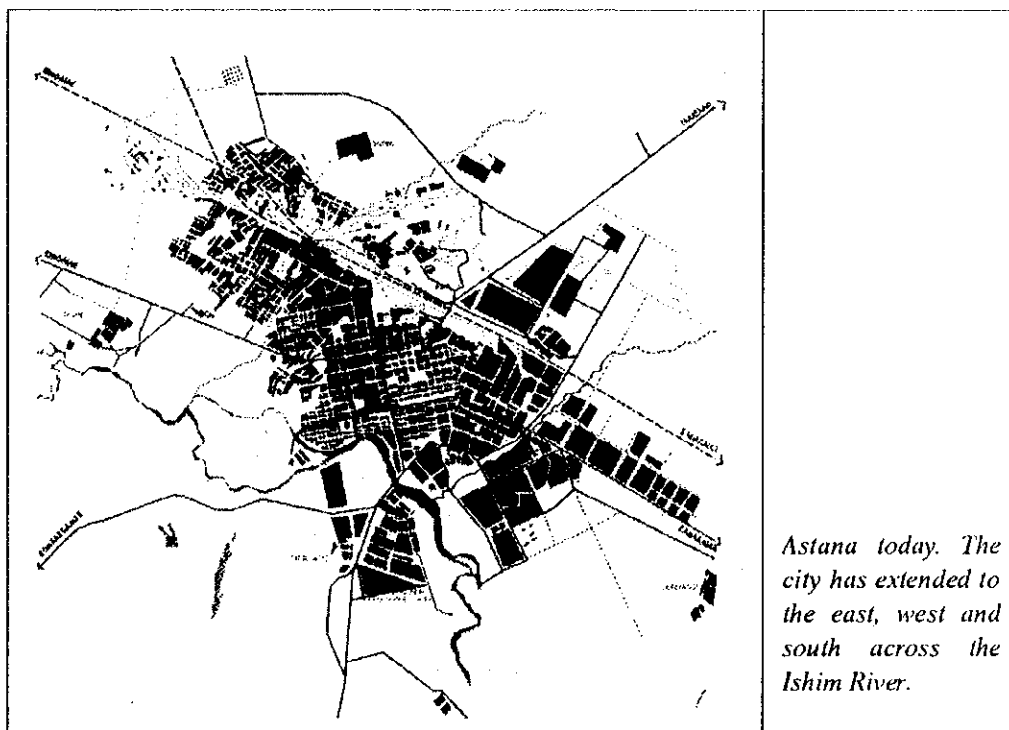


continued until 1997, when it marked 271,000.

(4) Astana as the Capital (Astana)

In 1994, the Supreme Council of Republic passed a Resolution "On Transferring of the Capital of the Republic of the Kazakhstan", which paved the route for capital transfer. On 10th December, 1997, Akmola was announced the new capital of the RK by the Decree of the dated 20th October, 1997, on approval by the Parliament. On 10th June, 1998, the International Presentation of Astana was held to celebrate the new capital of Kazakhstan. The name of the capital city was changed to Astana, as of 6th May, 1998. The word "Astana" is said to mean literally the "capital of a nation".

Immediately following the official announcement of capital transfer, movement of Ministries and central government agencies was started extensively and effectively. By the end of 1999, all but a few of the administrative offices were said to have completed the move. The population of Astana increased sharply in due course. On 1st January, 1998, the population was 275,300. The population increased to 318,100 by January, 1999, an increase in excess of 10%. By January, 2000, the population of Astana was estimated at 321,600.



3.1.2 History of Architecture

Although the numbers are limited, Astana city is gifted with an accumulation of historic architecture dating back to the pre-revolution period. With new development and reconstruction of buildings actively in progress, this architectural heritage is in danger. Amongst the buildings and monuments with apparent value for preservation, there are 17 already under State protection, including two with republican importance and 15 of local importance. There are 42 more to be adopted for protection soon. Yet, these are a small fraction of vast historical architecture in existence bearing cultural and historical value. Table 3.1.2 presents the list of these buildings and monuments. Figure 3.1.1 shows locations of the historical buildings.

The following is a description of the characteristics of architecture in a historical perspective, and introduces some of the representative examples of invaluable architectural heritage of Astana.

(1) Pre-Revolution Akmolinsk

Akmolinsk during the pre-revolution period was a small town. Stone houses were rare, and were located only in the central part of the city, located close to the Ishim River. Typically two-storied houses were constructed for the well-to-do citizens of the city, where the ground floor with brick walls were used as utility space, such as storage or shops, and the upper floor with log walls for living quarter.

Gradual growth of the city generated a relatively well-to-do class of citizens, particularly merchants who started construction of wood and stone houses as their dwellings. Architectural decoration such as carved face-work was applied.

Images of some of the representative architectural pieces of pre-revolutionary Akmolinsk are shown in Figure 3.1.2.

(2) Akmolinsk under Soviet Union

In 1940's and early 50's, with the increasing population, Ministry of Railway Department, the largest and most resourceful of FSU organizations, implemented major construction of houses and facilities in Akmolinsk. Besides, numerous two and three-storied collective housing buildings were constructed in the central city and areas around the railway station, particularly along the main streets.

These 1930's to 50's buildings constitute the body of architectural heritage of this city. The buildings not only show the architectural style of the

epoch, but also bear the historic and cultural values from which this city has evolved. Most of the buildings have been preserved until today, and refurbished to house restaurants, cafes, shops and apartments.

Unfortunately, however, some of the buildings constructed in this period were demolished in recent years to make room for modern buildings. One notable example was demolition of an entire block in 2000 in front of the Russian Drama Theater, which had been developed by the Railway Department.

Images of some of the representative architectural pieces of Soviet regime Akmolinsk are shown in Figure 3.1.3.

(3) Tselinograd Years

During this period, a number of five-storied buildings began to be constructed with a standard Soviet design prototype. In 1962 alone, new housing units with approximately 115,000 m² floor area were constructed in the entire city. Central Square of the city was formed in this period, with the construction of surrounding buildings

In the northern part of the city, a new railway station building and its surrounding square were built in 1954. In the same year, *Railway Worker's Palace* was built two blocks down the street facing the station, which is now being refurbished as Kazakhstan Opera and Ballet Theater.

In 1967, nine-storied housing buildings were the city's highest. In 1970's, old buildings along Respublika Ave. (formerly Tselinnikov Str.) were demolished for construction of 5-, 9- to 12-storied buildings, such as *Tourist Hotel* (still in operation today) and *Zhastar* (Youth) Palace, which changed the city's skyline significantly.

Images of some of the representative architectural pieces of Soviet regime Tselinograd are shown in Figure 3.1.4

(4) Akmola and Astana Years

The Akmola years after its renaming in 1991 were unexcitable from the architectural viewpoint. The climate only changed when Akmola was officially announced as the new capital of RK in 1997. Ever since the official capital transfer towards the end of 1997, a construction boom seized Astana City. Housing units as well as office towers, shops, recreational facilities were constructed. One of the most prominent are the housing complex newly built along the Ishim River to accommodate the immigrating

government officials. An office tower is under construction near the northern end of the bridge on the Ishim.

A large number of projects have been completed, are under construction, under design or pending building approval; ranging from Governmental facilities, cultural facilities, educational facilities to housing construction. The great volume of construction schemes in progress signifies the urgent need to streamline these projects in line with an overall land use plan and urban design guidelines.

3.1.3 Concept for Capital Transfer

The transfer of the capital to Astana was said to be advocated under the determined leadership of President Nazarbaev. On the event of the official ceremony of the presentation of the capital of Kazakhstan - Astana on 10th June, 1999, President Nazarbaev delivered a speech entitled "*A new capital – a new state – a new society*". The President mentioned three necessary characters of the capital; the capital as a center of the Eurasian Continent, symbolizing of the image of the nation, and endearment of the nation's past. The following are some of the major points depicted from the text of his speech concerning the conception of the new capital¹.

(1) Center of the Eurasian Continent

Astana is located not merely in the center of the nation, but in the center of the Eurasian Continent, where the young nation, the Republic of Kazakhstan must develop best relations with the neighboring nations. This element was expressed in the speech, "*The relocation of the capital is not a matter of merely internal calculations and concerns. Kazakhstan is a Euro-asian state and our movement towards the center of the country reflects the multivector orientation of our foreign policy, our perception of integration.*"

(2) Symbolizing the image of the nation

It was clearly stated that the capital needs to be "*more beautiful and attractive*", because "*the country is known by its capital*". Thus the speech conclude "*Astana symbolizes the image of our nation and state.*" The speech declared that we (the people of Kazakhstan) shall not spare our efforts "*to make it the symbol of a future society we aspire to build*".

¹ Analysis and Strategic Research Center (ASRC) of the Administration of the President of Kazakhstan, "*Astana – Capital of the Republic of Kazakhstan*"

(3) Endearment of the nation's past

Construction of a new capital must be conceived as an effort not to impair but to endear and strengthen the nation's past.

Towards the end, the speech pointed out, "A society which endears its past is capable of developing and moving ahead. A nation which endears its ancestors is capable of building a worthy future for its descendants".

3.1.4 Past Development Planning for Astana

A Master Plan was formulated in the early 1960's during the Tselinograd years, although the major part of this ambitious plan was not realized.

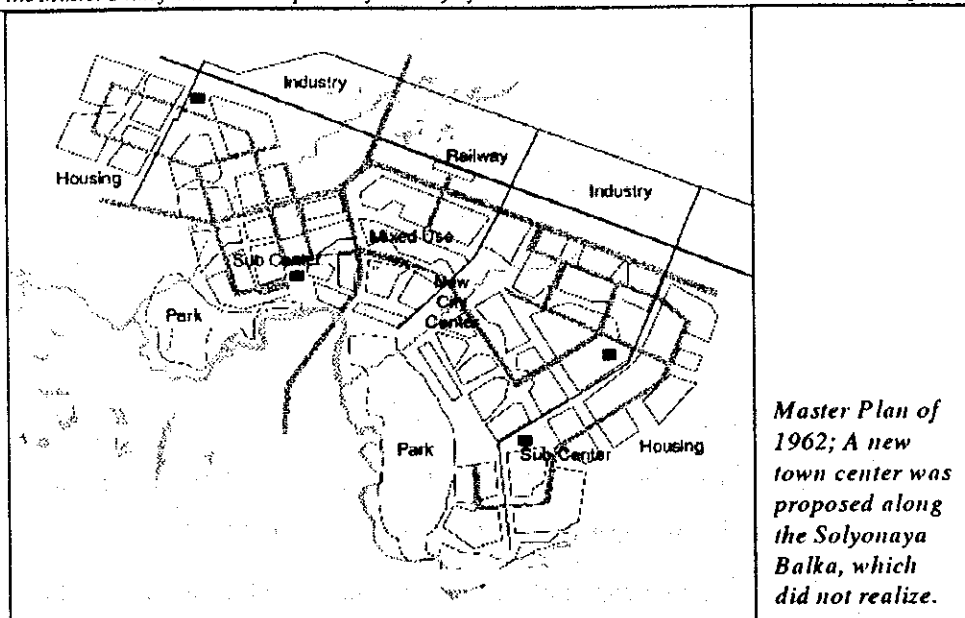
Since a few years before the official transfer of the capital to Astana, several efforts of development planning of the new capital have been conducted. These planning efforts preceding the JICA Study were considered to be important for and relevant to the execution of the Master Plan Study by JICA. Some of the major efforts are discussed below.

(1) Master Plan of Akmolinsk

During the years of Akmolinsk, the city had a master plan, which was reportedly strictly enforced, and only approved projects were constructed. In this period, a municipal orchard and forest nursery were built, and a green zone was established along the Ishim. The Master Plan of Akmolinsk is yet unavailable to M/P Team.

(2) Master Plan of 1962

A City Master Plan developed in the early 1960's, by the leading Designing Institute of Leningrad Urban Planning, Construction and Design (*Lengorstroyproject*) showed a relatively simple allocation of land use. According to this plan the City should be developed on the right bank of the Ishim River, along the railway corridor towards the Southeast crossing the Solyonaya Balka. Three linear zones were identified. A northern zone running from east to west along the Railway Corridor is to be used for industrial development. A mixed use residential zone south of the industrial zone and a recreational zone along the Ishim River were proposed in this plan.

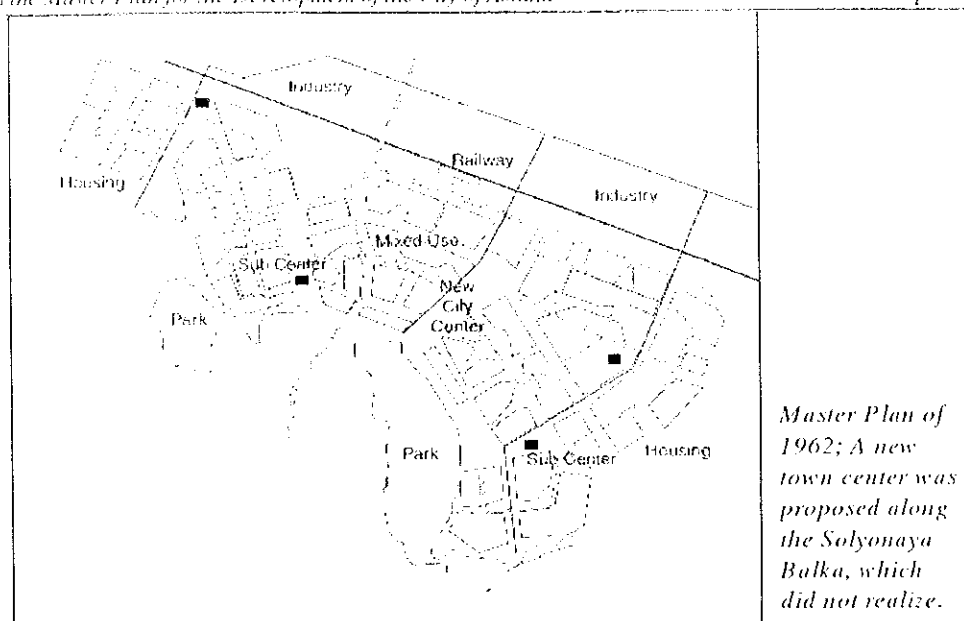


This recreational zone along the Ishim River was planned to include forest and park areas to form a zone to protect the fragile ecological system of the Ishim River.

The new housing territories across the Akbulak River were divided into five *Rayon* with a total projected population between 50,000 to 100,000 inhabitants. Each *Rayon* was planned with its own public center and park areas and further subdivided into Micro-Districts housing between 5,000 to 7,000 inhabitants.

On the banks of the Akbulak River an area was reserved to service as a new City Center, where among dense greenery a main city square, shops, theaters, administrative buildings, museums, hotels and sports facilities were planned. Only until recent days, part of this plan has been realized with the construction of the extension of the Eurasia University and the Sports Palace.

The areas along the banks of the Ishim River to the northwest and southeast, prone to flooding, were later developed for the location of *dachas*, with the largest area found in the Southwestern section of the City. Further south of the City, the airport from the area of the Chubary Village was relocated to an area 15 km south of the city on the shores of Lake Mybalik. Not far from the airport towards the city was the development of a small Micro Region (residential) development presumably for accommodating housing for airport staff. In the same period around 1964, the Taldy Kol reservoir was built in the southwestern fringe of the City to accommodate and evaporate the discharge of treated sewage water.



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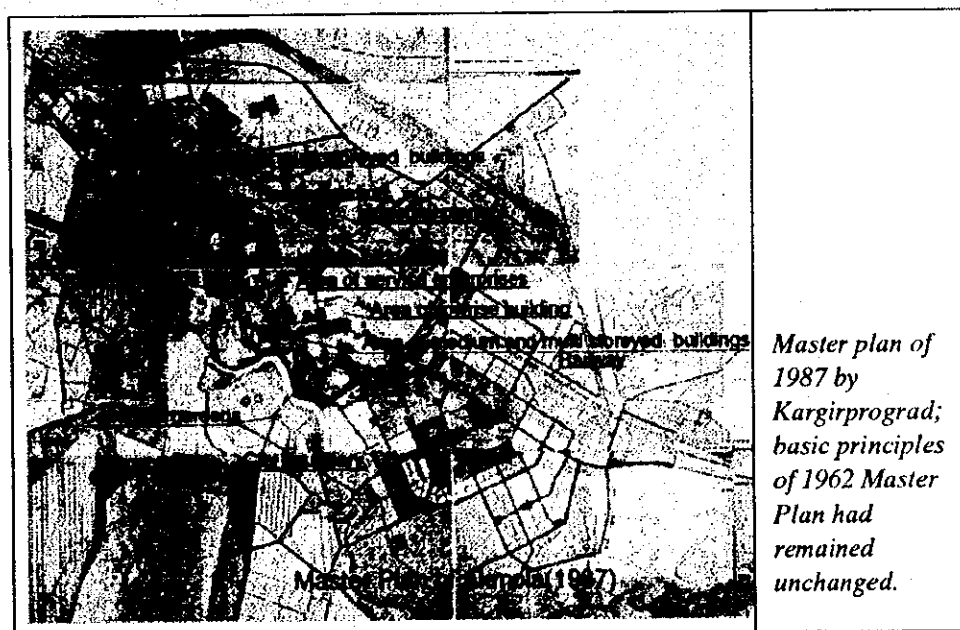
In addition to the industrial area north of the railway tracks, industrial areas were established in the far southeast and northwest fringes of the city. In particular, the Southeast industrial area will form an obstacle to further development of the city in this direction.

(3) Master Plan of Akmola (1987)

In 1987, the master plan of 1962 was amended by Kazakhstan Design Institute for Urban Planning (*Kazgiprograd*) and approved as the authorized master plan of Tselinograd. The principal ideas of the previous master plan remain effective, which were in essence;

- Main part of the development were to be restricted mainly on the right bank of the Ishim.
- The concept of linear-stripe zoning was to be adopted with creation of large buffer zone along the Ishim River.

By 1987, *dachas* were located on the Ishim River bank in the eastern and western part of the city. The new master plan proposed to lay out parks in these areas instead of *dachas*. In addition, spatial separation of functions were established in the Master Plan as a means to control the ongoing intrusion of industrial enterprises into residential zones.



The 1987 Master Plan abandoned the idea of moving the city center to a new location along the Solyonaya Balka (where the Ministry of Internal Affairs

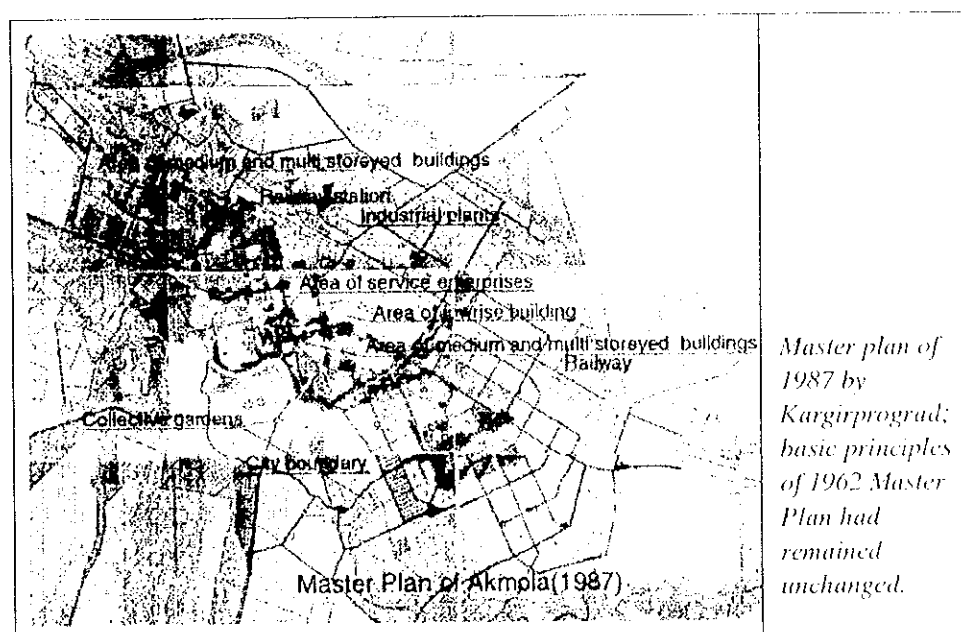
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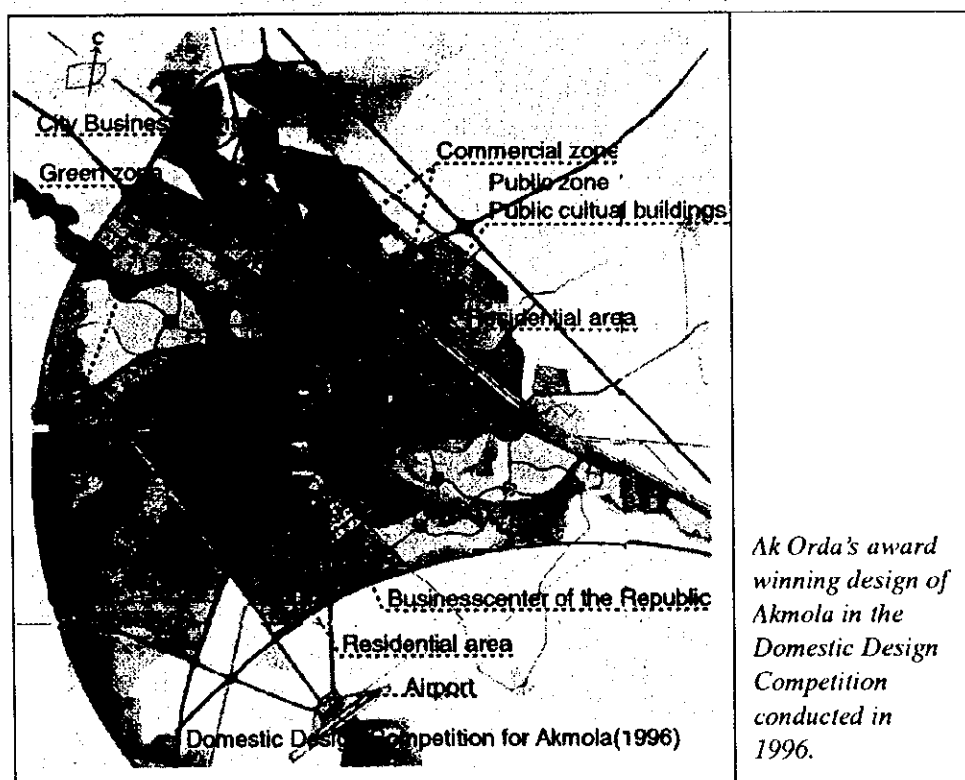
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and Roman Catholic Church are located). Therefore the city center was to remain in the same location as today.

Residential areas, previously planned in five locations in the city, were reduced to only three locations; central, eastern and western parts of the city. The city's direction of expansion was apparently to the east, extending along the railway axis.

(4) Domestic Design Competition for Akmola (1996)

In 1996, a competition for the designing of Akmola City was conducted by the Ministry of Construction of the Republic of Kazakhstan and Architects Union of Kazakhstan, by inviting consultants and architects from within the republic. As a result, the proposal prepared by the Design and Construction Company, Ak Orda (hereafter called "Ak Orda") was selected for the first prize.



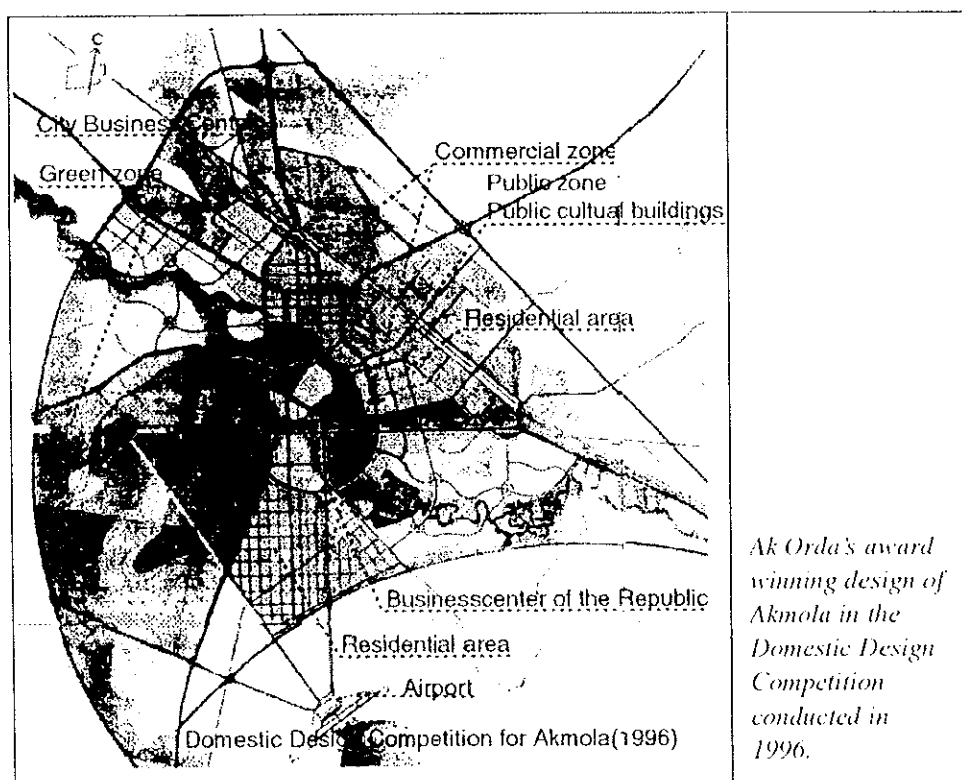
Ak Orda's proposal included extensive use of the under-developed left bank area of the Ishim River to accommodate large part of administrative and business functions. An existing axis starting at the railway station directing southwards and another axis starting from the airport northwards parallel to

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the first are intersected by a perpendicular axis extending west to east, connecting to the Akmola - Karaganda highway.

Akmola Municipality subsequently entrusted Ak Orda to formulate a new master plan based on the selected plan. The work was commenced, but unfortunately discontinued at some part, due to a financial reason.

(5) Master Plan of Akmola City by Ak Orda (1997)

In 1997, the State Committee on Relocation of High and Central State Organizations to Akmola² entrusted Ak Orda to prepare a master plan for Akmola City. Preparation of the master plan was necessitated by a new geopolitical role of the city as the capital of the Republic. The first phase was set for the year 2005, while the target year of the master plan was 2015.

This master plan elaborated on the concepts of Ak Orda's domestic competition winning proposal, and proposed the direction of expansion of the city southwards. The left bank of the Ishim was therefore considered as the site for new development to accommodate housing units and government complexes. Northern and northeastern directions from the existing city were limited for the expansion of industrial, communal and transport facilities. The basic concepts established in this master plan are generally effective today.

The master plan was unfortunately discontinued upon the completion of the fact finding phase. Only one volume of the report was published on the analysis of the existing conditions and major constraints in development.

(6) Master Plan of Astana City by Ak Orda (1998)

The master plan of the renamed Astana City was restarted in a somewhat reduced scale in 1998. This time the Municipality of Astana entrusted Ak Orda again to prepare a master plan for the target year of 2005 in an effort to fulfill the requirement described in the Resolution of the Government of Kazakhstan, dated 10 February, 1998, "Concerning the First Phase Plans for the Development of Astana".

² This committee was formed in November, 1995, based on the Presidential Decree issued in September, 1995, "On the Capital of Republic of Kazakhstan", which stipulated to form a state committee to coordinate the central and local governments for organizing the relocation of the high and state government organization to the then Akmola City.

The objective of the Master Plan was to identify, to the maximum extent, reserves of territories within the existing boundaries of the city that could be used for future construction. The population of the city in 2005 was projected to be 350,000.

In this master plan, planning of priority areas for development was carried out; the city center, covering an area of 400 ha, and a new housing development area southeast of the city, covering an area of 1,000 ha.

Substantial work for the master plan was completed, and published in 1998.

(7) International Tender for the Draft of the Master Plan of Development of the New Center of Astana³

After the renaming of Akmola to Astana, the Government of the Republic of Kazakhstan decided to conduct an “International Tender for the Draft of the Master Plan of Development of the New Center of Astana”, which was announced publicly by foreign mass media in April 1998. Terms and the program of the tender were sent to the 40 applicants from 19 different nations around the world, of which 27 tender proposals were submitted. The Board of Experts and Board of Judges were organized respectively by the prominent experts in relevant fields to evaluate and judge the tender proposals.

On 6th October, 1998, the President of the Republic of Kazakhstan considered presented materials and awarded the first prize to Kisho Kurokawa architect & associates, Japan. His basic concepts in his proposal focus around the three key-words drawn from the cosmology of Kurokawa’s architectural thoughts; “*symbiosis*”, “*metabolic city*” and “*abstract symbolism*”.

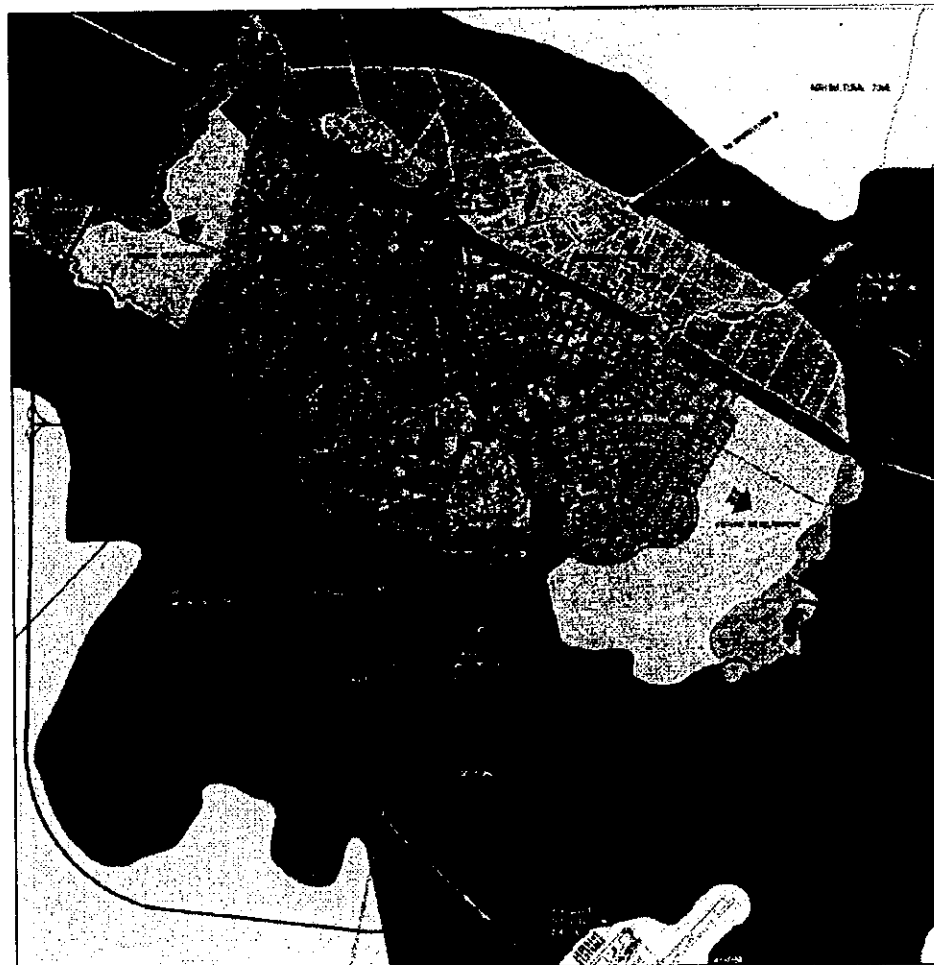
The word “*symbiosis*” refers to “*new, creative relationship born from competition and tension*”, a “*positive relationship in which the participants necessarily attempt to understand each other, despite opposition*”.⁴

The *metabolic city* concept utilize a linear zoning system, where the nature and urban life are in parallel, relieving a city from the limit of structural growth. This concept is a counter-proposal for a commonly practiced concentric city.

³ Government Committee of the Republic of Kazakhstan to Conduct the International Tender for the Draft Master Plan of the Development of the Astana-City, “International Tender for the Draft of the Master Plan of the New Center of Astana-Capital of the Republic of Kazakhstan”, 1998 (Astana).

⁴ Kisho Kurokawa, “The Philosophy of Symbiosis”, Kodansha International, 1997

“Abstract symbolism” relates to a design methodology in architecture extended upon use of *“abstract forms and geometric features”*. These forms and features are *“linked to the cosmologies of the different cultures in which they appeared”*, and Kurokawa thinks that the *abstract symbolism* is *“a new architectural style for the twenty-first century”*.⁵



Kisho Kurokawa's first prize winning design of Aknola in the International Design Competition conducted in 1998.

Some of the important concepts of the scheme proposed by Kurokawa for Astana are:

1) Creation of a Symbiotic City, Fit for the New Capital of Kazakhstan

Symbiosis of New and Old Cities

A new development area is set chiefly on the left bank of the Ishim River. The existing infrastructures shall be maintained and/or

⁵ Kisho Kurokawa, *“From the Age of the Machine to the Age of Life”*, Book Art, 1998.

rehabilitated as much as possible, and let the old and new cities to co-exist in *symbiotic* harmony. This shall allow the saving of development expenditure and thus contribute to accelerating the tempo of new capital development.

Symbiosis of Nature and City

Preservation of greenery and creation of urban livelihood full of amenity is an essential goal common to major cities in the world, and is an important issue in any practice of the city planning work. The *symbiotic* harmony of nature and urbanism is considered as a basic principle.

2) Formulation of a Flexible Development Plan based on the Metabolic City concept with Linear Zoning Method

In order that the development of Astana City be conducted flexibly, the linear zoning method shall be applied as a means to achieve a *Metabolic* City (an ever growing city).

Metabolic City with Linear Zoning

The new capital should be capable of adjusting to the future development of the city to maintain balance and order. Linear zoning is introduced in this regard, where the respective zones could be expanded linearly. The zones may comprise green buffer zones (as necessary to protect the capital against sand storms); existing industries and advanced hi-tech industries; green zones (for environmental protection); existing urban areas; residential zones; a new city center zone and an eco-park zone.

Eurasian Axis

The new capital shall have an invisible axis that symbolizes Kazakhstan as located in the center of the Eurasian Continent. The existing urban axis that starts from the railway station southwards is extended across the Ishim River, and the axis is concluded at the southern end where a new government city shall be placed. This invisible axis shall combine the existing station, central business district and the new government city in a line, and bridge the both banks of the Ishim River, and consolidate the past and future of Astana.

Application of Abstract Symbolism

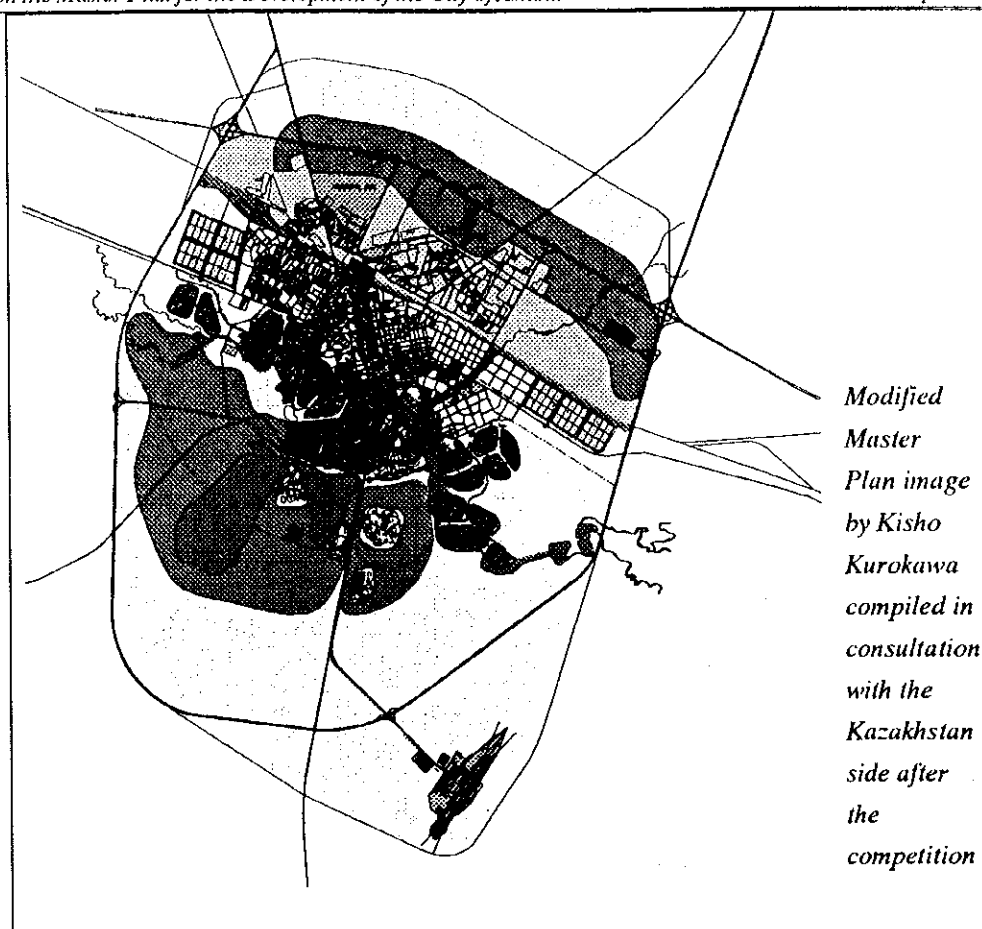
In designing the new capital, a method called the *abstract symbolism* shall be applied. The *abstract symbolism* utilizes the common geometric features that everyone can understand, and express the traditional cultural aspects of Kazakhstan in the abstract. A triangle as seen in decoration of nomad people, a cone as seen in nomad hats or trees, a circle or a semi-circle which is the shape of the moon and symbolizes the universe are the examples of such geometric features.

By applying the *abstract symbolism*, the capital that reflects the tradition and culture shall breed the affection by the nation, and construct the landscape fit for an international city.



Model on the image of the prize winning entry of Kisho Kurokawa for the international competition of the development of Astana

After the prize awarding, modification of the plan was initiated in close consultation with the President of RK, which yielded different versions of Master Plan drawings.



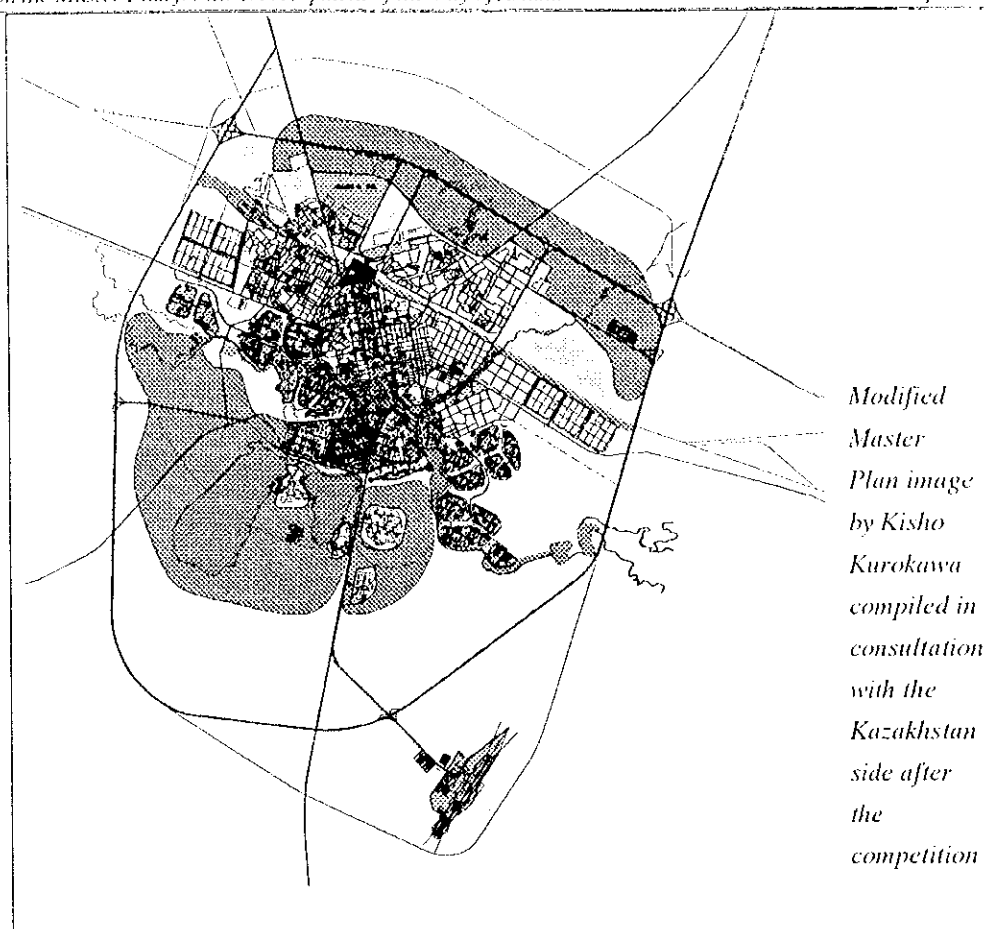
The major changes incorporated in this plan was the following;

- Residential areas were added on the both banks of the Ishim to enhance the residential function
- Residential areas were also extended along the western and eastern ends of the existing urban areas
- A business development area is proposed north of the railway track
- In between the Business Area and the Airport, various functional development aiming at sports, recreation and high-tech industries were proposed

(8) Existing Master Plan by a Saudi Group

In December, 1999, Master Plan for Astana Capital City of Kazakhstan, prepared by a Saudi group was submitted to Municipality of Astana. On 10th February, 2000, this master plan was approved with an obligation that some of the areas not fully covered in the master plan be additionally filled in by the Government.

The preparation of the master plan was conducted in three stages;



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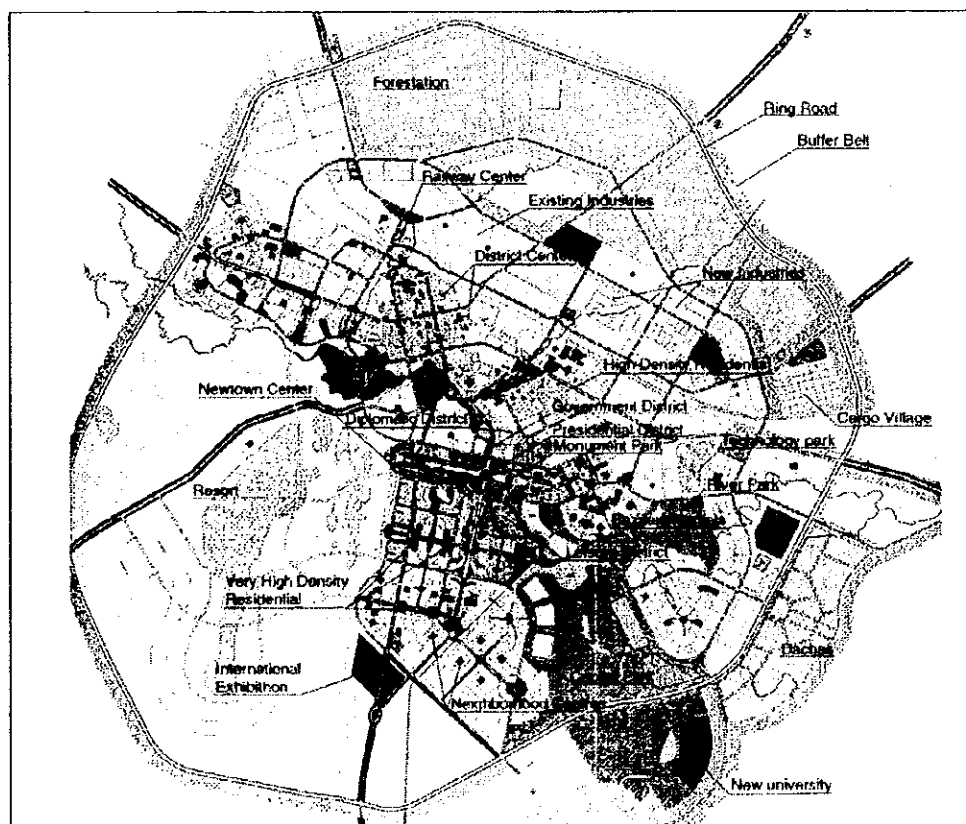
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- A short description of the Context and Setting of the new capital city
- An analysis of master plan determinants including the preparation and evaluation of Alternative Master Plan Options
- The elaboration of the preferred alternative master plan option into a robust master plan to guide the development of the city to the year 2030. Also the preparation of a short term plan for the years between 1999 and 2007 and to prepare a plan for the town center.

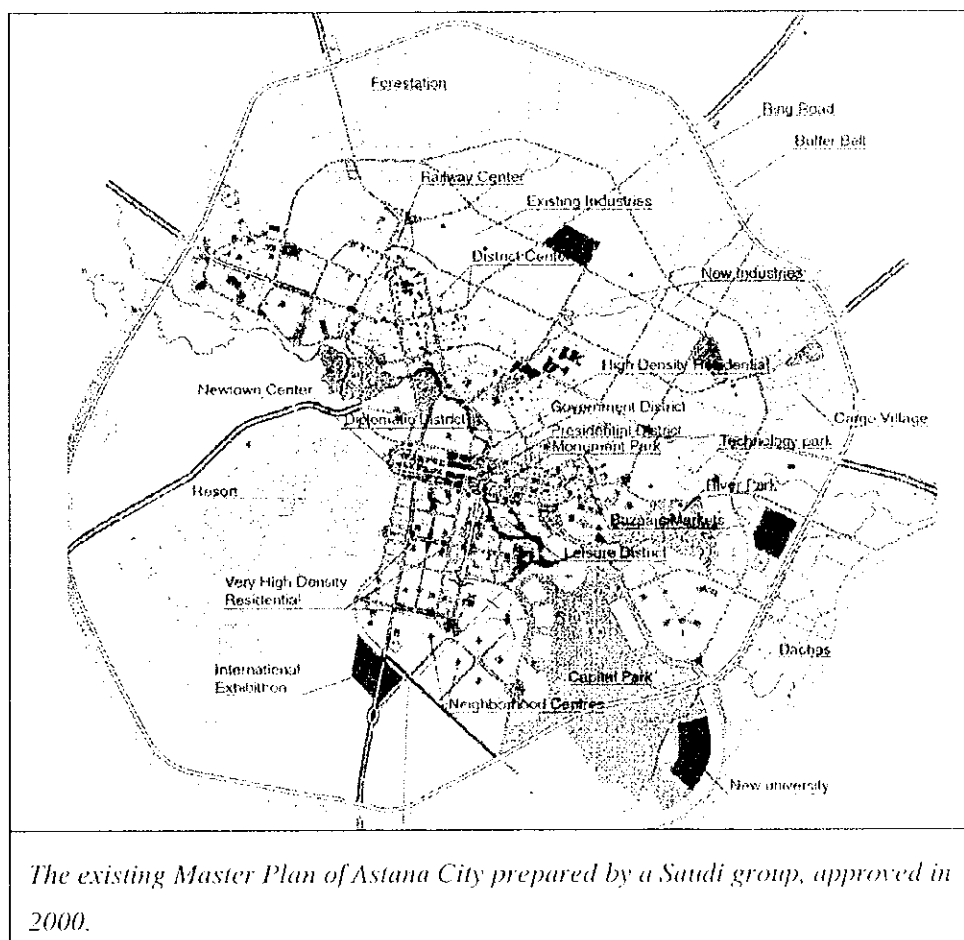


The existing Master Plan of Astana City prepared by a Saudi group, approved in 2000.

The basic concepts of the Master Plan as stated in Volume 1; Components and Phasing is as follows;

The principal purpose of the study is to prepare a Master Plan for Astana, which will enable it to function as the national capital in the most attractive, efficient and cost effective way.

- A short description of the Context and Setting of the new capital city
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References.

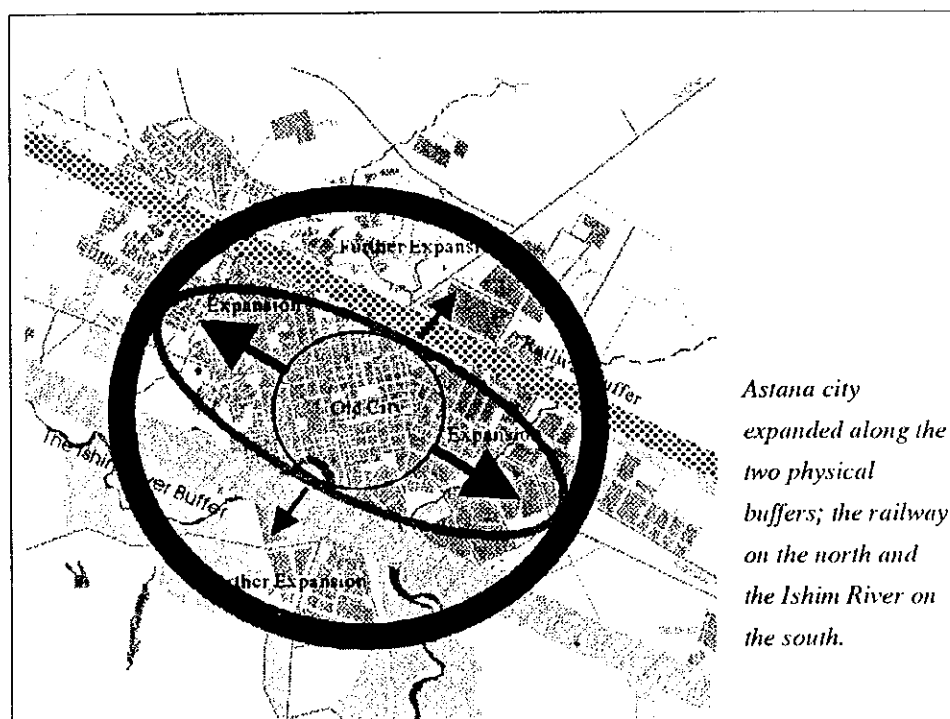
- [1] Department of Economy and Small Businesses of Astana Municipality, "Socio-Economic Passport of Astana", January 2000
- [2] A.F. Dubitskiy, "City on the Ishim River", Kazakhstan, 1986.
- [3] Analysis and Strategic Research Center (ASRC) of the Administration of the President of Kazakhstan, "A new capital – a new state – anew society; Speech of the President of the Republic of Kazakhstan N.A. Nazarbaev at the official ceremony of the presentation of the capital of Kazakhstan - Astana", 10th June, 1998.
- [4] Kisho Kurokawa architect & associates, "New City Design Proposal; Astana City, the Republic of Kazakhstan", 15th August, 1998.
- [5] Saudi Binladin Group, "Master Plan for Astana Capital City of Kazakhstan", Akimat of Astana, 1999.
- [6] Government of the Republic of Kazakhstan, "Concept of the Mid-term Program of Socio-economic Development of Astana City for the Period up to the year 2005; Blooming of Astana – Blooming of Kazakhstan", 2000.

3.2 Present Conditions of Urban Planning, Architecture and Land Use

3.2.1 Urban Structure of Astana City

(1) Overall Urban Structure

The existing urban areas are situated mainly north of the Ishim River on its right bank, and south of the railroad. Most of the urban areas are located between the two tributary rivers of the Ishim, the Solyonaya Balka and the Sarybulak. In recent years, the urban areas expanded beyond the two tributary rivers to the east and west, and also beyond the Ishim to the left bank areas. The north of the railway tracks is an industrial area, where factories, repair shops and power plants are located. The activity of the industrial area is generally low, reflecting the restructuring of the products market.



(2) Overall Land Use Condition

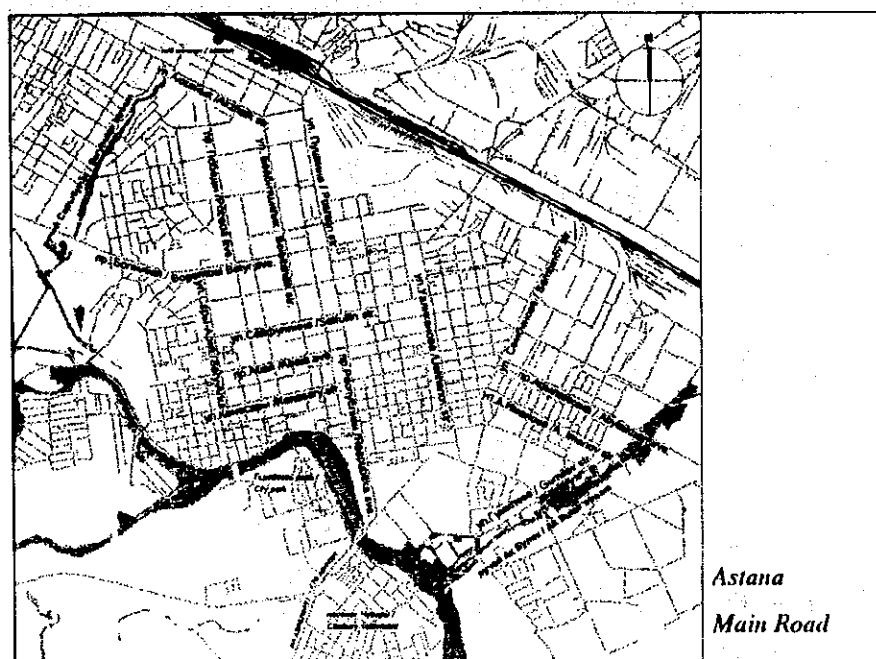
The existing situation of land use in and around the urban areas of Astana is shown in Figure 3.2.1. The urban structure described above is easily verifiable in this figure. The city has abundant open space around the existing built-up areas in almost all directions. Expansion of the city in the future does not seem to face much obstacle from the land use viewpoint.

Built-up areas concentrate in the central part of the city expanding along the axis joining the central square in the south and the railway station to the north. Relatively new housing areas are located at the fringe of the old city

to the east and southeast beyond the Solyonaya Balka and to the southwest across the Ishim.

(3) Roads

There are two major avenues running through the central city north-south; Respublica Ave. on the east and Poveda Ave. on the west. Respublica Ave. is one of the major avenues, with 24 meter wide lanes and spacious pavement, leading into Pushkin Street on the north, and directs southwards to the airport via the bridge on the Ishim. This avenue constitutes a major route to the city center for visitors arriving in Astana by air. Poveda Ave. is another 24 m wide arterial road, starting from the central business district of the city and connects to the existing railroad station to the north. Another street worth mentioning is the 23m wide Beibitsilik Street (formerly called Mira Street, a name which is still often used today). Beibitsilik Street runs between the two major avenues in parallel. Beibitsilik Street is a thickly tree-lined street with spacious sidewalks, where most of the city's good cafes and restaurants are located.



Intersecting perpendicular to these two avenues are Batyr Bogenbai Ave. and a few other streets running east-west. The 25m wide Batyr Bogenbai Ave. is a major east-west artery, providing connection to Astrakhanskoye Highway to the west for Athasar. Kenesary Street, an 11m wide urban street, runs in the southern part of the existing urban areas of Astana, serving local transportation demand and providing connection via Abylai Khan Ave. to Vishnevskoye Highway leading to Karaganda. Two more important

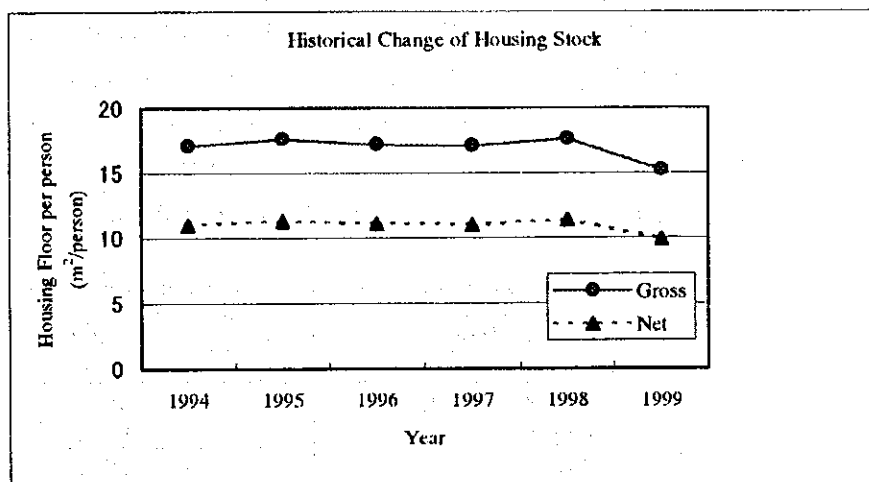
streets running east-west in the city between the two arterial roads mentioned above are Seifullin Street in the north and Abai Street in the south. Seifullin Street is a 12m wide street along which some of the city's historical buildings are located, and Abai Street, named after the nationally known poet, is a 15m street with continuous lining of trees. Figure 3.2.2 shows the major streets in the urban areas of Astana. Table 3.2.1 summarizes the physical characteristics of the major streets.

3.2.2 Housing

(1) Historical Change of Housing Stock

The housing stock of Astana shows improvement, as the average gross area of housing stock per person is increasing in the last 3 years. The average gross area of housing stock per person in year 1997 was 17.1m²/person.

In comparison, the total area per person of housing stock in Astana was more or less the same as those in all urban areas of RK until the year 1996, as the differences were generally less than 5%. Reflecting the rapid growth of the city's population due to the official capital transfer, the housing stock per person dropped substantially in 1999 despite rapid construction of new housing units in Astana. The drop of housing stocks was particularly remarkable in 1999. The detailed description shall be given in Sub-Section 3.4 below.



The net housing area is about 64 to 65% of the gross area. In 1997, the gross housing area was 15.2 m²/person, which means that for an average family of 4 people, the gross area for housing would be 61 m². This is considered to be small, and there is deemed to be plenty of room for improvement.

(2) Quality of Housing Stock

As part of the work for formulating the Master Plan of 1997, Ak Orda⁶ conducted a detailed survey of the existing housing stock with regard to various parameters of quality. These data are relatively elaborate and detailed, and thus deemed relevant as they clarify some of the key characteristics of the housing stock conditions immediately before the construction works were commenced for the new capital development.

At the time of the survey, characteristics of housing stock were clarified in terms of 5 parameters described below;

1) Ownership

Private sector provides about 77% of the total housing stock in Astana. They are either private houses or privately owned apartments.

Housing Stock with respect to Ownership

No.	Category of Housing	Total area	
		(1000 m ²)	(Share in %)
1	State sector	966.0	19.4
2	Public sector	12.8	0.3
3	Cooperatives	184.4	3.7
4	Private sector	3,795.8	76.5
	Total	4,959.0	100.0

2) Building types

With regard to the building types of housing units, medium rise buildings with 3 to 5 stories occupied 59% of the total stock. On the other hand detached houses accounted for 25% of the stock. High rises with 6 or more stories accounted for 9% of the total stock, although this percentage has increased significantly in the last 3 years.

Housing Stock with respect to Number of floors

No.	Building type	Total area	
		(1000 m ²)	(Share in %)
1	6-9 floor and higher	467.7	9.4
2	3-5 floor	2,947.7	59.4
3	2 floor	291.0	5.9
4	detached (ground)	1,252.6	25.3
	Total	4,959.0	100.0

⁶ Master Plan of Akmola city prepared by Ak Orda DCC, Volume I, Book I Chapter 4.2.2 Housing Stock

3) Building materials

With regard to the materials of walls, most of the housing buildings utilize either large panels and bricks. Wooden wall houses accounted for about 5%.

4) Availability of Utility

With regard to the availability of utility services, it is noteworthy that only 75% of the population has connection to the water supply system. The remaining 25% receive tap water from public faucets installed in residential areas. This imposes sanitary and amenity issue on the part of urban residents. No heating is supplied to 24% of the population, while 28% do not have hot water connection. These essential urban utility services shall have to be improved.

Housing Stock with respect to Availability of Utilities

No.	Type of facility	Availability (%)	Total area	No. residents
			(1000 m ²)	(1000 people)
1	Water supply system	75	3,719	to 208
2	Sewage system	75	3,719	208
3	Central heating system	76	3,769	211
4	Hot water supply system	72	3,570	199
5	Gas supply system	100	4,959	277
6	Bath (shower)	73	334	19

(3) Housing Market

Land, houses and apartments are traded in the housing market. The real estate sector employs 7,600 at present (refer to Sub-Section 3.4.2). The housing market, as such, seems to be a mixture of free, privatized entities controlled by public bodies. For example, all the issues pertaining to the land is administered by the City Committee on Land Resources Management, which executes all the juridical procedures in respect of sales and lease of land plot within the city boundary. The form of regulation itself does adapt to the market economy mechanism, taking into consideration the locational, infrastructural, environmental and socio-economic factors duly.

Table 3.2.2 present the general conditions of the housing market.

1) Land Price

The land cost benchmark in Astana City in 2000 is Tenge 411/m². The actual price of a certain land plot is determined by applying an adjustment coefficient to the base cost. Traded land prices in Astana City range between Tenge 123 and 822 / m².

2) Land Lease Price

Fixed cost of land leasing for agricultural production outside the city ranges between Tenge 3,800 and 71,600 / ha, depending on the soil type.

3) Housing Price

The prices of old low-rise buildings are generally low, say between US\$ 50 to 150/m² of total area. Relatively new housing units range between US\$150 to 400 /m² of total area. Prices of newly built apartments and houses recently range from US\$ 400 to 550/m² of total area.

3.2.3 Townscape

(1) Natural Landscape

Astana is a city located on relatively flat terrain. Seen from a height, an open view extending in all directions above the horizon is to be seen. Unlike Almaty, no high snow-ridged mountains are in sight. For better or worse, this open terrain constitutes one of the main characteristics of the landscape of Astana.

Vegetation is not thick in Astana. Some people say that the severe winter climate with low temperatures and strong winds hinders the growth of trees, while others attribute the slow growth of trees to generally high ground water tables. Forests and woods are rare in the vicinity of Astana, and it requires a day-trip to find them in every day life.

The Ishim River running at the southern bound of the existing urban areas of Astana is a prominent natural landscape element of the city. During the winter, the river becomes a popular site for skating and skiing, while in other seasons it lies quietly in the sight of the city with abundant water body. In the summer season, a water-jet fountain is now installed in the middle of the water body which apparently adds to the citizen's affection for the river. A river walk on the dyke of the right bank of the river near the city center is almost always crowded with the citizens of Astana.

(2) Skyline

The skyline of Astana, composed of various architectures and structures, is generally low in height. The highest buildings in Astana are the 25-storied twin-tower apartment buildings on Bogenbai Avenue, which is followed by the building of Inter Continental Hotel. Both of the buildings were constructed in the past few years.

Another new high-rise is the 17-storied building housing the Republic's Parliament. The building is prominent in the city's skyline as it faces the open space within the central square where the citizens often gather for a moment's relaxation.

A new addition to the city's skyline are high-rise apartment buildings along the Ishim, chiefly for incoming central government officials. There are seven 16-storied buildings overlooking the river surface with identical yellow and white coloring. Some other high-rise buildings are under construction along the Ishim towards the city center.

Most other buildings are generally not more than nine stories. There are quite a few nine-storied housing buildings in the city which appeared in the city's skyline in 1975 when the city was growing as a regional industrial center. There are also quite a number of five-storied apartment buildings particularly in the central part of the city. The five-storied buildings first appeared in 1960 when the city was flourishing as the center of the Virgin Lands. Any other low-rise buildings are less than four stories, and most of them are collective row-houses constructed in the 1930's to 1950's.

(3) Streets

The avenues and streets in Astana are generally wide and spacious. There are 10 streets with more than 20 meters of width of lanes. Combined with pavements and other appurtenant spaces alongside the roads, average widths of major streets often exceed 30 meters.

Along the major streets are spaces provided for townscape effects; trees, bushes, lawn and flower beds. Streets lined by more than 1,000 trees and bushes are, among others; Respublica Ave., Beibetshilik (Mira) Str., Auezov Str., Abylai-khan Str., Pobeda Ave., Abai Str., Seifullin Str. and Kenesary Str. Unfortunately, due to the reason mentioned in (1) above, the trees in Astana streets are generally low and the shade created by them is not dense. With regards to size and height, trees in the streets of Astana are not comparable to those in the former capital. Table 3.2.3 depicts townscape characteristics of major streets in Astana.

(4) Architecture

Although not many in number, historical buildings are precious elements of Astana's townscape composition. Preservation of these buildings are in progress, as 17 buildings and monuments are under state protection, as

described in Sub-Section 3.2 above, and 42 more are being proposed for addition.

Most of the residential buildings constructed in the 1940's and 50's are two- to three-storied brick buildings in a row-house style. A number of such buildings are seen in either around the central square area or in areas near the railway the station. These buildings have a stable outlook with regular allotment of windows and roofs. Many of the city's entrepreneurs apparently consider these buildings as ideal location to house cafes, restaurants and shops. The rowhouses constitute a body of architectural heritage of the city.

(5) Square

Central Square of Astana was formed in the beginning of Tselinograd years around the administrative buildings and hotels. This square is now an important open space for the city, utilized for various festive and commemorative occasions. Around the central square are *Parliament House* and *Presidential Office*, both of which are the Republic's central administrative functions constructed or reconstructed after the official announcement of the capital transfer. The square thus carries a symbolic importance to the Republic, as was depicted in the International Presentation of the new capital, held chiefly in this square on 10th June, 1998.

(6) Monuments and Statues

There are a number of monuments and sculptures in Astana. S.Seyfullyn Monument located in Pobeda Street in the campus of the Agrarian University by S.Seyfullyn, constructed in 1972 is a monument already under the state protection. There are five other monuments now proposed for state protection; Monument to the Motherland defenders located near the Russian Drama Theater; a memorial dedicated to victims of political repression constructed in 1994 along the highway to the airport; Tole bi, Kazybek bi and Ayteke bi monuments constructed in 1998; another S.Seyfullyn Monument located besides the S.Seyfullyn Museum; and A.S.Pushkin monument in Pushkin Street.

These monuments and sculptures constitute as landmarks of the city providing a sense of orientation and artistic touch to the otherwise relatively practical townscape of the city.

(7) Citizen's Perception of Townscape

In May 2000, a small survey was conducted by the Study Team to clarify the citizens perception towards the townscape of Astana. As the survey was simple and the sample taken was small, this survey may not necessarily reveal representative perception of general citizens. The results, however, show some tendencies and general directions about the townscape in Astana.

The total number of questionnaire sheets answered was 155. This sample included 60 architectural design office employees, 30 central governmental staff, and 55 architectural and engineering students and teaching staff.

The following are the essence of the survey.

1) Favorite Street

Respublika Ave., Beibitshilik (Mira) Street and Abai Street are found to be the most popular streets in Astana. These three streets are among the most spacious and fully tree-lined streets in Astana, as discussed in (3) above. The preference as revealed in this survey apparently supports the presumption that streets with good greenery and spacious conditions are also favored by citizens.

2) Favorite Architecture

This question requests the respondent to select at most five pieces of architecture to express their preference amongst a list of existing buildings in Astana. Most people chose very prominent buildings, such as the newly built *Cinema City*, *Intercontinental Hotel* and *Millenium Gallery*. Other popular choices are the outstanding Ministry of Finance building, *Congress Hall* and *Eurasia Shopping Center*. All the buildings chosen by citizens are modern architecture.

3.2.4 Issues Related to Urban Areas of Astana

In this Sub-Section, some of the issues pertinent to the urban areas of Astana shall be discussed. Perception of these issues provides an important starting point leading to the formulation of the planning framework, which shall be discussed in Sub-Section 3.4.

(1) Structure of City

The overall urban structure discussed in Sub-Section 3.2.1 revealed that most of the existing urban areas of Astana is located on the right bank of the Ishim. With the expansion of the city, development is now also taking place on the left bank. The areas on the left bank have relatively spacious

lands and have good access to the airport. It should be noted, however, that there is only one bridge for automobile transportation connecting the both banks connecting the two banks, which might cause a traffic problem with the expansion of urban areas on the left bank.

(2) Road Structure

The existing road network is essentially a grid pattern, with major roads coming into the city from four directions. With the future growth of the city's population, the traffic load might tend to concentrate on some of the major streets in the city. This issue will be discussed in full in Section 3.9

(3) Urban Areas

The existing city is composed of various types of urban areas with different characteristics. There are two issues in this regard.

1) Low-Density Residential Areas in Central City

Even in the close vicinity to the city's CBD, there are low-density residential areas mostly composed of detached houses. Most of the houses are old and the living environment is not good. In some areas, there are marshy areas in the midst of housing quarters.

In order to accommodate the rapidly increasing population of the city in the near future, phase-wise improvement shall have to be considered in such residential areas. These areas, if improved with better roads and regular land plots and improved drainage, shall be able to accommodate much more population in better conditions.

2) Mixing of Residential and Industrial Areas

In the northern part of the city, substantial mixing of the residential and industrial areas is taking place. This presumably came from the Tselinograd years, when the factory and/or railway workers lived in close vicinity to their working places. The conditions in these residential areas are generally low, with essential urban services such as water and heat supply are not provided. Effect of air and water pollution could also be apprehended. This type of mixing of conflicting urban functions need to be separated.

These issues will be discussed in Sub-section 3.4.2.

(4) Housing

As discussed in item (1) of Sub-Section 3.2.2, The statistical data show that the housing conditions in Astana has worsened since the capital transfer,

with a sharp decline in the housing floor area per person, both in gross and net terms. Particularly, the net housing area per person in Astana in 1999 is estimated to be about 10 m²/person, which means that a family of four would live in a 40 m² housing unit. Some drastic improvement of housing stock shall have to be conducted.

(5) Quality of Housing Stock

As discussed in item (2) of Sub-Section 3.2.2, about a quarter of housing stock lacks essential urban utilities such as water supply, sewerage, heating and hot water supply. These housing units are presumably those in the low-density residential areas at the fringe of the existing urban areas. Provision of essential urban utilities to these units would have to be considered.

(6) Townscape

As discussed earlier, the city has various elements composing the city's townscape. The following are two essential issues pertaining to the preservation and reinforcement of the city's townscape.

1) Historic Buildings

Although most of the city is of relatively new construction, there are a number of old buildings and houses that retain historic characteristics and flavors of the old times. Conditions of preservation are not as good as they should be, except presumably for the 17 buildings under official protection. Preservation and relocation, if necessary, of these historical objects shall have to be considered wherever necessary. Substantial expansion of the existing list of buildings under the state protection shall have to be considered

2) Improvement of Townscape at Favorable Streets

As shown in a survey conducted by the Study Team in this regard, many people consider Respublica Avenue, Beibitshilik (Mira) Street and Abai Street as their favorite streets. These are relatively spacious and full lined by trees, although the trees are not yet very large. Improvement and reinforcement of the townscape along these streets is already attracting citizens' affection and should be given serious consideration. Table 3.2.3 presents townscape characteristics of major streets in Astana.

3.3 Basic Concept of the Master Plan⁷

3.3.1 Capital in 21st Century

The Master Plan of Astana City, the new Capital of Kazakhstan, is the advanced Master Plan made on the basis of the Design Plan which was awarded the First Prize at the International Competition for the Master Plan and Design of Kazakhstan's New Capital. Thus, the Master Plan has been achieved through accumulating the plans of many study teams including Plan 1996, the Second Prize plan by Ak Orda and the existing Master Plan by a Saudi group.



First Sketch of Kisho Kurokawa

The Master Plan of Astana may be the first, and may also well be the last one for a new capital to be constructed during 21st Century. An ideal city of 21st Century, not only for the people of Kazakhstan but also for the mankind, needs to be realized, and for this purpose experts of Japanese as well as Kazakhstan sides must collaborate to achieve this historic construction.

⁷ This subsection is based on the speech text of Dr. Kurokawa at the event of Progress Meetings in April and July, 2000.

The 20th century was the era of the machine principle, but the 21st century will be the era of life principle. The concept of the era of life principle is represented by the keywords of *metabolism*, recycling, *symbiosis*, ecology, and environment. Astana City, based on the above concept with the most important keywords such as *symbiosis*, recycling, ecology, and *metabolism*, will become the model city of the 21st century.

3.3.2 Astana as Symbiotic City

Astana City is thought of as a *symbiotic* city. The new capital will be born in *symbiosis* of the history of the Akmola City and the newly built City.

The Ishim River was flowing along the border of the historical Akmola City, but was not actively utilized, for it caused spring floods due to melting snow and ice. For protection against floods, a dam was constructed at the upper stream part of the river. A safe and beautiful Ishim River will be achieved by reconstructing dykes and a detention pond and improving the river channel.

Tree planting will be implemented on both banks of the Ishim River to form a River Park and the new housing area (River city) there. By this means, River City will emerge in *symbiosis* with the Nature (the forest and the river). Thus, the Ishim River will not constitute a border of the city any more. Astana City will be created on the banks of the motherly Ishim River that is flowing across the city similar to Paris on the Seine River, London on The Thames, and Moscow on the Moscow River.

In winter, the temperature in Astana City sometimes drops below thirty degrees below zero Centigrade. Besides, the winter wind from the southwest direction reaches the speed of 7 meters per second on average. In order to protect the city from this winter wind, a large-scale manmade Eco-forest is to be formed in the low-lying ground area in the southwest of the city. The Eco-forest will not only avert the winter wind but also revitalize the ecosystem of the steppe and the forest. The Ring Road of Astana will be lined by trees planted on both sides that will play the role of wind protecting forest zone.

Symbiosis of advanced and future technologies and traditionalism; To avoid plainly copying western architecture or traditional architecture in the past, but to design architecture by *Abstract Symbolism* through abstraction of traditional architectural designs.

Promotion of agriculture in *Symbiosis* with Information Technology (IT) and advanced technologies such as bio-technology; To formulate a plan to advocate strategic agriculture in and around the Nura River basin to the south of Astana.

Symbiosis between pedestrians and automobiles; To provide a safe city for pedestrians by combining the green network and pedestrian roads in residential neighborhood

Symbiosis between agriculture and city; To promote agricultural development in and around Astana to secure food supply to the urban citizens and consolidate the rural communities with stable means of living.

3.3.3 Astana as Metabolic City

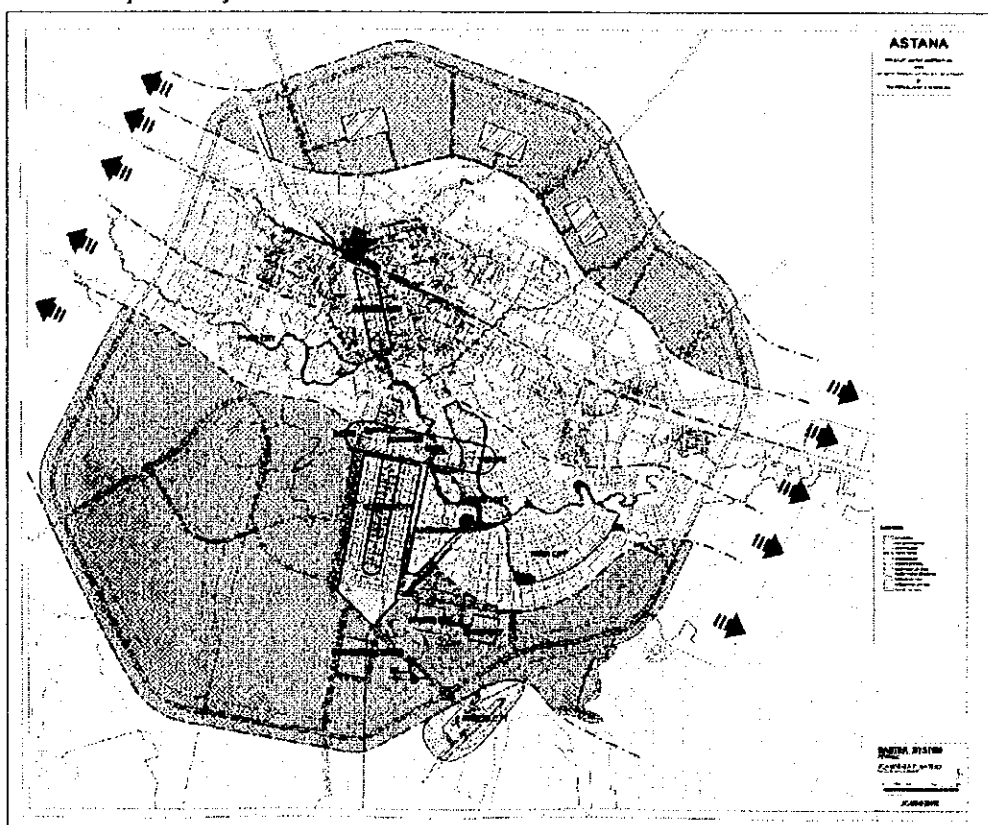
Astana City embodies a City of *Metabolism*.

The population growth in any city usually depends on natural growth as well as social growth due to migration. The natural growth rates in new cities are high, and in big cities the population growth is faster because of social migration. According to the planning statistics, the population of the new capital will grow very rapidly for a short period of time because of the migration process from the old capital. Astana City will accept 100-200 thousand new inhabitants and will probably reach 400-500 thousand inhabitants by the year 2005. Furthermore the new capital is expected to develop into a city with a population of 600-800 thousand inhabitants by the year 2030. The Master Plan of the new capital of Astana challenges for a well-balanced sustainable city with the population of maximum 800 thousand inhabitants by the year 2030, considering the further development of the city and the growth of the population up to 1 million in the future.

This will be the first Master Plan in history to include the Linear zoning system that will enable adaptation to the ever continuing development of the city. Astana City will be formed by the railway axis extending from east to west on one hand and the Ishim River flowing from east to west on the other. The new linear zoning of Astana City is considered as a linear system planned along the two axes leading from east to west. Linear zoning will consist of the following zones:

- The green buffer zone from the north side
- The current industrial zone and future high-tech industrial zone

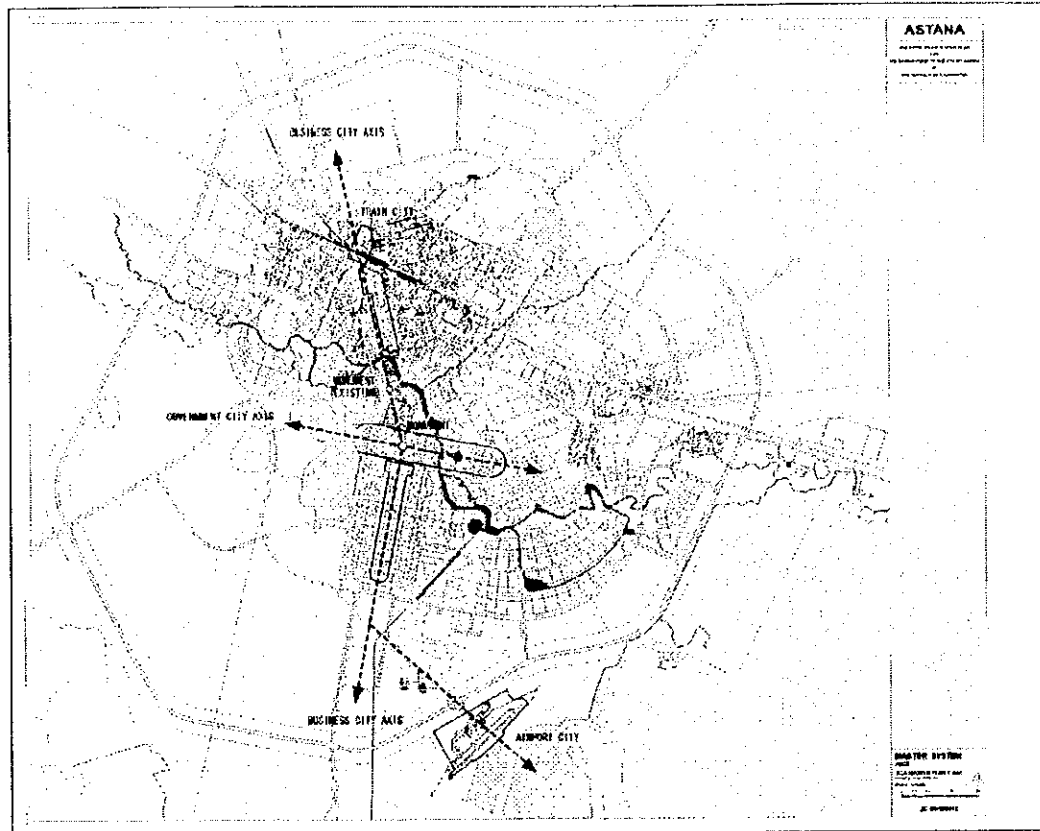
- The existing urban district (mixed use zone)
- River City & Housing area zone planned along the banks of the Ishim River.
- Government City (public and semi-public) zone
- Business City (commercial) zone
- Eco-Forest zone
- Airport City zone



The above linear zones will be developed according to the growth of the new capital along the main urban axis extending from west to east. Hence that will enable the realization of a new *symbiotic* city with constantly developing and well-balanced urban functions.

Astana City will enclose two urban axes. One of them, called Business City axis, is planned along the Business and commercial urban axis. The Business and Commercial City axis will be extending along the urban axis connecting the area of the railway station and the existing park from north to south, then it will cross the Ishim River and will extend further south. This Business and Commercial City axis is connecting the entire linear zones from north to south through the linear zoning system that extends across the city from west to east. The Business and

Commercial City axis in the north may possibly cross the railway station with redevelopment of Rail City, and in the south it also can be extended further.



The public and Government City axis includes Government building, the Parliament Palace, the Supreme Court building, the Presidential Office as well as diplomatic and embassy buildings, various semi-public institutions, memorial and culture centers.

In the Memorial Park linked to the existing city axis there will be a 200 meter high Monument in commemoration of the State National Foundation. (As well as in memory of accomplishing the study for the Master Plan and the start of the real construction of the new Capital: Astana-2000).

The public and Government City axis will express the spirit of the Astana City based on the philosophy "House of Eurasia" advocated by President Nazarbayev of the Republic of Kazakhstan.

Astana City will become a city where people and cars exist in *sybiosis*. Public buses and private cars are considered to be the main modes of transport in the city, however in the future the number of private cars is expected to increase rapidly. Therefore, parking areas in Business and Commercial City axis and Government City axis are being planned under the certain guideline strategy. In view of the fact

that it is necessary to construct the underground parking area or an artificially created deck (below this deck will be allocated levels for parking) in order to create appropriate landscape of the city.

On the city center Ring Road (R3), elevated ring freeway will be constructed in the future, so that smooth transport correspondence between the left and the right banks of the Ishim River can be realized. As for the public modes of transportation, it is necessary to connect the city districts from north to south by the introduction of a light rail transport system (LRT) that will link the Airport, the city center, Government City, the existing City center and the Railway Station. There will be not only numerous sidewalks in all the streets but also a green network for pedestrians arranged as a park-promenade. Thus, Astana City will be created with harmonious interaction between people and cars.

Astana City will be a ring city. There are three ring roads planned to be constructed in the new capital of Astana. One of them is the Outer Ring Road (R1) that will connect highways to be built in the region in the future. Moreover it will also completely encircle the existing radial main roads along the outer border of the city and it will have the function of a bypass to prevent traffic passing through the city. At the same time, Distribution Center, Truck Terminal, other logistic bases and the Airport city are being planned along the outer Ring Road (R1). In this sense, Astana City is to become the most important logistics center in Kazakhstan.

There are agricultural areas, and sites for the development of wind power plant on the outskirts of the outer Ring Freeway (R1). The urbanization of the new Capital, Astana will expand up to the inner Ring Road (R2) until 2030 with a population of 800 thousand inhabitants. An area between the inner Ring Road (R2) and the outer Ring Road (R1) will be reserved for future development. However as exceptions there are various facilities such as a university, a military base, the International Trade Fair & Exhibition center, sports complexes, cultural facilities, High-tech Park, Distribution Center, Truck Terminal and others that can be planned.

- The new River City formulated in clusters will grow along the river in *Symbiosis* with the Ishim River.
- A *Circulation* system shall be formed by 3 ring roads and residential neighborhoods.
- Wastewater shall be reused and recycled through advanced treatment for industrial and agricultural purposes.
- An eco-forest shall be built in the southeastern part of the city to provide an environment which is desirable for retaining and re-circulating of rain water.
- By introducing farm gardens in the outskirts of Astana and new agriculture in and along the Nura River, lands will be richly endowed with circulation and recycling capacity of water and ground water.
- Re-circulation of rainwater shall be promoted by introducing permeable road pavement.
- To consider solid waste treatment facilities utilizing recycle-oriented methods such as RDF (Refuse Derived Fuel).

3.3.4 Value for Environment

The Study Team would like to re-establish the basic thoughts which were presented in the First Prize winning work in the International competition for the new Capital of Kazakhstan in 1998.

The purpose of the Master Plan shall be VFM, or the "Value for Money", an infrastructure plan for expanding and developing economy; and VFC, or the "Value for Culture", creation of cultural values, magnificent architecture and beautiful townscape, which the generations to come shall take pride in and treasure as their heritage.; and VFE, or the Value for Environment, the implementation of a resource saving environmental principles in consideration of the global environment.

M/P Team followed the basic principles of Dr. Kurokawa's prize winning work for the competition, VFM; VFC and VFE, together with the original thoughts of *Symbiosis* and *Metabolism*.

To contemplate an alternative source of energy at power stations, such as natural gas, which will reduce the emission of CO₂ (carbon dioxide) and mitigate the burden to the global environmental problem.

The basic thoughts and concrete plans mentioned above may be difficult to realize in a short period of time. These basic thoughts and plans, however, shall have to be

born in mind by each and every member concerned with the formulation of the Master Plan as a basis for collaboration. This endeavor towards realization of the sustainable city that entails continuous and lasting growth, which is a widely accepted contemporary issue of the mankind, shall deserve true appreciation from the world.

Basic Concept of this Master Plan

Item	Contents
<i>Symbiosis</i> between the History and Present	• Maximal preservation and utilization of the existing buildings
<i>Symbiosis</i> with Nature	• Formation of a city extending on the both sides of the Ishim River
<i>Symbiosis</i> of Different Cultures	• Formation of an international city harmonizing differences in religion and ethnicity
<i>Symbiotic</i> city with Plenty of Greenery ; <i>Symbiosis</i> of human beings and other species	• Provision of an ecological corridor expanding over the network of forest, trees along streets, buffers along the river etc. effective for the biodiversity
<i>Symbiosis</i> between Technology and Tradition	• Consolidation of the traditionalism and the future technology through <i>Abstract Symbolism</i> through abstraction of traditional architectural designs
Promotion of New Agriculture	• Introduction of new and strategic agriculture
<i>Symbiosis</i> between Pedestrians and Automobiles	• Creation of a safe city by providing green network and pedestrian roads
Linear Zoning	• Linear Zoning retains flexibility for the future expansion of the city
Expandable Urban City Axis	• Delineation of the expandable urban city axis extending from the railway station, existing central city towards south to reach the new city center on the left bank of the Ishim
River City Cluster	• Expandable residential areas composed by clusters along the Ishim, which could be added with the growth of the city population
Circulation System by Ring Roads	• Introduction of 3 Ring Roads surrounding the existing and new cities to provide for a circulation system
Reuse of Treated Sewerage Water	• Reuse of treated sewerage water for agriculture and forestation
Eco-Forest	• Formation of rain-fed Eco-forests along the fringe for the mitigation of environmental load of development
Environmentally friendly Agriculture	• Promotion of new and suburban agriculture at the outskirts of the city
Re-circulation of rain water	• Use of permeable pavement for re-circulation rain water
Recycle oriented Waste Treatment	• Consideration of recycle oriented waste treatment methods
<i>Symbiosis</i> between agriculture and city	• Agricultural development in and around Astana to secure food supply to urban citizens and consolidate the rural communities with stable means of living

3.3.5 Astana as Regional and International Center

The origin of this city was a small township on the Great Silk Road, which flourished in its early years as a trading post on the inter-regional trade route. This

locational merit of Astana was one of the most important considerations for the capital transfer in 1997. Within the territory of RK, Astana is located in almost equal distance to most of the major cities around the nation

The President Nazarbaev once noted in his speech as the following;

... our new capital is situated not only in centre of the territory of our country, but in the center of the Eurasian continent as well. We hold this as a specific factor which was a must for our young state, since it was going to develop best relations with all states of the world. Being at the cross-roads of many routes, Astana is best fit to promote and ensure better internal as well as external communication for ourselves and for those who cooperate with us.

Despite the fact that this city grew as a regional industrial city, new course of development fit for the new capital of RK needs to be pursued now. Astana must enhance the relationship within the territory of RK as well as neighboring nations across the borders, in administrative, business and logistics spheres.

Reconstruction and extension of the International Airport of Astana is now under way to secure the safety of air transport and to cope with increasing air traffic demand. The financing for this project is rendered by a yen loan from the Government of Japan. The new and improved International Airport will considerably enhance the capability of wider regional and international communication through the air.

Another important aspect of Astana is its location on the Eurasian Landbridge routes. In 1992, rail connection between China and RK was commenced, which accelerated various initiatives to improve and enhance this Landbridge routes. Astana is located on one of the shortest routes from Lianyungan in Yellow Sea, through the territory of RK, via Moscow and further to Western Europe. This route could effectively utilize the modernized facilities at Druzhba near the border. This route is approximately 1,500 to 2,000 km shorter than the Trans-Siberian route on the north.

From the regional perspective, connections by rail and road with neighboring cities, particularly, Kokshetau and Karaganda, need to be initiated. Better connection with the neighboring areas will consolidate the hinterland area of Astana and enhance the functions of the respective cities. Express commuter train services shall be an effective idea for this purpose.

Accessibility to natural parks and resorts is an important element in the attractiveness of the new Capital. In the hinterland of Astana, there is natural park area in Baraboe with excellent forests, lakes and mountains. This resort area, often

called the little Switzerland, shall enhance the attractiveness of Astana for the visitors and residents alike. The natural conservation area around the Tangis Lake need also be given due attention. This area has not been readily prepared for tourists yet, but the potentiality of the area is deemed high, with a number of bird species, including pelicans and flamingos, flying in and nesting therein. Development of this area as bird and natural sanctuary needs to be considered for near future.

3.4 Urban Planning Framework

3.4.1 Basic Conception for Urban Planning Framework

(1) Basic Approach

As discussed in Sub-Section 3.3, attention shall be given to the *Symbiosis* of the existing and new urban areas. This basic conception leads to gradual improvement and reconstruction of the existing urban areas with the demand growth, as it materializes in accordance with the economic development of the city.

Symbiosis of the city and nature would be materialized by way of providing appropriate space for parks and greenery in all the Planning Regions in the course of improvement and reconstruction.

Housing conditions are another important aspect of the living condition in urban areas. Shortly after the capital transfer to Astana, construction of new housing units had not caught up with the rapid influx of new residents to the city, which was aggravating the housing conditions in Astana Area. This apparently temporary issue shall be solved in a short-term period. At the same time, the long-term goal of providing enough housing, as measured in space per capita of citizens, shall be incorporated in this Master Plan.

The employment structure of Astana shall go through a drastic change in the future, as the projected economic development described in Sub-Section 2.3 materializes.

(2) Issues to be Considered

As discussed in Sub-Section 3.2.4, the existing urban areas of Astana face various issues, relating to the structure for the city, road structure, composition of urban areas, parks, housing conditions and townscape. These issues shall be considered in formulating the Master Plan of Astana.

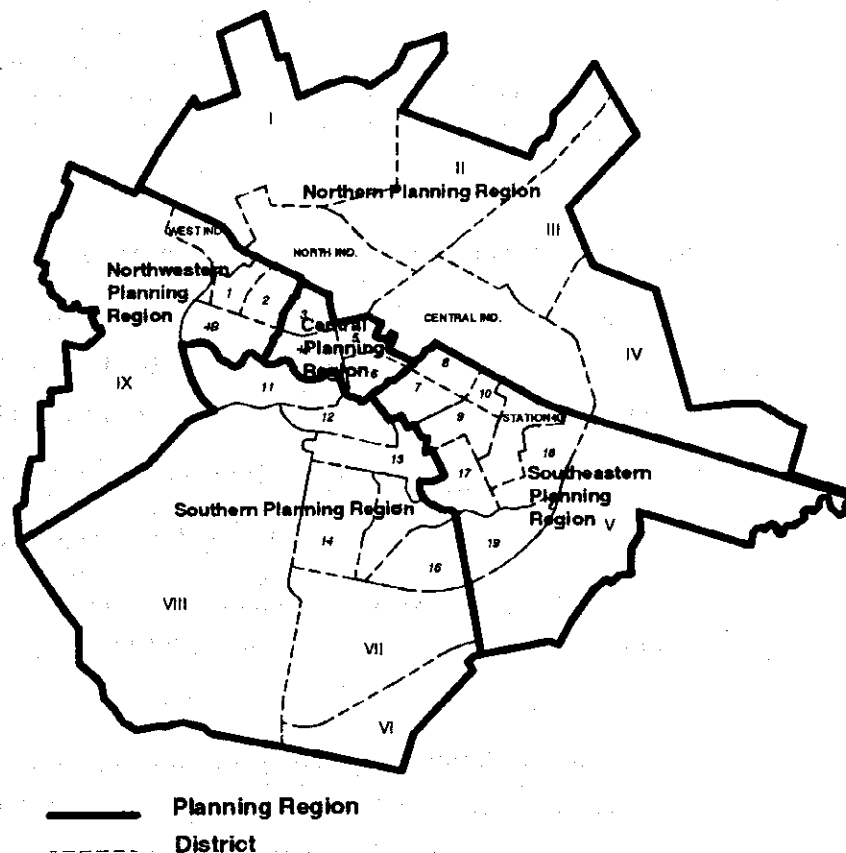
(3) Planning Regions

In the existing urban areas of Astana City, five Planning Regions exist, as established in the Ak Orda Master Plan. These regions are identified as Central Planning Region, Northern Planning Region, Southeastern Planning Region, Southern Planning Region and Northwestern Planning Region.

For the development of Astana Master Plan, the same terminology has been used, however these macro-planning regions have been expanded to meet the new boundaries of Astana City.

Each Planning Region is further divided into a number of districts, following, but expanding the original twelve residential districts and four industrial districts as identified by the Ak Orda Master Plan.

The urban development areas are divided into 20 residential districts, including the new Government City and Business City. The four industrial districts remained unchanged and the remaining non-urban areas have been divided into nine (I to IX) planning districts.



Planning Regions and Districts

Figure 3.4.1 shows the demarcation of the Planning Regions and Residential Areas.

Planning Regions and their Location and Characteristics

Planning Region	Location	Characteristics
1. Central Planning Region	South of railroad; east of the Sarybulak., west of the Solyonaya Balka, right bank of the Ishim	Old City part mostly developed before 1960's. Includes CBD and mostly medium density medium-rise residential commercial zones.
2. Northern Planning Region	North of railroad	Industrial city, mostly developed in and after 1960's. Mixture of industrial and residential.
3. Southeastern Planning Region	South of railroad; east of the Akbulak.	Relatively newly developed low density residential zone, developed after 1970's.
4. Southern Planning Region	Left bank of the Ishim	Newly developed residential zone on the left bank of the Ishim. Still low density and scattered.
5. Northwestern Planning Region	South of railroad; west of the Sarybulak.; right bank of the Ishim	Relatively low density residential area developed around or before 1960's

3.4.2 Urban Planning Considerations for Existing Urban Areas

In this Sub-Section, the planning considerations, including the strategy for improvement and the planning parameters, shall be discussed. This shall be the basis on which the planning framework for the entire city shall be contemplated.

(1) Basic Approach for Improvement of Existing Urban Areas

1) Improvement of Existing Low-Density Residential Areas

There are still low-density residential areas even in the central city areas close to CBD, as typically seen as TYPE D in Figure 3.4.2 in the central city area, or TYPE E in peripheral areas.

In order to formulate a compact and effective urban areas, these residential areas need gradually to be upgraded to medium-density residential districts. As the existing urban areas have a linear structure, this improvement and reconstruction process is planned to take place from the central to the peripheral areas with the elapse of time.

2) Population Density Reduction along Sarybulak and Akbulak Rivers

Along the two tributary rivers of the Ishim, namely Sarybulak and Akbulak Rivers, gradual retirement of existing houses will be carried out in the the existing low-density residential area so as to make the present population density of 60 person/ha to 10 person/ha in 2010, to allow for enhancement of the zone for green buffers.

3) Removal of Residential Areas Within Industrial City

In the north of the railway tracks, there are about 223 ha of residential areas within the industrial area. The roads are irregular and industrial and residential land uses are inter-woven in many locations. Basic types of urban infrastructure are often non-existent in most of these residential areas. From the viewpoint of improving urban environment, this small scale mixing of residential areas in the predominantly industrial areas shall be dissolved.

4) Strengthening of Townscape Major Streets

Streets are important components of the city's townscape. Major streets in Astana are spacious and provided with wide areas for pavement and plantation. In order to improve the attractiveness of Astana, attention needs to be paid to the townscape image of the major streets.

From the pedestrian's viewpoint, a very wide street tends to physically separate the blocks and is prone to be difficult to consolidate two sides of the street. In this respect, medium-width streets, such as Beibitshilik (Mira) Street in the north-south direction and Abai Street in the east-west, are considered to be ideal for improvement. Attractive streets not only comfort the eyes of citizens and tourist, but also stimulate the location of fashionable cafes, restaurants and retail outlets. A detailed strategy for townscaping of these streets is discussed in Section 3.8.

5) Protection of Historical Architecture

Historical buildings are a body of the city's cultural and traditional heritage. Although the city has a relatively plain construction as a city, which expanded as a center for the agricultural development scheme in 1960's and later as a regional industrial city, the city has quite a few pieces of architecture showing the sprits and conception of old days, as detailed in Sub-Section 3.1.2.

Presently only a small fraction of historical architecture is under legal protection. The general conditions of even the buildings under state protection are not quite sufficient to preserve them for the coming generations. This Master Plan thus pays special attention to the strengthening of protection of existing architectural heritage of the city.

(2) Improvement Strategies by Planning Regions

The following summarizes the major problems and direction of solution pertaining to the existing urban areas in Astana city, as divided into the 5 Planning Regions.

1) Northwestern Planning Region

Northwestern Planning Region is predominantly a low-density residential area composed chiefly of detached houses. The roads are irregular and the land with equally irregular land plots. Small water bodies exist due presumably to bad drainage conditions. Demands for development in this Region are considered to be low, as few housing buildings have been constructed in the past few years. Houses in this Region are relatively old, and infrastructure provision, such as water and heat, seems to be limited.

While Residential District 2, which constitutes the eastern half of the Region, is relatively built-up, Residential District 1 to the west has residential areas confined to a limited land area where the roads are provided, and there still seems to be plenty of room for future expansion.

Most of the low-density urban areas in this Region need to be reconstructed to provide better living conditions. The improvement, however, is assumed to come relatively late, considering the relatively low development pressure in this Region.

2) Central Planning Region

Central Planning Region constitutes the most part of the Old City, from which the city expanded after 1960's. The city's existing CBD is located on the southern part of this Region. The areas north of the CBD leading to the railway station constitutes a mixed land use zone where most of the city's commercial and administrative offices are located, together with medium-rise housing buildings.

Infrastructures in this Region are probably the best in the city, particularly Residential Districts 4 and 5. The roads are regular and spacious, with a number of trees lining the streets. Land plots are equally regular, with relatively large allotments.

Development pressure in this Region is very high, as a major part of the newly built housing buildings are located here. In particular, the areas

along the Ishim River south of CBD called Samal are a hot spot for housing construction. The high-rise housing buildings for the incoming government officials are also located in this area.

There is still a relatively large area of low-density residential area in the vicinity of the city center, where the detached houses are predominant, as typically depicted in TYPE D in Figure 3.4.2. Such areas are seen in the eastern part of Residential District 4, east of Sary Arka Avenue; western part of Residential District 5, west of Respublika Avenue; and eastern part of Residential District 6, west of Respublika Ave.

With a strong pressure for development and close vicinity not only to the existing CBD but also to the new development on the left bank of the Ishim, reconstruction of low-density residential areas remaining in this Region is assumed to take place in the medium term, say between 2010 and 2020.

Lack of parks in this Region is a clearly conceived issue in term of the living environment. Construction of medium-scaled parks, around 2 to 5 ha in size, should be seriously considered in several locations in this Region.

3) Southeastern Planning Region

Southeastern Planning Region covers a relatively new development area east of the Solyonaya Balka, consisting mainly of medium- to high-rise apartment buildings constructed after 1970's, often called *Micro Rayon*, or micro-districts.

Western part of this Region, namely Residential Districts 7 and 8, are already built-up, with the population density exceeding 150 person/ha, while the eastern half of this Region, Residential Districts 9 and 10, is generally under-developed, with the population density less than 100 person/ha, and yet there is plenty of room for future expansion. New construction of housing buildings is in progress in this Region, particularly in Residential Area 8, located beyond the Solyonaya Balka immediately south of the railway tracks.

Housing construction, mainly of medium- to high-rise apartment complexes, is already and will continue to be in progress in near future in this Region. New development could take place in areas adjacent to the existing housing buildings in Residential Districts 9 and 10 in a

short term period before 2010. Reconstruction of existing low-density residential areas, particularly in Residential District 7, may take place in the medium term period, between 2010 and 2020.

4) Northern Planning Region

Northern Planning Region consists essentially of industrial areas north of the railway tracks. Located in this Region are a number of important communal facilities such as the Thermal Power Stations (TETs) 1 and 2, the city's water treatment plant and others.

One of the most serious issues pertaining to this Region is intrusion of residential areas into predominantly industrial areas, where a number of factories, warehouses, repair shops and others are located. Residential areas within the industrial areas occupy an area of about 223 ha. This mixture of conflicting urban functions needs to be solved, by primarily relocating the housing units outside of this Region.

The areas after the relocation could be used for purely industrial purposes. Astana Technopark, created on the site of a former large scale factory south of the railway track is an example of such purified industrial use. As industrial output is decreasing dramatically since the disintegration of FSU, utilization of the once active industrial areas should be given a serious consideration.

5) Southern Planning Region

Southern Planning Region extends south of the Ishim River, on its left bank. The left bank area is generally new development, with relatively compact urban areas. As a result of this, the population density is not as low as the similar detached and low-rise residential areas in the city.

The existing urban areas are presumed to be maintained without much transformation.

3.4.3 Urban Planning Framework⁸

In this Sub-Section, some of the important parameters pertaining to the architectural construction shall be discussed.

⁸ Assessment of planning parameters for the present conditions of Astana City will appear in Section A.1 of Volume III: Supporting Report.

In the previous Sections, various socio-economic projections have been described. These socio-economic projections were first discussed in Seminars held in May 2000 by the Study Team in Astana, attended by various concerned organizations and agencies. Comments received in the Seminars were considered and modifications had been made. The proposed socio-economic projections are therefore now considered to be acceptable in all aspects.

The essence of the projections is summarized below;

(1) Population

The population of Astana at the end of 1999 was 322,000. Based on the adopted development scenario detailed in Section 2.2, the population for Astana is projected to reach 800,000 in year 2030. The following table summarizes the population projections.

The present urban areas, most of which extend on the right bank of the Ishim, accommodate the present population of Astana. Although the existing urban areas have some room for improvement and upgrading, the total population that could be accommodated in those areas is estimated to be about 400,000. The remaining 400,000 in 2030 shall have to be accommodated in new urban areas mainly on the left bank of the Ishim.

Population Projection for Astana up to 2030

Item / Year	2000	2010	2020	2030
Existing Urban Areas	322,000	340,000	380,000	400,000
New Urban Areas	0	150,000	310,000	400,000
Total Population	322,000	490,000	690,000	800,000

Table 3.4.1 summarizes the estimated district-wise population composition in 2000. Tables 3.4.2, 3.4.3 and 3.4.4 present the projected district-wise population composition in target years of 2010, 2020 and 2030, respectively.

Spatial composition of the population distribution set up above are shown in respective years in Figures 3.4.3, 3.4.4, 3.4.5 and 3.4.6.

These figures also illustrate the future redevelopment of residential areas within the existing urban areas, as the category of one residential area changes from low to medium, for example, in the progression of planning years. The strategy for redevelopment is derived from the description in Sub-section 3.4.2 above. Figure 3.4.7 illustrates planned redevelopment and retirement of existing residential areas.

(2) Employment

In 2000, the total employment in Astana, according to Indicative Plan of Astana, is estimated to be 147,000, as described in Section 2.2. With the economic development to take place in the future as stipulated for Case 2 in Section 2.2, the employment in Astana shall reach 440,000 in 2030.

The following table summarizes the projection of employment structure. These employment projections shall be the basis on which the framework of office floors shall be discussed.

Employment Projection for Astana up to 2030

Year	1999	2010	2020	2030
<i>Industry</i>	15,900	28,000	37,300	44,000
<i>Construction</i>	13,600	20,400	26,100	22,000
<i>Trade & Repair</i>	8,600	17,900	29,800	44,000
<i>Transport & communication</i>	14,100	25,500	37,300	44,000
<i>Hotel & restaurants</i>	1,500	2,600	3,900	4,500
<i>Financial Activities</i>	1,400	2,400	3,700	4,200
<i>Real Estate</i>	7,600	13,000	19,900	22,900
<i>State Management</i>	14,800	25,400	38,700	44,500
<i>Education</i>	10,100	17,300	26,400	30,400
<i>Health care & social services</i>	6,900	11,800	18,000	20,800
<i>Other public & communal services</i>	4,300	7,400	11,200	12,900
<i>Others</i>	22,200	38,100	58,000	66,800
<i>Self-employed</i>	26,300	45,100	68,700	79,100
TOTAL	147,300	254,900	379,000	440,100

(3) Architecture

1) Housing

The most important parameter is floor area person index. The following table shows the changes in the housing stock over the last 6 years in Astana.

Historical changes in Housing Stocks in Astana

Item	1994	1995	1996	1997	1998	1999
A. Total area (1000m ²)	4,871.9	4,921.6	4,765.3	4,731.7	4,838.4	4,906.0
B. Net area for housing (1000m ²)	3,131.4	3,145.3	3,066.5	3,054.6	3,145.0*	3,188.9*
C. Percentage of net area	64.3%	63.9%	64.4%	64.6%	65.0%*	65.0%*
D. Total area per person (m ² /per.)	17.1	17.6	17.2	17.1	17.6	15.2
E. Net area per person (m ² /per.)	11.0	11.3	11.1	11.0	11.4*	9.9*
F. Total area per person - RK	16.5	16.9	17.1	18.0	-	-

Source: 1994-1997 "Astana in Figures", Statistical Department of Astana City (Items A. through E)

1998-1999, provided by Statistical Department of Astana City (Items A, D)

1994-1997 "Statistical Yearbooks", RK. (Item F)

* indicates an estimated value.

As shown in the table, the housing floor area index in Astana decreased shortly after the capital transfer in late 1997 to slightly above 15 m²/person (gross), a substantial decrease from the previous levels of about 17 to 18 m²/person. This decrease is considered to be a temporary phenomenon occurring as a result of rapid influx of people to Astana in excess of the housing units construction, and will be rationalized by 2010. As seen in the item F of the table, the average floor area (gross) per person in the urban areas in RK has steadily increased in recent years. The housing stock level of Astana is soon to catch up with the RK level.

The data of major cities in the world show a great differentiation by cities. Some of the major cities in the process of development tend to have smaller housing stock around 10 m², while others have larger space for housing.

Housing Stocks in Major Cities in the World in 1995

City (Country)	Population	Net Housing Area per person (m ² /p)
Beijing (China)	10,703,000	9.0
Kuala Lumpur (Malaysia)	1,343,500	10.6
Moscow (Russia)	8,625,000	16.8
Tokyo (Japan)	11,771,819	26.5
Paris (France)	2,154,678	29.0
Berlin (Germany)	3,471,418	35.8

The housing stock that citizens of Astana can afford depends primarily on the income level. The per person housing floor shall be increased as the income levels of citizens in Astana grow, as projected. This aspect of housing stock affordability will be contemplated in Chapter 8. The gross housing floor per person for new residents is thus projected to reach 25 m²/person in 2030.

Projected Housing Quotas (Floor per Person) in Astana

(Unit ; m²/person)

Year/Period	Past Trends 1994-1998	1999 (Present)	Med. Term 2000-2010	Long Term 2010-2020	Ultimate Term 2020-2030
Net Floor	11.1	9.9	11.5	14.1	16.1
Gross Floor	17.3	15.2	18.0	22.0	25.0

In this Master Plan, newly constructed housing units are assumed to follow the above quotas for the respective terms.

The housing construction necessary for the increasing population is thus estimated as in the following table.

Projected Housing Floor Areas (gross)

Year		2000	2010	2020	2030
Population	per.	330,000	490,000	690,000	800,000
Population under redevelopment	per.	0	25,554	15,434	5,918
Incremental population	per.	-	185,554	215,434	115,918
Housing quota (gross)	m ² /per	15	18	22	25
Demolition for redevelopment	1000 m ²	0	388	278	130
Existing housing units	1000 m ²	5,016	4,628	7,690	12,299
New Housing Floor	1000 m ²	-	3,340	4,740	2,898
Total Housing Floor	1000 m ²	5,016	7,968	12,429	15,197

The district-wise breakdown of the projected housing floor area demand for 2010, 2020 and 2030 are summarized in Tables 3.4.5, 3.4.6 and 3.4.7.

2) Office Floors

It was estimated in that the net office space per total working population in Astana at present is on an average 10 m²/person now. This unit floor area is neither large nor small from the international standard. In the future, the equipment in the offices will be improved with higher usage of electronic devices and information technologies, but the required office space per working population was assumed to remain the same.

On close examination, the office requirement is different for the office type and non-office type sectors. For example, most of the workers in *Construction* sector find their working place on site. The same rule applies to Industry, Transport and Communication sectors. Based on an analysis of the present employment structure, the percentage of "office workers" is estimated as 55% of the total working population. With the projected economic growth, this percentage ratio will inevitably increase gradually up to 57% in 2030.

Due to the above-mentioned different nature of office requirement for "office type" and "non-office type" working population, different

quotas need to be established. Assuming that about 10% of office space is required for the “non-office type” worker, the following quotas were adopted, whilst keeping the average office floor per total working population at 10 m². The adopted quota for “office type” worker is 16.7 m² per person, while the quota for “non-office” working population is 1.7 m² per person, assuming that the latter requires 1/10 of the office type worker.

The following table summarizes the overall office floor requirement up to the year 2030.

Demand for Net Office Areas by Two Types of Employment

Item		1999	2010	2020	2030
TOTAL Employment (Persons)		147,300	254,900	379,000	440,100
Ratio of Office Employment (%)		55	55	56	57
Office Type Employment		81,000	139,200	211,900	249,100
Non-Office Type Employment		66,300	115,700	167,100	191,000
Net Office Demand (1000m ²)	Quota (m ² /per.)	1999	2010	2020	2030
Office Type Employment	16.8	1,360	2,340	3,560	4,180
Non-Office Type Employment	1.7	110	200	280	320
Total Net Office Floor	10.0	1,470	2,540	3,840	4,500
Total Gross Office Floor	12.5	1,838	3,175	4,800	5,625

It should be noted that the above figures show the net floor area per office workers. In order to identify the space requirement for land use, a gross estimate is more relevant. The gross floor areas for offices are estimated using a multiplication factor of 1.25, meaning that an average of 25% of the total office floor area is dedicated for structure, circulation, machine-rooms, storage and so on.

Table 3.4.8 summarizes the estimated district-wise employment and office floor composition in 2000. Tables 3.4.9, 3.4.10 and 3.4.11 present the future projections of the above for the target years of 2010, 2020 and 2030.

3) Commercial and Retail

The present floor areas for the commercial and retail function were estimated at around 120,000 m². For the future Astana City, this commercial and retail sector shall be one of the engines of economic development, as discussed earlier in Section 2.2.

In projecting the future demand for the commercial and retail function,

the following assumptions were made.

- The gross sales in Astana shall be expanded as per the projected output value for the Trade and Repair Sector in Table 2.2.7.
- The gross sales per unit floor area shall be expanded as per the projected added value per worker of the same sector in Table 2.2.7.

The following table summarizes the projection of the demand for commercial and retail function in Astana.

Demand for Commercial and Retail Floors

Item / Year	2000	2010	2020	2030
Total output of the sector (bil. Tenge)	22	133	245	323
Added value per person (1000 Tenge)	994	3,169	3,791	3,632
Gross Sales (bil. Tenge)	17	103	189	250
Gross Sales per unit floor (1000 Tg/m ²)	150	478	572	548
Commercial & Retail floor (1000 m ²)	120	215	330	543

These figures represent net sales areas, gross commercial areas are estimated by using a multiplication factor of 1.4, meaning that 40% of the total floor area is allocated for other facilities, such as public circulation, structures, offices, staffing areas, storage areas, kitchens (in case of restaurants), machine rooms and the like. As such the total floor area projection can be summarized as following:

Demand for Commercial and Retail Gross Floors Areas

(Figures in 1000m ²)				
Item / Year	2000	2010	2020	2030
Commercial & Retail Gross Floor Area	168	301	462	760

This calculation is based on analytical commercial economics. Other methods of calculating the total demand for retail and commercial floor areas include a historical analytical method and the use of general planalogical analytical method. As Astana City is undergoing drastic changes in its population and social structure the historical method will not result in any useful projections. In the planalogical method a hierarchy of commercial activities is identified on three levels: the neighborhood services for the direct living or working surroundings, the district centers servicing a series of neighborhoods and the city centers servicing the city as a whole, including the outer lying residential areas, beyond the boundaries of the city but still under the city's economical influence.

The gross floor area per inhabitant has thus been identified as follows:

Gross Commercial Floor Areas per inhabitant

Neighborhood Level	0.30 m ² /p
District rayon Level	0.30 m ² /p
City center	0.35 m ² /p
Total	0.95 m ² /p

It should be noted that the SNiP 2.07.01-89, appendix 7, states an acceptable level of commercial floor area to be a minimum of 0.28 m²/person. The above levels are well above the minimum acceptable level, but are justified by the economical analysis.

Looking at the total population of Astana City in the year 2030 of 800,000 people, the total Retail and Commercial areas add to a total of 760,200 m² of gross floor areas. The following table shows a gradual increase of the commercial floor area per person from present level to the year 2030, indicating a growing spending power for the inhabitants of Astana City in years to come.

Average Commercial and Retail Floor Areas per Person

	1999	2010	2020	2030
Commercial & Retail Gross Floor Area in m ²	168,000	301,000	462,000	760,200
Population	322,000	490,000	690,000	800,000
Average Floor Area per person	0.53 m ² /p	0.61 m ² /p	0.67 m ² /p	0.95 m ² /p

Table 3.4.12 summarizes the estimated district-wise commercial floor area composition in 2000. Tables 3.4.13, 3.4.14 and 3.4.15 present the spatial distribution of commercial and retail floor areas for the target years, 2010, 2020 and 2030.

(4) Land Use

The population forecast estimates that the population will grow from present level of 330,000 inhabitants to around 800,000 inhabitants by the year 2030. Three types of residential zones have been identified, namely: low density residential areas with an average net density of 50 inhabitants per hectare, mid-density residential areas with an average net density of 180 inhabitants per hectare and high density residential areas with an average of just under 300 inhabitants per hectare.

These average densities have been adopted based on analysis of the existing situation and applied international norms taking into consideration the climatic conditions of Astana City. The analysis of the existing situation has

identified the plot ratios for the various densities. For future developments it is proposed that these plot ratios will increase marginally as show in the table below

Year	Low Density		Medium Density		High Density	
	Plot Ratio (Floor Area to Land Ratio)	Building to Land Ratio	Plot Ratio (Floor Area to Land Ratio)	Building to Land Ratio	Plot Ratio (Floor Area to Land Ratio)	Building to Land Ratio
2000	6.3%	6.3%	31.0%	6.2%	45.0%	5.6%
2010	7.5%	7.5%	33.3%	8.3%	57.1%	7.1%
2020	11.3%	11.3%	39.4%	9.8%	66.5%	5.5%
2030	13.0%	13.0%	44.2%	11.0%	74.3%	6.2%

The average gross floor area per inhabitant has been estimated at present at 15 m² per inhabitant, growing to 25 m² per inhabitant by the year 2030. In addition it is estimated that the average dwelling occupancy will reduce from the present level of 3.8 inhabitants per dwelling to 3.0 inhabitants per dwelling by the year 2030. Thus with a gradual reduction of the average occupancy per dwelling and a gradual increase of the average gross floor area per inhabitant, the total residential floor areas and the number of dwellings for the various target years can be calculated as follows:

	Projected Total Population	Average Occupancy per dwelling	Average Gross Floor Area per Inhabitant	Total Residential Floor Area (1000 m ²)	Total Number of Dwellings (1000 Nos.)
2000	331,000	3.8	15	4,960	87
2010	490,000	3.5	18	8,820	140
2020	690,000	3.2	22	15,120	214
2030	800,000	3.0	25	19,900	265

At present the residential land use is divided to 28% for low-density dwellings, 70% for medium density dwellings and only 2% for high-density dwellings. With a reduction of the number of cottages together with an increase of the density in the existing city fabric and an increase in high-density areas, the proportional split in residential land use is thus estimated as follows:

	Low Density	Medium Density	High Density
2000	28.1%	69.5%	2.4%
2010	22.6%	61.2%	16.4%
2020	25.4%	58.3%	16.4%
2030	24.2%	52.1%	18.7%

Based on the applied net residential density areas the required land use areas for residential usage have been estimated as:

		Low Density	Medium Density	High Density
2000	Land Area	2,216 ha.	1,114 ha.	26ha.
	Total Net Residential Land Area	3,355.9 ha.		
2010	Land Area	2,643 ha.	1,616 ha.	253 ha.
	Total Net Residential Land Area	4,512 ha.		
2020	Land Area	3,405 ha.	2,239 ha.	372 ha.
	Total Net Residential Land Area	6,016 ha.		
2030	Land Area	3,695 ha.	2,570 ha.	502 ha.
	Total Net Residential Land Area	6,767 ha.		

The gross residential areas have been calculated, taking into account the requirements for urban greenery area, the area required for roads and other hard surfaces, areas required for community services and taking into account the necessary open spaces and green buffer areas between the various residential zones, as shown in the following table:

(Areas in ha.)	2000	2010	2020	2030
Population	331,000	490,000	690,000	800,000
Net residential area	3,356	4,512	6,016	6,767
Urban Greenery (max. 12 m ² /p)	126	402	681	955
Roads and other hard surfaces (15%)	503	677	902	1,015
Community facilities (5%)	67	125	241	338
Gross Residential Land Area	4,052	5,726	7,840	9,075

The existing Industrial Area occupies a total land area of approximately 7,000 ha. This includes the northern industrial area, the central industrial area and the industrial areas west and Station 40. It should be noted that in the central industrial area in particular, more than 50% of the land is unused. It is estimated that future industrial development can easily be accommodated within the existing industrial area and no immediate additional space reservations have to be made.

There are many natural and manmade features found in Astana City, which control or restrict the development of the urban areas. These areas, although part of the urban development, will be kept and preserved into river parks, green buffers and other open areas. The land area occupied by these natural and manmade features have been estimated at around 2,500 ha.

In August 2000 the boundaries of Astana City were extended to a total land area of around 700 km². Based on the above analysis of the necessary land areas for urban development a total remaining area of around 500 km² will not have to be developed for urban residential or business development purposes. In conclusion the total land use framework can be summarized as follows:

Total Land Use (in ha.)	2000	2010	2020	2030
Gross Residential Land Area	4,052	5,726	7,840	9,075
Government, Diplomat and New Business City	-	750	850	950
Expansion Area of New Business	-	-	-	300
Industrial Areas	7,000	7,000	7,000	7,000
River Zone, Waterbodies and Other Open Areas	N.A.	6,405	4,191	2,556
Green Buffers (316m ² /p to 250m ² /p)	10,180	13,543	16,726	20,000
Buffer Zones and Open land (Non Urban Areas)	N.A.	37,576	34,393	31,119
Total Land Area Astana City (City Boundary)	71,000	71,000	71,000	71,000