No.

Japan International Cooperation Agency (JICA)

Dehsabz City Development Authority (DCDA)
Ministry of Urban Development (MoUD)

THE STUDY FOR THE DEVELOPMENT OF THE MASTER PLAN FOR THE KABUL METROPOLITAN AREA IN THE ISLAMIC REPUBLIC OF AFGHANISTAN

FINAL REPORT

MASTER PLAN FOR KABUL NEW CITY DEVELOPMENT

September 2009

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Abbreviations

ACCI	Afghanistan Chamber of Commerce and Industry
ADB	Asian Development Bank
AFN	Afghanistan afghani
AIMS	Afghanistan Information Management Service
AISA	Afghanistan Investment Support Agency
ANDS	Afghanistan National Development Strategy
AREU	Afghanistan Research and Evaluation Unit
av.	average
BDS	business development services
BRT	bus rapid transit
BSE	bovine spongiform encephalopathy
CAWSS	Central Authority for Water Supply and Sewerage
CIMMYT	International Maize and Wheat Improvement Center
DC	direct current
DCDA	Dehsabz City Development Authority
DEG	Deutsche Investitions-und Entwicklungsgesellschaft mbH
devt.	development
DoS	Department of Sanitation
EIA	environmental impact assessment
est.	estimate(d)
FIRR	financial rate of return
FMD	foot and mouth disease
GDP	gross domestic product
GIS	gas insulated substation or geographic information system
GLC	Greater London Council
Govt. or govt.	government
GRDP	gross regional domestic product
HPP	hydro power plant
ICARDA	International Center for Agricultural Research in the Dry Areas
ICQHS	International Center on Qanats and Historic Hydraulic Structures
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICT	information and communication technology
IEE	initial environmental examination
IT	information technology
IWRM study	Integrated Water Resources Management Study in Kabul River Basin, 2006
JICA	Japan International Cooperation Agency
JS	junction station
KCIRR	Kabul city inner ring road
KCORR	Kabul city outer ring road
KED	Kabul Electricity Development
KfW	Kreditanstalt für Wiederaufbau (German Development Bank)
KMA	Kabul metropolitan area
KMG	Kabul metropolitan government
LCD	liter per capita per day
LF	landfill
LRT	light rail transit
MAIL	Ministry of Agriculture, Irrigation and Livestock
mil. (or M)	million
mo(s).	month(s)
MoCI	Ministry of Commerce and Industry
MoE	Ministry of Education or Ministry of Environment
MoEW	Ministry of Energy and Water
MOM	Ministry of Mines

MoPW	Ministry of Public Works
MoUD	Ministry of Urban Development
N/A	not available/applicable
NCRK	National Capital Region of Kabul
NGO	nongovernmental organization
NMT	non-motorized traffic
OD	origin-destination
OPGW	optical ground wire or optical fiber composite overhead ground wire
p.a.	per annum
pop.	population
PPP	public-private partnership
PS	power station
PT	person-trip
pub.	public
R&D	research and development
ROW	right of way
SDF	Skills Development Fund
SME	small and medium sized enterprise
SS	substation
TRACECA	Transport Corridor: Europe-Caucasus-Asia
TOR	terms of reference
TPP	thermal power plant
TS	transfer station
UAE	United Arab Emirates
UK	United Kingdom
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNHCR	United Nations High Commissioner for Refugees
USA	United States of America
USAID	United States Agency for International Development
WHRB	waste heat recovery boiler
w/o	without
/d	per day
/s	per second
/y	per year

Units of Measure

ha	hectare
GW	gigawatt
GWh	gigawatt-hour
kV	kilovolt
kWh	kilowatt-hour
km	kilometer
km2	square kilometer
LCD	liter per capita per day
m	meter
m2	square meter
m3	cubic meter
MCM	million cubic meters
mm	millimeter
MW	megawatt
PCU	passenger car unit
tcf	trillion cubic feet
W	watt

PREAMBLE

The Study for the Development of the Master Plan for the Kabul Metropolitan Area (KMA) has been carried out since March 2008 under the technical cooperation of the Japan International Cooperation Agency (JICA). The Study has been undertaken by close collaboration of the counterpart agencies of the Afghan Government represented by the Independent Board for the Dehsabz City Development Authority (DCDA) and the Ministry of Urban Development (MoUD). Many other government organizations have been cooperating with the JICA Study Team and its Afghan counterpart team.

The Interim Report of the Study was prepared and formally submitted to the Afghan side at the end of January 2009. The Report contained a draft master plan for the KMA covering both the existing Kabul city and the new city in Dehsabz and Barikab. DCDA continued to work on the draft master plan for the new city, supported by the JICA Study Team, and prepared the master plan for the Kabul new city development, which was formally approved in principle by the Cabinet on March 26, 2009. The Kabul new city master plan has been further elaborated through the subsequent works of the JICA Study.

GUIDE TO THE MASTER PLAN

In Chapter 1, basic conditions for the Kabul new city are clarified. First, the need for the new city is clarified from three points of view: the national and regional context, water balance and sustainable population in the upper Kabul basin, and the national development strategy spelled out in the ANDS. Second, functional division between the existing Kabul city and the new city is examined, and factors affecting the successful new city development discussed.

In Chapter 2, three planning concepts are established to guide the planning and implementation of the new city development: socio-economic diversity, urban-rural complementarity and recycle-oriented eco-city. Implications of each concept are clarified. The planning concepts guide the formulation of projects and programs by sector.

In Chapter 3, Development frameworks are presented. First, alternatives are defined with respect to the distribution in the new city and the northern region of the spillover population from the upper Kabul basin. Second, the KMA master plan alternative is defined, and the projected population is allocated to different areas together with the gross regional domestic product (GRDP). Third, the spatial framework is established with respect to urbanization pattern and regional artery transport network for the KMA, and principles and framework of land development in the new city.

In Chapter 4, the development scenario for the new city is presented. It describes by phase a series of activities to develop and events to take place over the planning period up to 2025. The descriptions are substantiated by development plan by sector presented in the subsequent chapters.

In Chapter 5, the economic development plan is presented, covering agriculture, industry and services. Measures to be taken to promote these sectors of the economy are proposed, which would support the new city development by ensuring sufficient employment opportunities for residents.

In Chapter 6, the land development plan is presented. First, land capability for development is analyzed and the directional land use plan prepared for the KMA as a whole. Based on that, the land use plan for the new city is prepared, following the principles established as part of the spatial framework. The plan presents the expected conditions of land use in the new city in 2025, but phasing of greening program and the initial development are also clarified.

In Chapter 7, the infrastructure development plan is presented, covering transportation, water resources development, water supply and sewerage, power and energy supply, and solid waste management. Each sector plan has been prepared in accordance with the socio-economic and spatial frameworks for the new city development so that they are mutually consistent and also consistent with the land use plan.

In Chapter 8, implementing arrangements for the new city development are proposed within the framework of expected administrative re-structuring for the KMA. Strategic considerations for the new city development are also presented.

In Chapter 9, the new city development is evaluated mainly from financial points of view. First, market conditions for housing units and commercial and business spaces are clarified to determine sales prices and rents for different facilities that the new city would offer. A simple cash flow analysis is conducted from the viewpoint of the Afghan Government under a set of assumptions on external financing of the new city development. Finally, social and environmental considerations are provided to clarify such environmental aspects that need to be further looked into in the planning and development of the new city.

1 BASIC CONDITIONS FOR KABUL NEW CITY

1.1 Need for a New City

1.1.1 Kabul in the national and regional context

Kabul was originally established as an oasis along the east-west trade route and developed also to link the Central Asia in the north with the Asian coastal areas in the south. With the establishment of national territories in the modern world, therefore, Kabul is naturally linked through the national road network with the seven neighboring countries: Tajikistan, Uzbekistan, Kyrgyz, Turkmenistan, Pakistan, Iran and China.

The national road network of Afghanistan comprises seven major cities: Kabul, Jalalabad, Mazarisharif, Kunduz, Bamian, Kandahar and Herat (Figure 1). The links between these cities will be much strengthened with the completion of the national ring road in 2009. This means that Kabul will be more strongly linked through these cities to the neighboring countries and beyond.

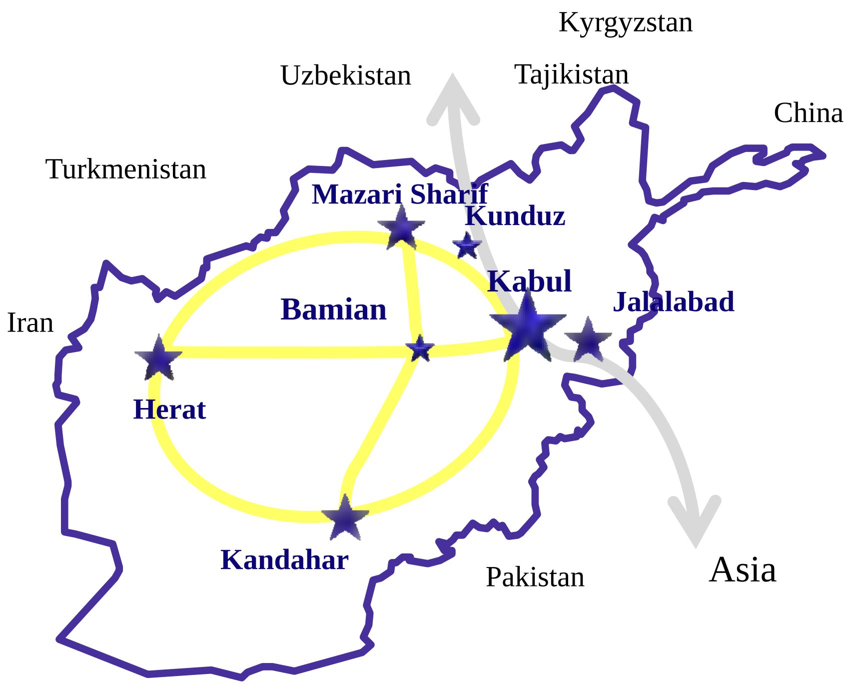

Figure 1 Seven Neighboring Countries and Seven Major Cities of Afghanistan

New major international trade routes have been conceived linking China in the east through the Central Asia to Europe in the west. They are collectively called TRACECA representing transport corridor Europe – Caucasus – Asia. One of the routes called the TRACECA Turkmen route passes through parts of Kazakhstan, Kyrgyz, Uzbekistan and Turkmenistan (Figure 2). This corridor, once established, would provide Kabul and the area along the access roads alternative trade routes to the east and the west.

Capital functions of Kabul should be enhanced to support the socio-economic development of Afghanistan linked with the global socio-economy by integrating the neighboring areas for broader resource base and more diversified socio-economy. The Kabul Metropolitan Area (KMA) is conceived to realize this, and a new city conceived to the north of the Kabul city is considered an important part of the KMA to strengthen the urban functions of the capital region.

Figure 2 New International Trade and Logistic Corridor

1.1.2 Water balance in the upper Kabul basin

The water resources in the upper Kabul basin are in jeopardy for the first time in the millennia due to rapid population growth of the Kabul city. The shallow groundwater, which is the lifeline for the majority of people in the Kabul city, is threatened by pollution and degradation of the groundwater tables. The water resources management of the upper Kabul basin from the upstream to the confluence with the Panjshir river is of utmost importance for the livelihood of the city residents and flora.

Construction of dams in the upstream may help to enhance the water availability by improving the flow distribution, but the groundwater extraction in the downstream would need to be managed to avoid the degradation of groundwater tables. Groundwater recharging areas should be protected from urbanization. Introduction of additional water transferred from the neighboring basin would cause extensive inundation of urbanized areas unless urban drainage is concomitantly improved. The improvement of urban drainage, however, may cause degradation of shallow groundwater tables, which could be detrimental to the livelihood of people and flora.

It should be recognized that the further development of the Kabul city would be based on very delicate balance of water endowment, use and management within the unique hydro-geological regime of the upper Kabul basin. The population in the upper Kabul basin should be controlled within the capacity of water resources available in the upper Kabul basin as a matter of principle. In case where the inter-basin water transfer is judged necessary, the amount of water to be introduced should be kept minimal, and the water balance should be carefully observed.

The total amount of water that can be developed for urban use is estimated by the JICA Study to be 171MCM/year, if the agricultural water use should not be sacrificed (Figure 3). This amount can support the population of some 5million at the per capita water use of 90liter/capita/day, while the present population is already over 4million, which is projected to increase to 7.5million by 2025. The excess population will have to be accommodated in the Panjshir basin in the north.

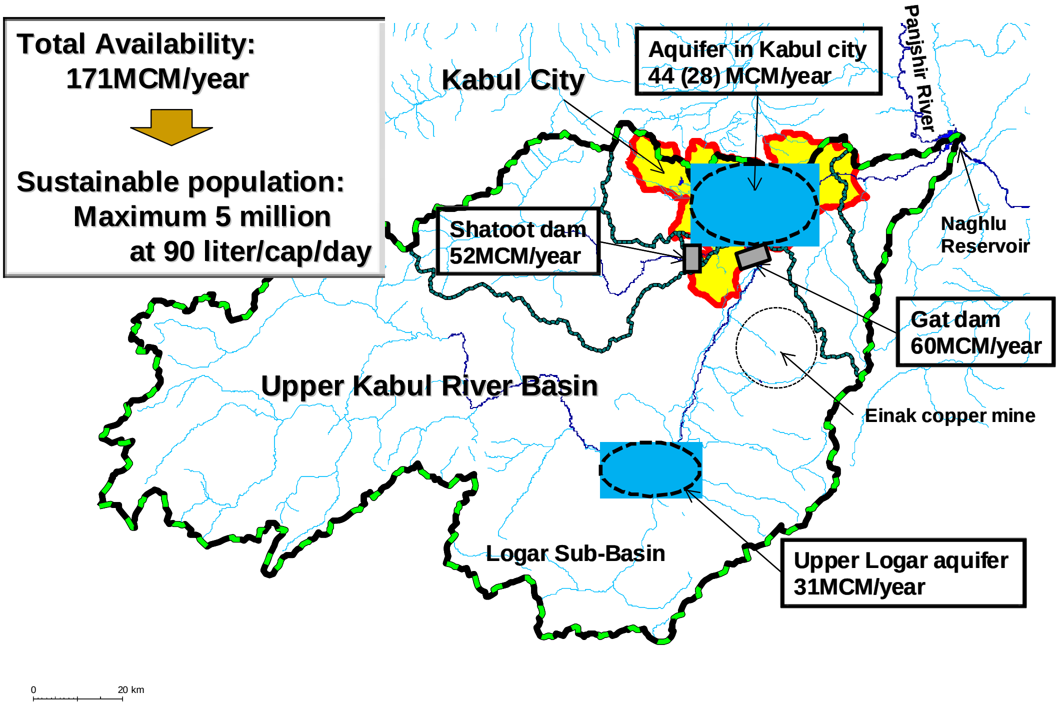

Figure 3 Water Balance and Sustainable Population in Upper Kabul Basin

1.1.3 Afghanistan National Development Strategy

For the urban sector, the ANDS aims: "to ensure increased access to improved services and affordable shelters, while promoting sustainable economic growth through the implementation of the National Urban Program, which includes the National Land Policy and the City Development Plans." The following outcomes are expected:

1) Strengthened municipal capacity to manage urban development and deliver services
2) Improved institutional coordination and monitoring of key urban indicators
3) Increased access to basic services for urban households
4) Phased regularization of tenure for 50% of households living in informal settlements,
5) Upgrading public services and facilities, including new urban area development, e.g., the development of a new city in Dehsabz north of the existing Kabul city
6) Increased availability of affordable shelters, including a 50% increase in number of housing units and 30% increase in area of serviced land on the market, coupled with access to affordable finance
7) Improved urban environment with green areas and open spaces

The urban development by public-private partnership in financing, service provision and management is indicated by the ANDS. Also, the ANDS states: "To alleviate urban sprawl, zoning and new city planning management capacities will be strengthened."

More specifically for the new city development in Dehsabz and Barikab, the ANDS spells out the roles of the Government as planning, investment in some basic infrastructure, facilitation of private commercial investment, and generating revenues for reconstruction and development of the Kabul city as well as the development of the new city itself. That is, the new city is regarded as a mechanism to mobilize private sector resources for the development of the capital region for the development of Afghanistan as a whole.

1.2 Factors Affecting New City Development

1.2.1 Distribution of urban functions with a new city

(1) Preferable locations of urban functions

In an attempt to determine urban functions to be located in the Dehsabz new city and those to be strengthened in the existing Kabul city, preferable locations of different urban functions are examined first in general terms. Urban functions are broadly broken down, and preferable locations of each function are assessed between the city center, sub-centers and outer areas. Results are summarized in Table 1.

Table 1 Analysis on Preferable Locations of Urban Functions

Function	Breakdown	Preferable location		
		City center	Sub-centers	Outer areas
Administrative	Infrastructure	√	√	
	Economy & finance	√	√	
	Social affairs	√	√	
	High governance	√	√	
	Defense & security		√	√
Commercial	Domestic trade		√	√
	International trade	√		√
	Business activities	√	√	√
	Financial services	√		√
	Conference/convention		√	√
Legislative	Parliament		√	√
Judicial	Supreme court	√	√	
	Local courts		√	√
Diplomatic	Embassies		√	
Research & development	Agricultural			√
	Industrial		√	√
	ICT related		√	√
Social	Hospital		√	√
	Higher education		√	√
Cultural, recreational & sporting	Cultural	√	√	
	Recreational		√	√
	Sporting		√	√
Agricultural	Suburban agriculture			√
	Industrial agriculture		√	√

In Table 1, the government administrative functions are broadly categorized into five classes. Ministries may be classified as follows.

All the administrative functions, except the defense and security related administration, would better be located in either in the city center or sub-centers. The defense and security related administration may be located in sub-centers or even outer areas. Of the legislative, judicial and diplomatic functions, only the Supreme Court should better be located in the city center. Other functions commonly locate in sub-centers, and local courts may locate also in outer areas.

Class	Ministries
Economy & finance	Agriculture, Irrigation & Livestock; Commerce & Industry; Economy; Finance; Mines
Infrastructure	Communication & Information Technology; Energy & Water; Public Works; Rural Rehabilitation & Development; Transport & Civil Aviation; Urban Development & Housing
Social affairs	Culture & Youth Affairs; Education; Haj & Religious Affairs; Higher Education; Labor, Social Affairs, Martyrs & Disabled; Public Health; Women's Affairs; Refugees & Returnees
High governance	Foreign Affairs; Justice
Defense & security	Borders & Tribal Affairs; Interior Affairs; Counter Narcotics; Defense

Of the commercial functions, international trade and business, including central offices of international banks, may be located in the city center, but most common commercial functions generally locate in sub-centers and also outer areas. Research and development (R & D) functions would not need to locate in the city center, and the agricultural R & D function should better be located in outer areas where land availability is better for experimental farms.

Hospitals at a higher tier of the health referral system such as a national hospital, and higher education institutes need not to locate in the city center. Their preferred location would be either sub-centers or outer areas where land availability and other conditions are superior.

(2) Possible functions of the new city

All the functions that are assessed to locate in outer areas may be located in the new city. They include defense and security related administration, domestic and international trade, international business and financial services, conference/convention, R & D for all the sectors, higher order social services, and recreational and sporting functions. Local courts may also locate in the new city, but their preferred location may be sub-centers due to their strong functional links with administrative functions.

There exist only limited R&D functions in the Kabul city, including the Kabul university main campus and research facilities of some ministries located in or close to the city center. These functions may be all re-established in the new city. New higher order social services should also be introduced in the new city. In this connection, the existing hospital in the city center, which is at the highest tier of the health referral system, may be relocated to the new city with upgraded functions, while those health facilities at lower tiers should remain close to respective service population.

In the case of the new city in Dehsabz, all the administrative functions related to construction and development may better be located in the new city as it will be the location of major and continuous construction activities for a few decades to come. Head offices of international contractors and logistic industries may also locate in the new city. An industrial estate should be established for the construction related industries such as construction materials, machinery and engineering as well as consumer goods industries. Commercial agriculture, agro-processing, agricultural R & D, and other related services should locate in the Barikab area.

1.2.2 Factors affecting the new city development

The development of the Kabul city would be affected significantly by the new city development. If the new city does not develop as expected, the population of the existing Kabul city within the upper Kabul basin will exceed the level of sustainable population. This will result in the over-stress on the local water resource, or development of additional water resources would be necessary to avoid it. The latter has a significant implication to the urbanization pattern in the KMA.

Various factors affect how fast and successfully the new city may be developed. These factors include policy, strategic plan, land clearance, marketing, cooperation of stakeholders, fund availability, development management, and procurement of construction materials. Each factor is described.

(1) Policy

A clear policy for the new city development is the basic condition for successful development of the new city. Such a policy should be made known to all by an official document. In the case of the new city in Dehsabz and Barikab, the Afghanistan National Development Strategy (ANDS) just completed serves the purpose.

In the ANDS, roles of urban development are described to support the economic and social development as one of three pillars for national development, and the needs for capacity development in zoning and new city planning are recognized to alleviate urban sprawl.

Specifically, the ANDS clarifies the Government's role for planning, investment in some basic infrastructure, and facilitating private commercial investments for the Dehsabz new city area and the Barikab area for commercial agro-business. Another important function of the new city development as described in the ANDS is to generate revenues that can be used for the reconstruction and development of the Kabul city itself.

(2) Strategic plan

The new city development should be based on a strategic plan to realize the orderly, comfortable and efficient urban spaces to attract investors and residents. The plan should establish, among others, macro zoning for different land uses in different areas, stage-wise development of key infrastructure facilities such as artery roads and water supply, implementing arrangements by public-private partnership, financing plan for the key infrastructure, and marketing plan to mobilize the private sector and donors.

(3) Land clearance

At present, the land in the new city area is partly owned by the Government and partly by the private sector. Many development activities are planned with and without proper land documentations. The Committee for Land Clearance has been undertaking the land clearance procedure for the new city area, in cooperation with DCDA. At the same time, a survey was conducted as part of the JICA Study to clarify the ongoing development activities on the ground.

(4) Marketing

Marketing for the new city should be undertaken in two fronts: for donors to support the key infrastructure development and capacity development of the Afghan personnel, and for the private sector to undertake the development activities. For both, the master plan to be prepared by the Study would provide effective tools, and marketing strategy would be developed based on the plan.

(5) Cooperation of stakeholders

Stakeholders for the new city development include related government agencies, donors, various public and private institutes and organizations, NGOs, and most importantly the general public or citizens. The cooperation of related government agencies should be ensured through joint preparation of the master plan as attempted for the Study. During the Study, several seminars and workshops were organized to report the progress of the Study and discuss on issues involved in the master planning. A wide range of stakeholders, including international donors and NGOs, academic institutes, and private sector representatives, were invited to participate in these seminars and workshops to be operated effectively as stakeholders' meetings.

Special efforts would be necessary to involve the general public in the new city development, including both the city residents and the residents of villages in the new city area. One way is to initiate the tree planting in the new city area by mobilizing the citizens. It may be undertaken initially in the villages together with the provision of small water impoundments, and along the Bagram road, which will serve as the main access to the new city.

(6) Fund availability

The implementation of the key infrastructure development would be supported by donors. Feasibility studies, detailed design and construction should be supported by grant-in-aid or concessional loans in view of the debt sustainability of the Country. The provision of concessional loans would be justifiable as the new city development is seen as a revenue generating project, implemented by mobilizing largely private financial resources. The timely provision of the key infrastructure would be the critical condition to mobilize the private sector financial resources.

(7) Development management

The organizational structure for the development management of this mega project was proposed initially by the JICA project formulation study in 2006. The existing organizational structure with DCDA is largely in line with the proposal. Staff capacity of DCDA is being enhanced by recruiting additional staff members. Capacity development of the Afghan counterpart organizations and personnel is being effected through collaborative works with the JICA Study Team and special training programs.

(8) Procurement of construction materials

To develop the new city in the scale and at the pace expected by the Afghan side, construction activities should take place in more than a few locations at the same time. A number of contractors, both Afghan and foreign, would be mobilized in a short time initially and continually thereafter. This is possible under the proper development management.

Procurement of construction materials may become a serious constraint as Afghanistan relies on imports for most construction materials. Not only for rapid construction works in several locations at the same time, but also for consistent quality and appearance of buildings and structures, many pre-cast or pre-fabricated materials may be utilized. It is desirable that domestic industries for construction works and materials would develop in a medium term. In a short term, special arrangements would be required to ensure sufficient construction materials would be procured and properly stored.

2 PLANNING CONCEPTS FOR NEW CITY DEVELOPMENT

In planning for urban or regional development, it is useful to establish planning concepts to be applied to the development and to share them among stakeholders. The planning concepts widely shared by stakeholders would provide guidelines and help to muster their efforts in planning and implementation to realize more coherent and desirable development acceptable for all.

Given the unique hydro-geological conditions discussed above as well as the millennia long history and culture, the Kabul city should pursue a unique urbanization model of its own, and the new city development would be an important element of the model. Three planning concepts are proposed to be applied to the new city: (1) socio-economic diversity, (2) urban-rural complementarity, and (3) recycle-oriented eco-city. Each concept is described.

2.1 Socio-economic Diversity

Socio-economic diversity implies various values to be built in the KMA development in general and the new city development in particular as indicated in Figure 4. It consists of social diversity and economic diversity applicable to the Kabul city and the new city. More important aspects are described.

Afghanistan is a plural society. The ANDS presents a positive view on the plurality as expressed in the vision for 2020. Social diversity is a potential source of dynamism, which applies particularly to urban societies. The Kabul city's dynamism should be supported by the mixed culture and mixed ethnicity of people living there. The civil war, however, undermined such characteristics, resulting in somewhat segregated habitation patterns in the city. This should be rectified through planned development to restore the urban society of mixed culture of diverse people.

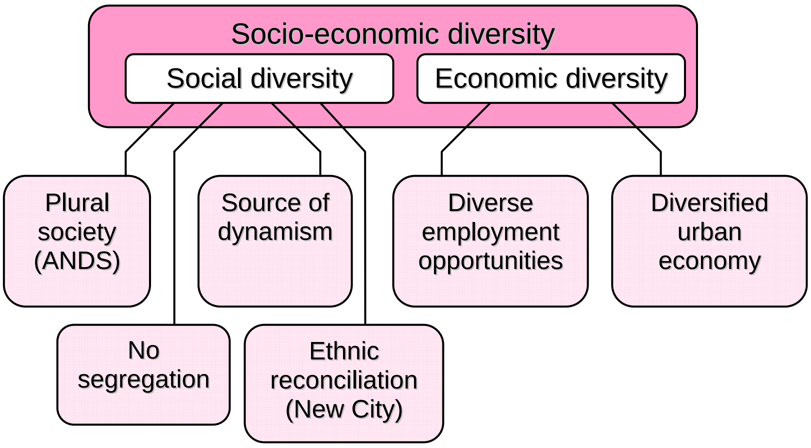

Figure 4 Planning Concept of Socio-economic Diversity

The new city would present new opportunities to promote social diversity. It is planned as the symbol of national unity for reconciliation and coexistence among various peoples. All the ethnic groups are expected to participate in the construction of the new city and the reconstruction of the capital city to realize the pleasant and robust capital region of the KMA as a whole.

Social diversity in urban development means urban development with no segregated habitation by ethnic or any other social group. Specifically, it may be promoted among others by the following:

(1) Inclusion of social housing for low income people in any sizeable housing development; in case where such housing is provided by the private sector, provision should be made that a certain portion of housing units are devoted to low income people by regulation and incentive measures

(2) Provision of public facilities in central area of each enclave type urban area for all the residents, including multi-functional culture center and community complex around a mosque

Provision of diverse economic opportunities attracts people to the Kabul city, and provision of sufficient employment opportunities would be a key for successful new city development. Unless the new city offers sufficient and diverse employment opportunities, the residents would commute to the existing Kabul city. Then, the new city would become a mere commuters' city or a dormitory city. The existing Kabul city and the new city in Dehsabz together should offer most diverse economic and employment opportunities with complimentary functional division between them.

2.2 Urban-rural Complementarity

In pursuing a unique urbanization model, the Kabul urbanization should take advantage of the presence of rural and agricultural areas within the city boundaries and the existing villages in the new city areas. This may be effectively realized by utilizing complementary aspects of its urban and rural areas in many ways as indicated in Figure 5.

The Kabul city has unique urban landscape with a sort of semi-rural atmosphere. This is due much to many large trees thanks to shallow groundwater. It is undermined only by "modern" architecture with glassy exterior.

The Kabul city encompasses large agricultural land, accounting for 14% of the total city area. The share of agricultural land is 14% even in the central districts of Districts 1 through 16, excluding District 14. Preserving the agricultural land is essential to ensure open space and greenery, which serve as infiltration area for urban drainage and some sewage. The preservation of agricultural land will help to maintain shallow groundwater, which is critically important as sources of domestic water for the majority of the city residents and as a prerequisite to preserving and enhancing the greenery.

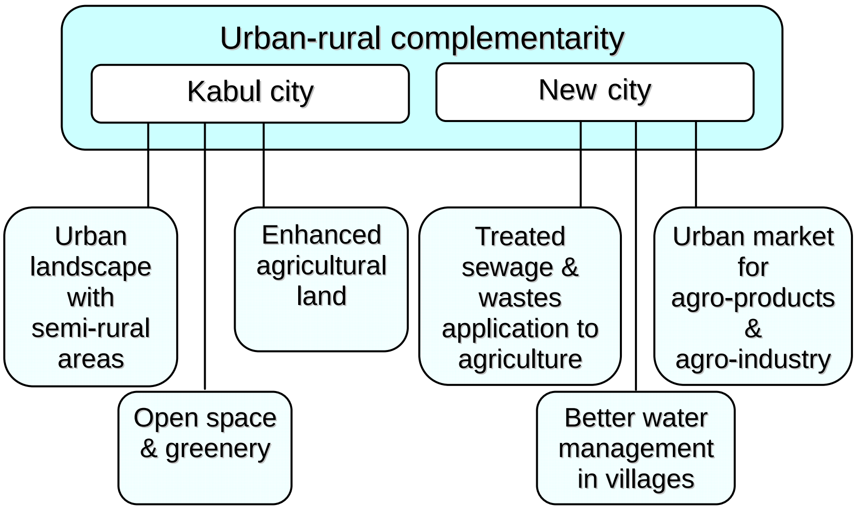

Figure 5 Planning Concept of Urban-Rural Complementarity

The new city in Dehsabz should pursue urban-rural complementarity more consciously and deliberately. On-site treatment of human wastes should be promoted, and the sludge digested and applied to agricultural land to improve soil conditions. Urban drainage and some sewage should be treated also on-site by ensuring sufficient area for infiltration in semi-rural residential areas. In the central urban areas, sewerage should be provided, and sewage treatment facilities established. Treated sewage would be applied to irrigate agricultural land.

Water availability will be improved as a prerequisite of the new city development, which would benefit the existing villages as well. Better water management in the villages would mitigate flush floods due to snowmelt and gully erosion. Enhanced water retention capacity of land due to soil improvement would also have the mitigation effects.

The new city development would create most accessible urban market for agricultural products produced in the rural areas surrounding the new city. Conversely, the urban residents would be supplied with fresh vegetables and fruits from the suburban agriculture in the existing villages. Increased agricultural production there due to improved water availability and soil conditions may expand the base for agro-processing and related industries in the peri-urban areas of the new city.

2.3 Recycle-oriented Eco-city

Some important elements of the recycle-oriented eco-city have already been described above. Other elements should also be incorporated in the new city development as illustrated in Figure 6.

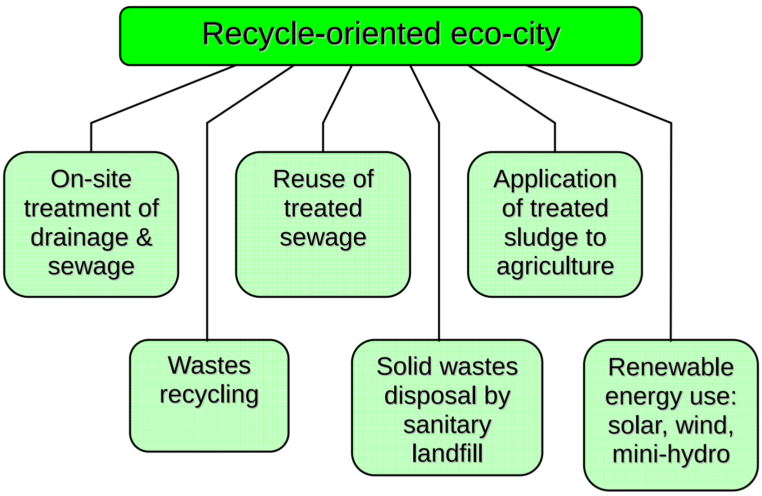

Figure 6 Planning Concept of Recycle-oriented Eco-city

On-site treatment of human wastes, sewage and urban drainage should be widely applied in the new city. For solid wastes management, wastes separation at source and recycling may be experimented first in the new city. The first site for sanitary landfill for solid wastes disposal may be located in the new city area to dispose wastes generated in the existing Kabul city. Use of landfill site after the exhaustion of disposal capacity should be planned as part of the new city planning. Digested sludge from existing septic tanks in the Kabul city may be applied to the new city area, if the transport costs justify such application.

Use of renewable energy is another aspect of the recycle-oriented eco-city. Power generation by solar, wind and mini-hydro should be encouraged in the new city by applying the state-of-art technology. Rural electrification by mini-hydro should be part of the better water management in the existing villages around the new city site. The concept of waste to energy may also be applied to treat the solid wastes. Organic wastes are separated and used for biogas digestion, and remaining combustible wastes incinerated to generate electricity in both ways.

3 DEVELOPMENT FRAMEWORKS FOR NEW CITY DEVELOPMENT

3.1 Socio-economic Framework

3.1.1 Population framework

(1) Alternatives for the new city development

If only sufficient water is made available, the urbanization would proceed naturally from the Kabul city to the north along the Bagram road. It may take a form either of urban sprawl or planned urbanization. The planned urbanization should take a form of the new city development to realize more orderly, comfortable and efficient urban spaces.

The population in the new city area will grow even without the new city, once the water availability is improved. From the present population of some 100,000, the population will grow at well over 5% per annum to reach at least 250,000 by 2025. With deliberate efforts to develop the new city, the significantly larger population growth will be realized.

The future urbanization of the KMA would depend critically on the development of the new city. Therefore, alternatives for the KMA development would be defined with respect to the alternatives for the new city development. Three alternative levels of population are assumed for the new city in 2025: 0.5 million, 1.0 million and 2.0 million. These alternatives for the new city development are called (1) modest development, (2) steady development, and (3) ambitious development.

(2) KMA master plan alternative

The Kabul city population within the upper Kabul basin should be suppressed and 5million is assumed in 2025 as mentioned above, while the population may grow to reach 7.5million without any control. The excess population would have to be accommodated somewhere. The western part is mountainous with resort and agricultural areas. The eastern and the southern parts are still in the upper catchment area. Thus, the only choice is the northern region.

In total including the existing population that will also grow, some 3.5million people will have to be accommodated in the new city and the northern region. Depending on how fast the new city may develop, three alternatives have been defined above. The population in the new city and the northern region under the three alternatives are summarized in Table 2.

Under the alternative of Ambitious Development, the northern region would need to develop only at 3.05% per annum. This level of growth seems easily attainable. Under Steady Development of the new city, the northern region would have to attain the population growth of 6.2% per annum. This is difficult to attain even if deliberate efforts are made for the regional development of the northern region. Therefore, a reasonable level of the new city development is found between these two alternatives and defined as the KMA master plan alternative.

The population in different parts of the national capital region under the master plan alternative is projected as shown in Figure 7. As shown, the new city will be developed to reach population of 1.5 million in 2025.

Table 2 Population and Population Growth in New City under Three Alternatives

Alternative	Population (10^6)		Population growth (% p.a.)		
	2015	2025	2008-15	2015-25	2008-25
1. Ambitious development	0.40	2.0	21.9	17.5	19.3
2. Steady development	0.25	1.0	14.0	14.9	14.5
3. Modest development	0.20	0.5	10.4	9.6	9.9

Source: JICA Study Team

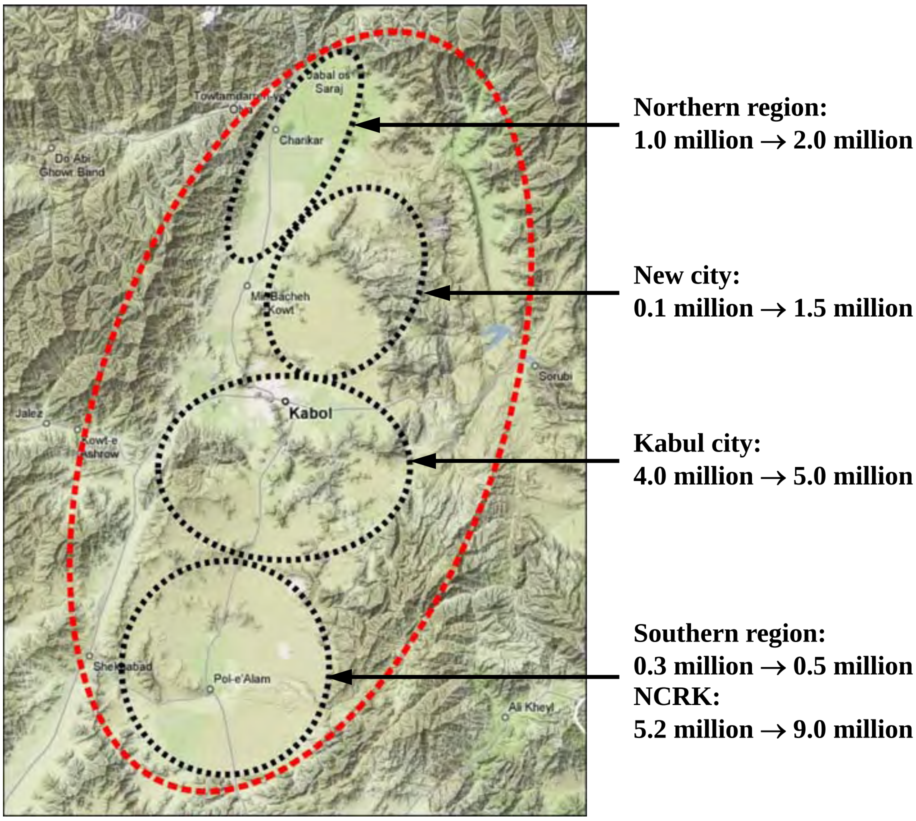

Figure 7 Population Projection in National Capital Region of Kabul

3.1.2 Distribution of population, GRDP and per capita GRDP in 2025

The GRDP of the Kabul province is projected to increase from US$1,560million in 2008 to US$7,494million in 2025 according to the socio-economic framework of the KMA master plan. The projected GRDP of the Kabul province in 2025 is distributed to the three sub-areas in the new city in proportion to the planned population. The results are shown in Table 3 together with the per capita GRDP.

Table 3 Distribution of GRDP and Per Capita GRDP, 2025

Area	GRDP (US$$10^6$)	Population (10^3)	Per capita GRDP (US$)
Kabul province	7,494	7,500	999
Kabul city	5,480	5,500	996
- Upper Kabul basin	5,113	5,000	1,023
New city	1,500	1,500	1,000

Area	GRDP (US$$10^6$)	Population (10^3)	Per capita GRDP (US$)
- Barikab	195	195	1,000
- Dehsabz north	510	501	1,000
- Dehsabz south	461	461	1,000
- Paymonar	343	343	1,000
Other areas (outside KMA)	880	1,000	880

Source: ibid.

3.2 Spatial Framework

The spatial framework for the new city development is prescribed by the urbanization pattern and the regional artery transport system for the KMA development (Figure 8), and land development principles and land use framework for the new city. As seen from Figure 8, the urbanization pattern for the Kabul city is characterized by several large and small enclave type urban areas separated by hills and mountains.

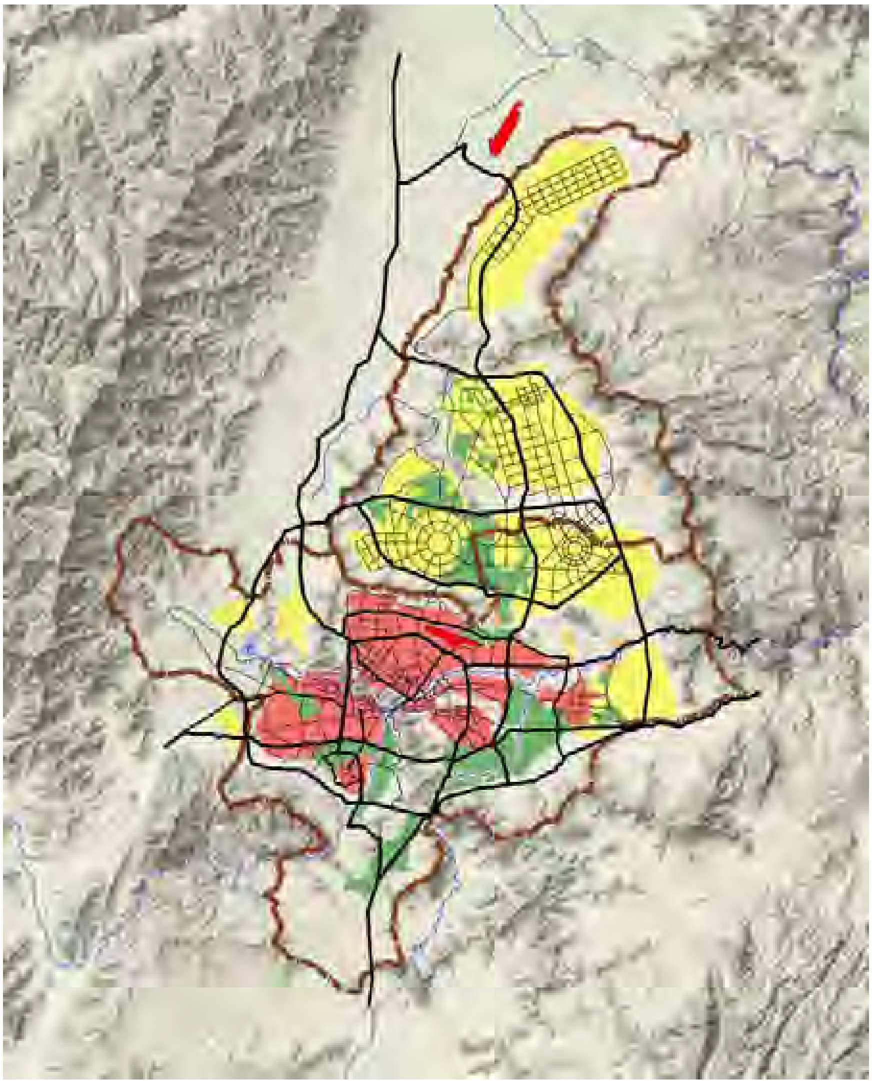

Figure 8 Spatial Framework for New City Development

The urbanization pattern in the new city replicates this by defining sub-areas separated by hills and greenery. Consequently, a multi-centric urbanization pattern will be realized in the KMA with the new city. This pattern fits well to the topographic and hydro-geological conditions in the Kabul basin. By planning each enclave type urban area more or less self-contained, traffic congestion and other pollution would be minimized. On-site treatment of sewage and human wastes, and maintenance of groundwater tables and quality of groundwater can be more effectively managed.

The regional artery transport system for the KMA development and land development principles and land use framework are described below.

3.2.1 Regional artery transport system

At present, main national highways and provincial roads extend radially from the Kabul city center to constitute the artery transport system. Due to the delay in secondary artery road development, undeveloped hierarchy of urban road system, and poor conditions of community roads, most traffic, including daily traffic by city residents, concentrates on the main artery roads to cause traffic congestion, air pollution and other problems. The regional artery transport system for the KMA should be established with the following components (Figure 9).

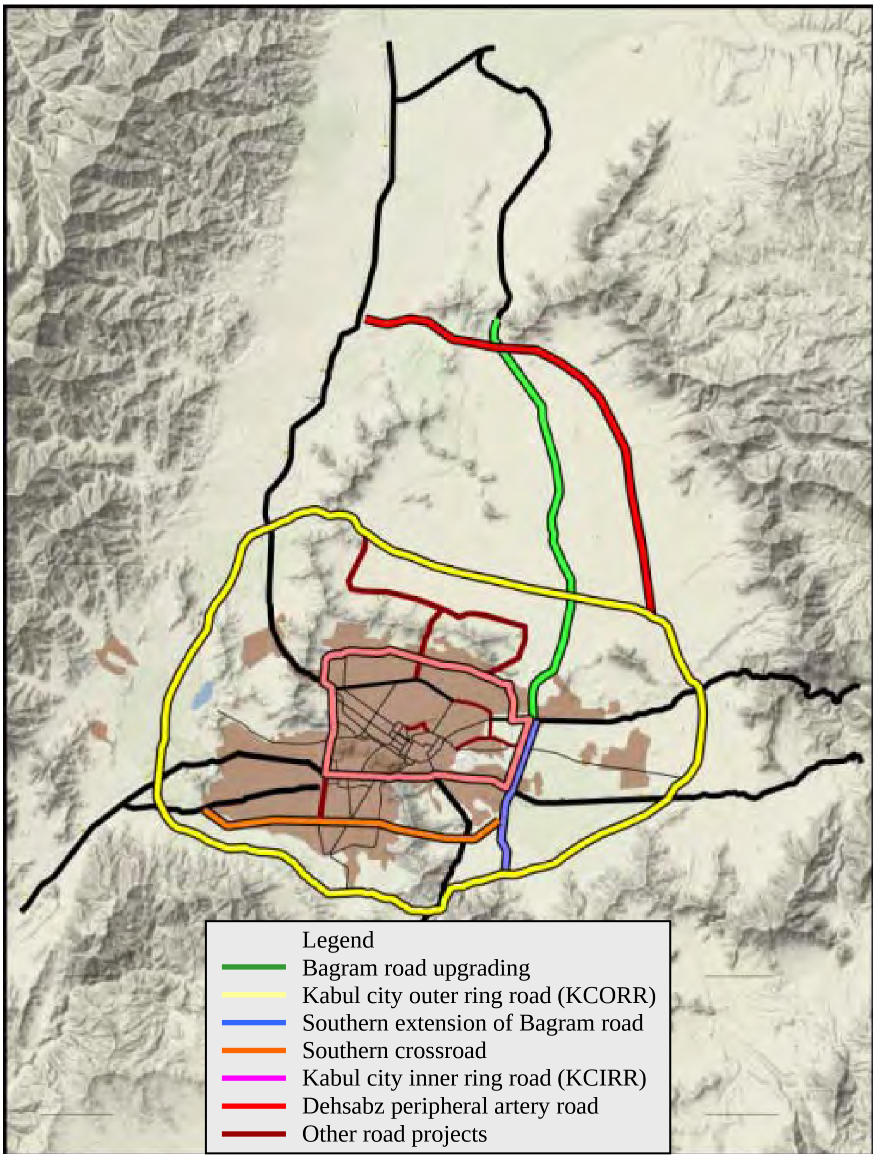

Figure 9 Regional Artery Transport System for KMA

(1) Kabul city outer ring road

A feasibility study was completed in early 2008, supported by the World Bank, of the Kabul city outer ring road, and the road alignment was determines through examination of alternatives of some sections as well as coordination between related government ministries and the Kabul municipality. The alignment thus determined does not reflect the planned new city in Dehsabz, and needs to be re-examined.

The alignment of the Kabul city outer ring road was proposed by the 2006 JICA Study in such a way that its northern section would serve as an artery road for the new city in Dehsabz. It should be reviewed and such alignment that would serve the new city area better should be adopted. Important factors to be reflected in the alignment include the following:

1) The road would serve as a main artery for the new city linking different areas in the new city.
2) The road would have areas of traffic generation on both sides of the road for cost-effectiveness of investment.
3) The road would be used to provide better links between the eastern and the northern regions, without passing through the Kabul city.
4) The road would facilitate links between different districts of the Kabul city among themselves and between these districts and the new city.
5) The road would link with the four main artery highways and provincial roads to constitute the regional artery transport system for the KMA as a whole, and link effectively also with the Kabul city road system.

(2) Southern extension of the Bagram road

The existing Bagram road, currently widened to a 4-lane highway, should be extended to the south, passing through the eastern part of the existing urbanized area of the Kabul city. This extension would link to the Karte new road and further to the southeastern section of the Kabul city outer ring road. This would facilitate the link between the Logar region and the Dehsabz new city. In order to protect the groundwater recharging areas for the lower Logar aquifers, the alignment of this extension road should pass through the area at least 2km away from the Logar river.

(3) Periphery road through the new city

The Dehsabz periphery artery road is planned to serve the traffic between the east to Jalalabad and beyond to the north to Parwan and beyond. This artery, while serving as another artery road for the new city, will prevent the through traffic to use city roads of the new city.

(4) East-west roads

Four east-west roads would link to the main artery roads to constitute part of the regional artery transport system. They are: 1) the road passing through the northern part of the existing airport, 2) Jalalabad road, 3) new Ahmad Sha Baba Mina road under construction, and 4) Karte new road. In addition, a new road will be necessary in the further south over the ridge separating Districts 7 and 8 so that the east-west traffic would not concentrate on the Karte new road. This new road link would be necessary to avoid heavy traffic to pass through the old city areas of District 1. In addition, another east-west road should be provided in the south, which will not pass through the central part of the city. This may be called the southern cross road.

3.2.2 Principles for land development in the new city

The following principles should apply to planning for the development of the Dehsabz and the Barikab areas.

(1) Preservation and enhancement of existing villages

Existing villages should be preserved and enhanced through the new city development, which pursues the complementary development between urban and rural areas as described in Section 2.2. Enhancement of existing villages on the foot of mountains in the east with productive greenery would help to mitigate flash floods and gully erosion and thus benefit the new city. The existing villages will benefit from the new city development also through improved access to the urban and export market.

(2) Preservation of existing farmland

Most farmlands are located along the karez systems, irrigation canals and rivers. Preservation of these farmlands would be essential in managing water and related land resources in Dehsabz and Barikab. Existing farmlands should be preserved as a matter of principle, and even enhanced as part of greenery surrounding the new city as planned. Road alignments are determined to avoid interference with the farmland as much as possible. Productive greenery would be provided even in the outskirts of the new city, where semi-rural housing may be provided with home garden agriculture in housing compounds.

(3) Enhancement of gullies

To facilitate urban drainage and create greenery around water courses, the gullies should be utilized through enhancement. A minimum construction works for bank protection to control soil erosion would be undertaken and areas along gullies are protected by vegetation cover and trees.

There are a lot of gullies in the Dehsabz area, some of which are as deep as 20m. These gullies are classified into two categories for planning purposes. For major gullies having wide and deep sections, the riverbanks are planned to be greened by 30 to 50m in width. Minor gullies are expected to be rearranged and improved during developing works.

(4) Rehabilitation and use of karez systems

Existing karez systems should be rehabilitated and used as important part of water preservation and circulation for the new city. The karez systems in the upstream areas would help to enhance the water retention capacity and reduce flash floods and gully erosion. Existing gullies should be improved with bank protection works and check dams, linked with karez systems, to control drainage and sewage discharge.

(5) Utilization of existing roads

Some of the gullies existing in the Dehsabz area are very precipitous and deep. Existing roads are aligned to cross these gullies at the easiest points to ensure access to villages. These alignments should be utilized as much as possible. This will not only ensure the access to remote areas at the shortest road distance but also reduce the development costs.

(6) Sub-centers development

For the large urban area expected to develop in Dehsabz and Barikab, at least a few urban centers need to be developed for core urban functions. Four sub-areas are defined as illustrated in Figure 10: Dehsabz south, Paymonar, Dehsabz north and Barikab. An urban center should be located in each of the four sub-areas.

(7) Ring cities

The cores of the sub-centers in Dehsabz south and Paymonar are designed as ring cities. A basic composition of each ring city is to make the central area an open space and to surround it by ring roads. This composition would help to avoid major urban problems such as excessive concentration and traffic jam that many big cities all over the world have faced. Also, balanced land use will be realized by its radial development in any developing phase. In a central open space, a unique landscape is created by green space and cultural facilities that are combined to enhance spatial value of the new city.

(8) Complementary development with existing development

In the Dehsabz north area, the 26 Dalwa project is implemented to construct 20,000 housing units. The project plans a central green space surrounded by public facilities and middle and high-rise apartments. The core of the Dehsabz north area is designed according to its spatial composition. For continuity of the central green space, a greenbelt with business and commercial blocks are arranged on the opposite side of the Bagram road as extension. With the mutually complementary relationships, the entire district functions as a stronger core of the northern part of Dehsabz.

(9) Linear zoning system

A linear zoning system is applied for the Barikab area. By this system, each land use is arranged in the direction of development. This spatial composition makes balanced land use at any development period.

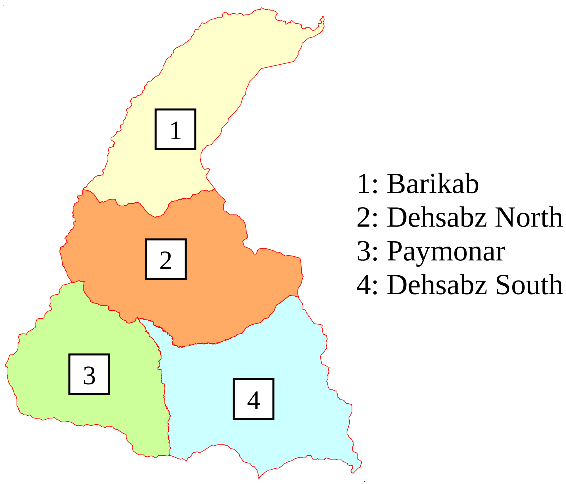

Figure 10 Definition of Four Sub-areas in New City for Planning

3.2.3 Land use and population frameworks

(1) Existing land use

The existing land use in the new city area is summarized in Table 4. Of the total land area of 740.4km^2, 212.2km or 28.7% is slope land having gradient larger than 5 degrees. Of the remaining 528.3km^2, agricultural land occupies only 44.4km^2 or 8.4%, consisting of 31.4km^2 under intensive cropping mainly for grapevines and orchards, and 13.0km^2 for other cropped land or abandoned farmland. The existing villages occupy 8.4km^2. The remaining area of 506.2km^2 may be used for development, of which some development is taking place in 30.7km^2.

Table 4 Existing Land Use in New City Area

(Unit: ha)

Land use	Barikab	Dehsabz N	Paymonar	Dehsabz S	Total
Slope land	5,654	6,796	3,306	5,460	21,216
Intensive agriculture	27	707	2,042	363	3,139
Marginal agriculture	0	155	102	1,040	1,297
Villages	5	199	480	157	841
Developable	11,813	13,465	9,341	12,929	47,548
Area under development	347	387	0	2,333	3,067
Total	17,499	21,322	15,271	19,949	74,041

Source: JICA Study Team.

Of the four broad areas, the Paymonar area has comparatively larger flat land accounting for 78.4%, and agricultural land, particularly under intensive cultivation occupies the largest area of the four areas. The Barikab area is the least developed even for agriculture. Of the area under development, more than three-thirds (76.1%) is found in the Dehsabz south area closest to the existing urbanized area of the Kabul city. Most ongoing developments are located within the 2km bands on both sides of the Bagram road, and many of them are undertaken without official permits.

(2) Distribution of land and population

The entire new city area of 74,000ha will be developed in steps for various purposes. Broad land use distribution at the ultimate development for the 3million population is shown in Table 5. As shown in the table, the urban development area up to 2025 will be about 20,000ha, not including the area of ongoing public projects and the expansion of agricultural land. Other areas include slope land, military zone and periphery greenery.

Table 5 Land Area Distribution at Ultimate Development

(Unit: ha)

Classification	Barikab	Dehsabz N	Dehsabz S	Paymonar	Total
Development area I (up to 2025)	3,965	6,221	5,127	4,823	20,136
Ongoing public projects	946	965	325	0	2,237
Development area II (ultimate development)	942	4,232	3,815	1,547	10,537
Agricultural area	3,512	1,486	1,171	4,819	10,989
Other areas	8,132	8,417	9,511	4,082	30,142
Total land area	17,449	21,322	19,949	15,271	74,040

The population of some 1.5million in 2025 will be distributed to different areas and land classes as shown in Table 6.

Table 6 Population Distribution in 2025

Classification	Barikab	Dehsabz N	Dehsabz S	Paymonar	Total
Development area I	140,000	320,000	382,00	271,000	1,111,300
Ongoing public projects	45,000	150,000	51,721	0	246,721
Villages	9,841	31,376	27,112	71,671	140,000
Total population	194,841	501,376	460,833	342,671	1,498,021

3.2.4 Spatial composition of sub-areas

The spatial composition of each sub-area is illustrated in Figure 11. The sub-center has basic cultural and administrative facilities in a green space, where residents gather. This zone is planned with low density. Low-rise buildings are located in the immediate vicinity of the sub-center to allow residents to enjoy spacious urban life.

High- and medium-rise buildings are located in outer areas near the foot of mountains. Office buildings and commercial facilities are also planned in this zone. Urban landscape with high- and medium-rise buildings and rural landscape of existing villages would alternately appear along the foot of the mountains in the east. Industrial zones are located closer to the trunk roads for easy vehicular access. The access to the sub-center will be separately provided.

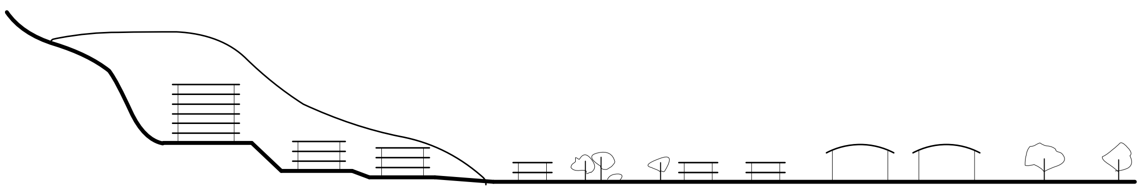

Figure 11 Spatial Composition of Sub-area in New City

4 DEVELOPMENT SCENARIO FOR NEW CITY DEVELOPMENT

A series of activities to develop and events to take place over the planning period up to 2025 under the KMA master plan alternative is described here as the development scenario for the KMA and the Kabul new city. There exist naturally various uncertainties involved in drawing up a development scenario for any country or region. This is particularly true for Afghanistan and Kabul as the Country has been undergoing reconstruction and reform in all the sectors. The difficulty is further compounded by deteriorating security conditions even in the capital region.

These uncertainties are not directly treated in the development scenario of the KMA and the new city presented here. It is expected that the ongoing reconstruction and development works supported by the international aid community would be steadily continued, the macro socio-economic stability would be attained at a reasonable level, and the security conditions would be improved in the medium term.

To describe the development scenario for the KMA and the Kabul new city, the planning period is divided broadly into three phases: Phase 1 up to 2015, Phase 2 for 2016-20, and Phase 3 for 2021-25. The expected performance of the socioeconomic and spatial development of the new city in each phase is described. The described performance is substantiated in the subsequent chapters presenting sector-wise development plans.

4.1 Development Scenario for KMA

4.1.1 Economic development scenario

(1) Agriculture

High value agriculture in the KMA would develop in steps as shown in Figure 12. In the Kabul city, high productivity use of agricultural land would be undertaken such as mixed farming combining fruit trees and crop production, tourism orchards and provision of sporting and cultural facilities in farmland. The development of the remaining agricultural land should be encouraged under strict regulations on scale and types of developments, land coverage and other conditions. At the same time, incentive measures should be combined to encourage investments to enhance the productivity such as tax reduction on the initial investments and accelerated depreciation of facilities.

Various forms of facility agriculture would be practiced in Dehsabz and Barikab such as greenhouse agriculture under controlled environment to produce high value crops. Promising crops include fruits such as berries and muskmelon, herbal and medicinal plants, and spices. Seedlings of various tree species may also be produced to take advantage of immediate market for greening of the new city. Commercial agro-business would be undertaken in Barikab.

These activities would be initiated in Phase 1, and expanded in Phase 2. Export orientated production would start in Phase 2, which would encourage accumulation of agro-products from other regions for export. The export would increase rapidly in Phase 3, and eventually the Afghan brand would establish in the international market for quality agro-products.

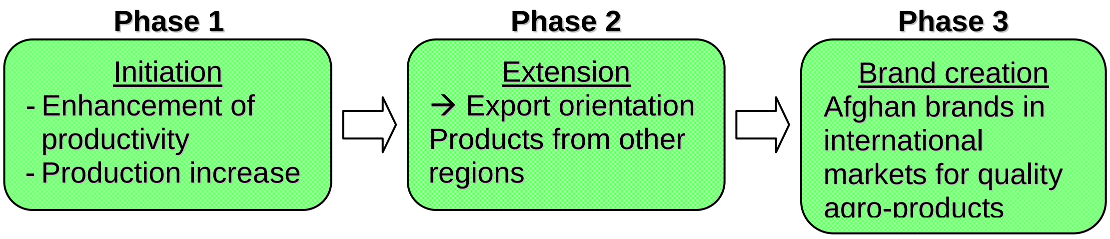

Figure 12 Agricultural Development in KMA by Phase

(2) Industry

Diversified manufacturing would be established in steps as shown in Figure 13. Initially, construction materials and consumer goods industries would take the lead, and traditional industries may be selectively improved such as handicrafts and wood products.

With much expanded raw materials base due to production increase in the Kabul city, Dehsabz and Barikab and the accumulation of products from other regions, some agro-processing industries would establish during Phase 2. Toward the end of Phase 2, some medium high-tech and knowledge intensive industries may be invited to establish in the new city area. Eventually, the KMA would become the industrial heartland of Afghanistan with diversified industrial structure.

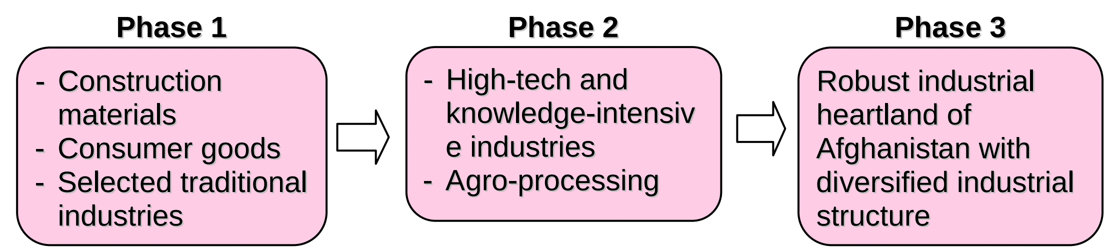

Figure 13 Industrial Development in KMA by Phase

(3) Services

Different service activities would develop in Phase 1 and Phase 2 as shown in Figure 14. In Phase 1, construction-related services such as procurement, transport and storage and agricultural services would develop rapidly. As the regional economy develops, various business and financial services would develop during Phase 2. Also, the transactions with neighboring regions and countries would accelerate in Phase 2 along with the development of transport and communications infrastructure as well as the improvement in security conditions, and broad logistic services would develop.

High-grade social services would develop in Phase 2 and Phase 3, as international class high education and research institutes develop and specialized health care establish in the new city. International tourism related services would also develop rapidly as the security improves. Eventually, the KMA would be characterized as the center of high-grade services in these fields.

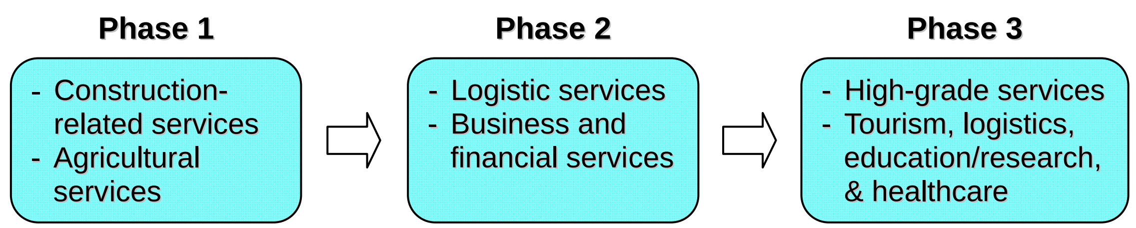

Figure 14 Services Development in KMA by Phase

4.1.2 Spatial development scenario

The spatial development in the KMA would take place in steps as shown in Figure 15 to integrate the new city with the existing Kabul city for complementary development with functional division. Initially, the links between the Kabul city and the new city will be strengthened by the Bagram road and the Kabul city outer ring road. A new urbanized area would develop in the east of the Kabul city as currently undertaken by the Kabul municipality, but with slightly different functions. In addition to residential areas planned by the municipality, some logistic and related facilities should be provided such as warehouses, regional wholesale market and some processing.

In Phase 2, the southern extension of the Bagram road, the southern cross road and the Paymonar road would facilitate the integration of these two major urban spaces. Additional urban areas would develop in the south and in the northwest of the city during Phase 2. Eventually in Phase 3, the Kabul city and the new city would be integrated by the green artery network.

4.2 New City Development by Phase

4.2.1 Phase 1 (up to 2015)

(1) Overview

The planning concepts applicable to the Kabul new city development as presented above should be made widely known and accepted by all the stakeholders. While the master plan itself has technical elements not easily understood and accepted by many, these concepts are easy to understand.

Sharing these concepts in planning and implementing urban developments would make significant differences in the long run. To cultivate wide public acceptance of these concepts, they should be applied to initial developments to create something visible and accessible by many residents.

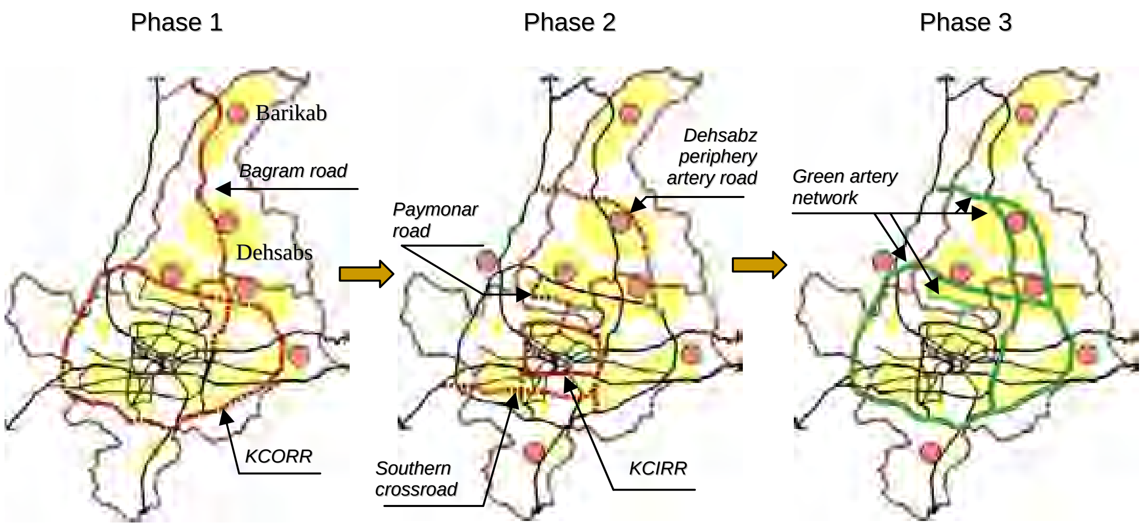

Figure 15 Spatial Development of KMA by Phase

The DCDA Board has adopted as the first project for the new city development the Greenbelt and Roadside Plantation project. This project fits well with the concept of recycle-oriented eco-city applicable to the new city as it will contribute to enhancing water retention capacity of the land and landscaping for the new city.

Initial development of core infrastructure for the new city will be completed, particularly for water supply with water transfer from the Panjshir basin and artery roads including the northern sections of the Kabul city outer ring road.

This phase is characterized by the initiation of institutional reform for the urban sector. The zoning ordinance and the national building code that have already been drafted will be enacted, and legislative actions will be taken for regional planning as well. The scope and division of duties for master planning and detailed planning will be further clarified and legislated. Institutional mechanism will be established for the coordination and monitoring of the master plan implementation, and their review and revision.

(2) Socio-economy

Greenhouse agriculture will be initiated by private investors in the new city as well as the Kabul city to produce vegetables and other high value crops such as berries, muskmelon, spices and medicinal herbs under controlled environment. Initial development of commercial agriculture in Barikab will take place.

Some existing industries mixed in residential areas will be relocated and re-established in either District 9 or the new city. Construction and construction materials industries will develop rapidly as the new city development starts. Some of them may establish manufacturing of pre-fabricated and pre-cast construction materials.

The tourism industry will start to develop in the KMA by the private sector under improved security conditions. A few local tourism agencies will start to associate with international agencies, and local tourism associations will be strengthened for proactive marketing aiming at international tourists. Conference facilities may be provided in the new city for conference tourism.

Advanced business and financial services will start to develop based mainly in the new city. They include consulting services of various kinds, export and logistic services, and international financial services for both commercial and Islam finance.

Some of government functions will be relocated to the new city including the construction and development related functions. A major university will be established, either inviting a foreign based institution or relocating one from the Kabul city.

(3) Spatial development

The Bagram road widening in the new city will be completed in early part of the phase. The northern sections of the Kabul city outer ring road will be completed as well as limited sections in the south. The 26 Dalwa project, currently undertaken by MoUD, will be completed as planned as the first planned urban district in the new city. A few new residential development projects will be initiated both in the existing Kabul city and the new city with independent water supply and sewerage systems, respectively.

4.2.2 Phase 2 (2016-20)

(1) Overview

This is the phase for accelerated development of the new city. Additional public facilities and government functions will be relocated from the existing Kabul city, and urban renewal will be undertaken in the Kabul city by utilizing the land made available by the relocation.

Complementary aspects of the development of the Kabul city and the new city in Dehsabz will be increasingly realized throughout this phase. They may include de-sludging of septic tanks in the Kabul city, and sludge digestion and application to improve soil property in Dehsabz, and disposal of solid wastes generated in the Kabul city by sanitary landfill in Dehsabz. The completion of the Kabul city outer ring road will facilitate complementary development of newly urbanized areas in the Kabul city and the new city in Dehsabz. Population pressure on the Kabul city will be reduced to facilitate urban management of the city.

Construction of dams in both the upper Kabul and the Panjshir basins will be started during this phase to expand water supply capacity for both the Kabul city and the new city. Independent power supply systems will be established by the private sector initiative, including solar and wind generation system. Mini-hydro generation for rural electrification in villages around the new city will be widely practiced.

The zoning ordinance and the national building code enacted during Phase 1 will be widely accepted and applied in practice. They should be continually revised and amended as necessary with feedback from the field applications.

(2) Socio-economy

High value-added agriculture in the Kabul city and greenhouse agriculture in the new city will develop rapidly. Commercial agriculture in Barikab will be fully developed by the private sector. Both greenhouse agriculture in Dehsabz and commercial agriculture in Barikab will produce increasingly for export.

Agro-processing and related agro-business will establish in the new city. An agribusiness park may be established in the new city with marketing center and exhibition hall for agro-products, and laboratory for advanced agricultural technology such as tissue culture as well as agro-processing industries.

Construction and construction materials industries and a wide range of consumer goods industries will continue to develop. Traditional industries selectively strengthened during Phase 1 will start to export their products. With the university and R & D facilities of the Government located in the new city, some high-tech and knowledge-intensive industries may be invited to establish, possibly in a high-tech industrial park in Dehsabz.

International tourism will further develop, including conference tourism. Other forms of tourism may be introduced such as health tourism and agro-eco-tourism. A major theme park may be established by the private sector, possibly featuring heritage of the Silk Road.

Personal, business and financial services will develop rapidly along with the business development. In particular, logistic services will expand as new international trade routes of TRACECA are developed and security conditions improve.

(3) Spatial development

Physical links between the Kabul city and the new city will be strengthened with the completion of the Kabul city outer ring road and the southern extension of the Bagram road. To further strengthen the links, an alternative access from the Kabul city to Paymonar of the new city will start construction.

4.2.3 Phase 3 (2021-25)

(1) Overview

The major dams in the upper Kabul and the Panjshir basins will be completed together with water conveyance pipelines for the Kabul city and the new city, respectively. The early water supply system for the new city will be adjusted including diversion to other uses.

The identity of the new city will have been well established with the recycling of water transferred from the Panjshir river as well as human and solid wastes. Wide use of renewable energy will also characterize the new city.

The zoning ordinance and the national building code will be fully effective and applied widely. A new administration may be established for region-wide governance of the capital region.

(2) Socio-economy

The KMA will become a model region for high value-added agriculture with water saving irrigation techniques. It will become an export base for various agro-products, including those transported from other regions. The Afghan brand will be established in the international market for quality agro-products.

The new city will become a robust industrial heartland of Afghanistan having diversified industrial structure. It encompasses some high-tech and knowledge intensive industries as well as construction, construction materials, consumer goods, agro-processing and traditional industries.

Both the Kabul city and the new city will be equipped with some high-grade services. They include international tourism related services, logistic services, advanced education and research, and specialized health care.

(3) Spatial development

The urban fabric of the new city will be fully developed with the Kabul city outer ring road, the Bagram road and the Dehsabz periphery artery road as main artery roads, network of drainage canals established by improving gullies and a reservoir, and network of pedestrian ways linking urban parks and greenery.

The regional artery network will be fully established, linking the new city effectively with the Kabul city. Logistic facilities such as truck depots, warehouses and wholesale markets, and bus terminals with public or commercial facilities will be located around the nodes linking the regional artery network and the Kabul city road system.

With roadside tree planting for the Kabul city outer ring road, the southern extension of the Bagram road and other roads, the Kabul city and the new city will be linked by the green artery network.

5 ECONOMIC DEVELOPMENT PLAN

5.1 Agricultural Development

5.1.1 Agriculture in Dehsabz

For Dehsabz, a household-based farming system is to be pursued, which should be supported by proper cultivation practice, engagement of family labor, security, defined land ownership, innovation and mechanization as well as managerial ability for productive and sustainable production. In this system, households remain the core of farming to produce largely fruits and vegetables with irrigation, and cultivate cereal (wheat) and fodder crops mostly under rain-fed conditions. The KMA agricultural strategy is to provide incentives and facilities for farming to maximize returns per unit of water and per unit of land, ensuring profitability and engaging a large population in its operation. To realize this, following agro-technical measures are stipulated.

(1) Introduction of water-saving irrigation method

Agricultural water use efficiency in the area is estimated at 25% at present, well below the global standards and the levels of neighboring countries (e.g., 40% in Iran). Considering that the efficiency of some new irrigation methods is up to 90% and the productivity of fields under such irrigation is at least triple that of rain-fed farms, introduction of a water-saving irrigation method is encouraged.

Currently, surface irrigation methods with furrows and flood/inundation are used in the area (see examples below). These methods are low in running cost and easy to apply. However, they are labor intensive, inefficient as they irrigate areas between plants where water is not needed, and not suited to light sandy soils. High seepage and evaporation rates, stagnation and uneven distribution of water, and occurrences of water logging and water-related diseases are other defects.

Thus, a modern and improved system needs to be introduced to overcome some of the disadvantages. Of the modern systems, drip irrigation is known to have 90% efficiency with merits that it is easy to manage/automate and not labor intensive with low running cost and no topography limitation. However, it also has such disadvantages as high initial installation cost and requirements for clean water as well as skill and experience in its operation and maintenance.

Therefore, a hybrid of surface and drip irrigation methods using pipes to supply water to plants, either by gravity or under pressure, is planned (Figure 16). In this hybrid irrigation system, a large pipe (about 200mm in diameter) is used to convey water from the source through medium (140mm) and small pipes (100mm) to the farms. In each farm, the water is then supplied to the plants through smaller pipes. The system has the following advantages:

1) Water flows in pipes so that no seepage/evaporation loss occurs.
2) Water is directly supplied to intended plants, and thus chance of weed growth is minimal.
3) No stagnation of water occurs at undesired points.
4) Uniform and equitable supply of water to all plants is realized.
5) Occurrence of water related diseases is minimized.
6) Valves in the system control and regulate water supply to prevent water losses.

This new system would be gradually introduced into farmlands with the target of covering the entire area by the year 2020, including the task of finding appropriate materials and testing their efficiency for field use.

(2) Rehabilitation and renewal (standardization) of old vineyards and orchards

Most vineyards are old with traditional layout characterized by overcrowded trees with no proper planting distance, and susceptible to pest and diseases, making their maintenance uneconomical. Such vineyards should be gradually replanted with improved varieties demanded by international market. In the renewal, layout, alignment and spacing of vines are carefully considered, and work is undertaken block by block in accordance with farmers' desire and capacity. Vines over 50 years old, and apricot, apple and other trees over 25 years old as well as defected plants are targets of replacement. Poor performances, susceptibility to pest and diseases and less tolerance to weeds are among demerits of aged plantation.

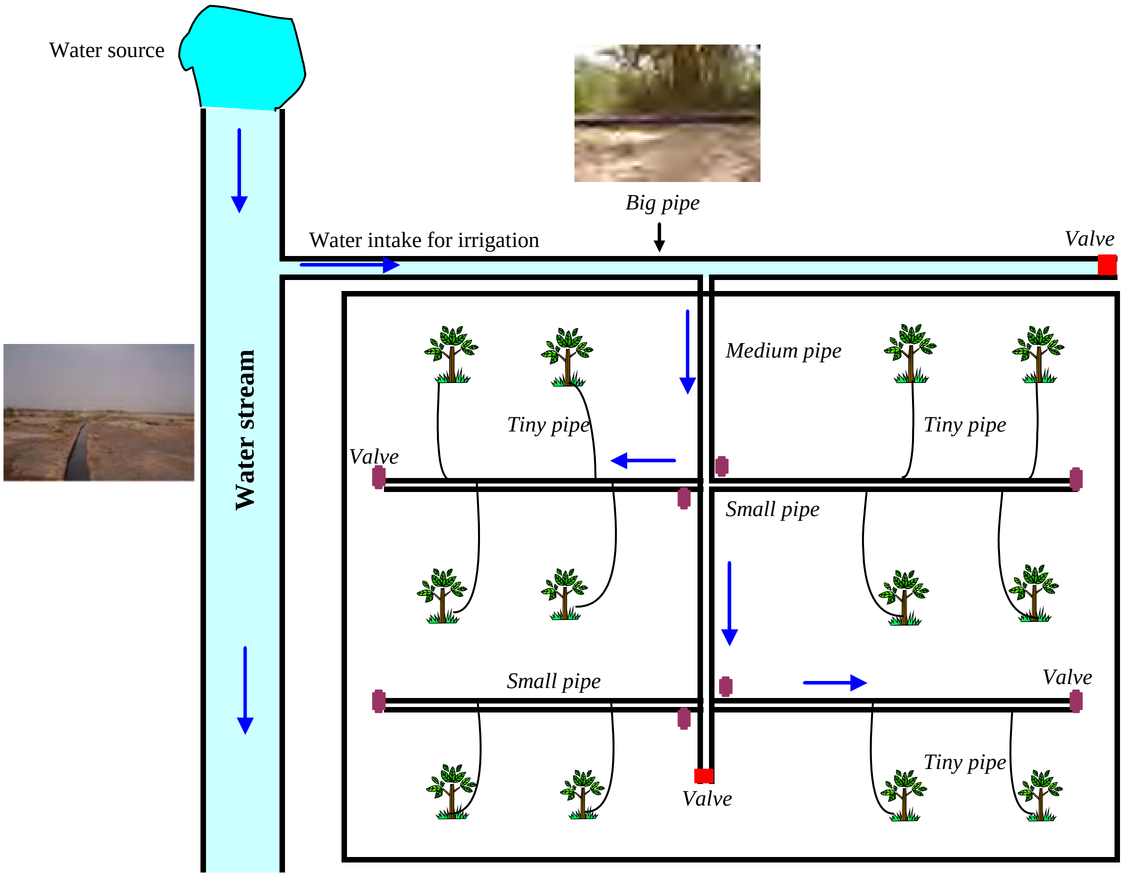

Figure 16 Planned Layout of Crop Production under Irrigation

Due to high water demand, and poor performance of apple in Dehsabz, its planting is discouraged; instead, cultivation of cherry/plum, potato and onion is promoted to gain higher income per unit of land and per unit of water. After removal of trees, the land is cultivated for two year with legume, vegetables, and fodder crops in alteration for betterment of soil condition, and thereafter, saplings of fruit trees are planted to create an orchard. With standardization applying appropriate planting distances in due consideration of nature and physiology of plantation, proper crop selection and efficient farm management, a significant increase in production would be achieved, typically 30%.

In designing new vineyards and orchards, planting distance is so adjusted as to ensure sufficient sunlight and aeration, and to avoid incident of diseases to plants as well as to facilitate farm works such as pruning, fertilization and harvesting. In a renewed area, instead of usual monoculture of grapes, multi-culture of fruits is introduced for diversification, and minimization of risk of crop failure. To have diverse vegetation and reduce chance of pest attack to crops, some non-fruit plants are also planted in suitable points. These may include pine, locust, oriental plane, willow, elm and ash trees, which largely absorb Co_2 and release O_2 in atmosphere. Rehabilitation and renewal works would be accomplished by 2025, as the activities are undertaken gradually and block-wise, to avoid sudden alteration of farming environment.

(3) Systematic control of weed, pest, and diseases

Weeds compete with cultivated crops for water, nutrients and light, and provide shelter to insects and rodents, thereby reducing the crop yield and income of farmers. At harvest, seeds of poisonous weeds could mix with cereal grains to threat the human life. Weeds can be eliminated through a package of cultural, chemical and biological measures.

Cultural measures are to make the fields less favorable for survival, growth and reproductions of weeds. These include uprooting (hand pulling), plowing, strategic starvation, crop rotation, intercropping, increasing crop diversity and promoting sanitation on the farms. Using pure crop seed free of weed seeds and controlling the weeds at their early stage of growth help in easing the problem. Deep plowing of fields before planting crops will bury the weed seeds in deep layers, reducing chance of their germination and growth. Hand pulling is the simplest method that can be realized at a cost of AFN 1000/ha, mostly as labor wage. Chemical measures are herbicide and other organic and inorganic compounds to destroy weeds. In consideration of adverse impact on the environment, affiliated cost and human safety, this measure should be undertaken when absolutely needed. Monuron, Diclofotmetyl, 2-4-D, and Thirsm are some of materials that can be used with care and as prescribed by makers. The cost of chemical weed control is about AFN 1,950/ha, for purchasing chemicals and application wage. Biological measures are animals that feed on seeds or vegetative parts of weeds such as birds and goats. Among these, cultural measures are most suited to Dehsabz, as it is simple, inexpensive, not requiring sophisticated equipment. Women and children can undertake hand pulling of weeds at convenient time.

Pest and disease causing agents are similarly controlled through cultural, chemical (pesticide, insecticide and fungicides) and biological measures, or with an integrated approach to prevent loss and obtain farm products of export quality. Considering the fact that up to 36% of fruits was lost in the Country in 2007 to pest and plant diseases, routine monitoring and destruction of these elements are essential. Maintaining sanitary conditions on farms and disinfection of farm implement would ease/remove the problem. Soil fumigation is also an approach to eradicate most pathogens, weeds and insect pests.

In Dehsabz, diseases of grapes are powdery mildew, anthracnose and mealy bug, which can be controlled by applying lime sulfur, coprolite bule, folidol, and sevin. Rust and early blight of tomato and potato (*Alternaria solani*) are among the diseases that infest cereals and vegetables fields, thus requiring timely control.

Mice (*Mus muculus*) and rats (*Ratus ratus*) are also of pests that impose damages on agricultural products at field and in store, as one rat eats about 22kg of grain/year. These noxious elements are destroyed through mechanical (trapping), chemical (zinc phosphate poisoning) and biological (introducing eager cats) measures.

Of livestock and poultry diseases, FMD (foot and mouth diseases), bangs, anthrax, pox, avian influenza, and Newcastle are to be controlled through preventive efforts, timely diagnosis, vaccination, treatment, and other veterinary and precautionary measures such as quarantine. FMD, avian influenza and Newcastle, are viral diseases; among these, virus causing avian influenza (bird flu) can alter itself to make new strains and cause new diseases in poultry and human, thus requiring careful attention and regular efforts. BSE (bovine spongiform encephalopathy) commonly known as “mad cow disease” has not been reported in Afghanistan.

(4) Provision of on-farm facilities for sanitary harvest and polishing of fruits

Initial cleaning (e.g., washing and removal of damaged fruits), separation and grading (based on the size), and mass packing of harvested fruits should promptly be done at the farms to assure the freshness and timely transport to market/cold storage. For this purpose, sanitary platforms should be constructed in appropriate locations within farming areas. A rectangular concrete platform 1.5m high with $60m^2$ (15m by 4m) space, furnished with a long table and chairs to accommodate 30 persons (for even pregnant women to sit and work comfortably). Restrooms supplied with sanitary kits will be annexed to each platform to assure a healthy and reputable working environment.

For smooth carriage of harvested materials to platforms, on-farm corridors and wheeled implement are provided. To avoid injury to fruits, hard-paper or hard-plastic boxes are used for packing. Shelter for ripening and conversion of grape to raisin are also established adjoining to platforms to ensure timely and sanitary processing. These facilities would be established up to 2015. By ensuring sanitation and food safety, demand for farm produce and income of farmers will increase.

(5) Construction of cold storage

To prevent spoilage of farm products at peak harvest, and ensure availability of goods in market throughout the year, construction of a cold storage with 20,000t capacity is proposed for Dehsabz. The cold storage will be constructed with the latest international standards and layout equipped with modern instruments to assure its efficiency and durability as well as incorporate new technologies in production system of Dehsabz. The target-year for work completion, and operation of cold storage is set at 2020.

The cold storage construction of and food supply regulation would reduce seasonal variations in food availability and contribute to balanced diet and better health of people, and reduction of malnutrition particularly among children. A shelter for conversion of grapes to raisins is also installed in the vicinity of the cold storage to produce raisins in response to the demand. The construction of the platform, shelter and cold storage would lead to more choices in the timing and markets to sell farm products for more profits in better sanitary conditions (Figure 17 for grapes).

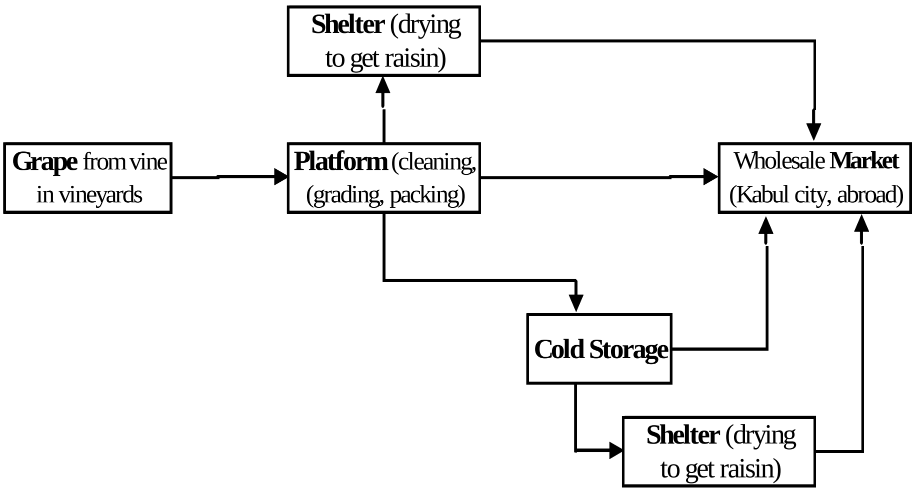

Figure 17 Planned Marketing Channels for Farm Products

In addition to these measures, MAIL as a responsible body for agriculture enhancement in the Country must endeavor in tackling the common/basic issues such as introduction of appropriate machinery and farm implements, provision of improved seed and quality agro-chemicals, strengthening extension services, and facilitating marketing of farm produce at national and international markets.

Agricultural cooperatives have many merits such as collective purchase of input and sales of output, joint efforts for establishment of infrastructure, mechanization, and operation/maintenance of rural facilities, which together bring about decrease in production cost and increase in income to farmers. Thus, formation/strengthening of cooperatives should be positively considered by MAIL, coupled with facilitation of credit/loans to cooperatives/farmers by financial institutions. Establishing a proper pricing system with regular monitoring mechanism to discourage black-marketing of farm input and output needs to be considered by concerned authorities by the MAIL initiative.

As Dehsabz will become an urbanized area with a large population, establishment of livestock/poultry complexes is not planned. This will ensure sanitation of the area and safeguard its inhabitants against incident of livestock/poultry diseases such as avian influenza (bird flu).

(6) General guidance

To improve overall agricultural situations in Dehsabz, following guidance are provided.

1) Accountability of managerial system should be improved through good governance and transparency to attract domestic and global capitals in developmental activities.

2) Damaged and inoperative karez systems should be rehabilitated as they are life-blood of rural areas. Since karez is considered a world cultural heritage, financial and technical cooperation should be sought from UNESCO in restoration works. Malfunctioning of karez systems makes farming vulnerable to droughts. Karez maintenance groups may be established at the district level assembling government personnel, NGOs and farmers to work with support/guidance of UNESCO. Assistance of the international center on Qanats and historic hydraulic structures (ICQHS) in Yazd, Iran may also be sought.

3) Many (about 200) brick-kilns are scattered in the Dehsabz area, using inferior materials as fuel and emitting soot that reaches farmlands affecting the quantity and quality of crops. The concerned authorities should pay attention to this problem and make effort to solve it, for instance, compiling and enforcing guidelines on proper fuel for the brick-kilns in the area.

4) Arrangements should be made for timely access by farmers to agro-inputs as well as efficient, durable and suitable farming implements to facilitate farm works and ensure labor productivity.

5) A system to regularly disperse information on demand, supply and prices of farm products in local, regional, national and international markets through radio broadcasting or by other means to the farmers should be established.

5.1.2 Agriculture in Barikab

For Barikab, a dualistic farming system is planned, comprising large irrigated commercial orchards, grain fields and livestock farms together with cultivation of rain-fed cereals (e.g., wheat) and fodder crops (e.g., green maize) in small holdings. As vast land and water scarcity prevail in Barikab, strategy is to maximize the production per unit of water to justify introduction of the irrigated system.

Considering that no accurate data/information on soil and land productivity of Barikab exists, a package of measures should initially be formulated to identify lands with agricultural potential, and arrange for their efficient utilization. For a virgin land such as Barikab, it is logical and prudent to start development activities with assessment of resources. Mechanization of agriculture will be promoted gradually and in conformity with social, economy and technical progress of the area. The following tasks should be undertaken.

(1) Soil survey

To divide the area in blocks suited for each of intended crops, investigation on soil characteristics need to be undertaken, covering the following.

- Fertility: determining the amount of nutrients (nitrogen, phosphorous and potassium) naturally available in the soil for supporting the plant growth
- Soil reaction: measuring pH to know the degree of acidity-alkalinity in the soil, which influences the plant growth
- Moisture content: amount of water existing in soil in natural condition
- Texture: varying from sand to clay soils
- Structure: having role in soil aeration
- Thickness of layers: important for expansion of plant roots
- Erosion: by which soil particles and plant nutrients are lost

Other characteristics are also to be determined according to situations.

(2) Land suitability classification

Suitability of agricultural lands varies from highly suitable for cultivation to not suitable, depending on such factors as soil and climatic conditions. To designate sites for establishing vineyard, orchard, vegetable plot, grain field, or livestock farms, knowledge on land status is required. Therefore, accurate and suitable classification needs to be formulated to ensure that land will be used according to its respective suitability. Such land utilization not only assures maximum production per unit area but also minimizes the risk of land degradation. A soil survey and land suitability classification will be completed by 2015.

(3) Improvement of waterways

In the area, there are about 10 natural waterways, 3.0m wide and 4.5km long on average, in the direction of Safi mountain-Barikab river. They have been eroded and widened year by year, and thus stabilization works are required to prevent possible land deterioration hazards.

(4) Establishment of nursery

To raise saplings of superior varieties of grapes and other horticultural crops for planting in Barikab, and sending to other parts on demand, a modern nursery of 5,000m^2 space should be established on governmental land where there is no strong wind. The nursery will operate under strict sanitary conditions to produce healthy quality seedlings. The criteria to be considered in selecting crop varieties include high yield, less water demand and resistance to pests and diseases. The nursery will become operational in 2015.

(5) Establishment of agricultural research station

To conduct experiments on plant adaptation, and gradually introduce new superior crop varieties into the area, an agricultural research station should be established in a piece of governmental land with 10,000m2, and furnished with latest instruments. Affiliated facilities and respective space requirements are briefed below.

To conduct agricultural research and experiments and introduce new crop varieties into the area, an agricultural research station equipped with the latest tools and equipment should be established on a government land of 10,000m^2. Its facilities and the respective specifications are described below.

1) Plots with a total area of 6000m^2, fenced to conduct cultivation trials under the natural condition
2) 2 glass structures, 500m^2 each (1,000m^2 in total), with accessories necessary to conduct experiments on the greenhouse effect
3) A laboratory compound with 10 rooms, 20m^2 each (200m^2 in total), equipped with the latest experimental instruments
4) A climatology station on 200m^2 land, equipped with the latest instruments to record and keep accurate climatic data/information (precipitation, temperature and wind)
5) A library of 60m^2 to be built nearby the laboratory compound to store documents on methodology and results of experiments conducted at the research station together with relevant scientific reference materials for public use
6) 5 offices, 20m^2 each (100m^2 in total) with computers, office equipment and file cabinets to provide work environment for staff
7) A dinning hall of 200m^2 with a kitchen and self-service facilities
8) A storage facility of 75m^2 to keep materials, equipment, instruments and spare parts
9) Lodging facilities with 4 rooms of 10m^2 each for the research station personnel
10) 2 amenity complexes, 12.5m^2 each (total 25m^2), with a prayer-room, bathroom, toilet, and washing machine
11) The remaining 2,100m^2 area to be utilized as yards and parking lots for vehicles and machinery

The station needs to concentrate on plant-genetic works for improvement/adaptation of new crop varieties for resistance to clod/drought injury, high yield, and resistance to pest and diseases as well as generation of new products with high market demand. With time and progress of works, it can also create a gene-bank for conserving genes of various plant varieties to serve the entire Country. As it requires site selection and careful designing, the station would be operational in 2020.

In connection with establishment of research station, it is noted that the Afghanistan Research and Evaluation Unit (AREU), established by assistance communities working in Afghanistan (e.g., UN, multilateral agencies, NGOs, etc.), usually gets involved in research works, and voluntarily implement small-scale on-farm trials to examine impact of new input/innovation in farming systems. AREU is a potential source to be approached by MAIL at the time of arranging for the establishment of the research station in Barikab.

The station needs to establish close and collaborative relationships with international research and training institutes such as International Maize and Wheat Improvement Center (CIMMYT), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), International Center for Agricultural Research in the Dry Areas (ICARDA), and the JICA training center in Tsukuba for enhancing its capability. Other potential organizations for the benefit of the station's activities include the Faculty of Agriculture of the Kabul University and the Professional Development Institute of American University of Afghanistan, a non-profit organization in Kabul. The existing agricultural research center in Darulaman, established with the support of JICA, may be transferred and become the core of the station to be established in Barikab.

(6) Establishment of new vineyards and orchards

Upon delineation of land suitability classes, the sites for growing grape, almond, apple and other fruit trees are selected and planted with saplings of the respective plants by applying international standards and using modern farming techniques. The saplings obtained from the nursery are planted with attention to the following.

The vineyards are irrigated by a pipe network delivering water by gravity or pressure as described in the section of Dehsabz. Vine saplings are planted 2.5m apart from each other. Besides watering, other cultural tasks such as fertilization, pest and weed control, and pruning are performed routinely to ensure vigor growths of the plants and the productivity and profitability of the vineyards. To uphold the vines and facilitates farm works such as pruning branches and harvesting the fruits, a network of poles and wires will be introduced in vineyards. The irrigation system is so designed to nullify the probable negative impacts such as soil salinization, water logging, incidence of water related diseases, and spread of pest and plant pathogens.

In orchards, almond, apricot and apple saplings are planted at a distance of 5m from each other but pomegranate at 3m intervals within a row and 4m apart between rows. As mentioned for vineyards, all farm works are also undertaken routinely to maintain the orchards in a reputable condition. Appropriate distancing is important to ensure sufficient sunlight and air, prevent damage by pests and diseases, and facilitate farm works such as weeding, pruning and fertilization.

As in the case of Dehsabz, for the vineyards and orchards in Barikab also, platforms for sanitary harvest and polishing of fruits as well as a shelter for the conversion of grapes to raisins are similarly constructed at appropriate locations. Similarly, in accordance with land suitability, plots for growing commercial flowers, melons and vegetables are delineated and planted with superior varieties, using the most efficient cultivation methods. To facilitate pollination of trees and promote apiculture, some honeybee hives are set in appropriate locations within the cultivated area. Durable greenhouses for mass production of vegetables in off-seasons are to be established at locations with easy access to major roads for direct marketing of produce. Further, the establishment of new plantations in Barikab will contribute to the fulfillment of the target set by Agricultural Master Plan (2005) to establishment 70,000 ha of new orchards in the Country in a decade.

(7) Establishment of livestock and poultry compounds

To ensure regular supply of dairy and poultry products to the KMA inhabitants, complexes for raising livestock and poultry are established in lesser-grade land plots (quality land for crop cultivation). In the livestock compound in a complex, a mixed population (500 heads) of local and hybrid milking cows are reared to produce about 1,700 tons of milk per year. With the mixed population, a cow produces 3.4 tons of milk per year on average. By mixing different breeds, the risk of occurrence and spread of diseases is reduced. Male calves born in the compound are reared for meat, and aged cows are slaughtered for hide and meat for processed meat products (e.g., sausages and canned foods). The compound built to the latest standards operates under strict sanitary conditions to promote consumers' confidence in Barikab products. As daily exercise, the cows may walk to Barikab river, drink water and return to the compound, saving cost of onsite manual watering.

A poultry compound for egg and meat production is set apart from the livestock compound also on a lesser-grade land plot in a complex. Indigenous and hybrid poultry breeds are introduced to diversify poultry products.

In Afghanistan, livestock and poultry raising is traditionally carried out by women. Thus, most of the jobs in the complexes to be established in Barikab may be offered to women to exploit their expertise and promote their economic and social status.

Arrangements need to be made for collection of livestock and poultry manure and its utilization in the farming area after it is converted to compost in the designated facilities. Feeding the plant residues generated in farmlands to livestock, either directly or after simple softening treatment, will reduce the operation cost of the complex.

(8) Construction of cold storage

A cold storage of 20,000 tons capacity will be constructed in a piece of land having poor soil conditions unfit for cultivation. It is established with the same standard and in same manner as described in the case of Dehsabz, up to 2025.

An efficient mechanism for communication between cold storages in Dehsabz and Barikab will be established for enabling their managers to inform the vacancy and surplus to each other and arrange for smooth accommodation of materials in either side.

(9) Designation of pastureland

Areas unsuitable for crop production are designated and promoted as pasture through a simple and economical measure, using human and livestock labor. After delineating an area as pasture, a herd of local livestock is allowed in to disturb the soil. The herd is dismissed, seed of pasture crops is spread by local labors, and again the herd is guided into the area for covering the seeds. Pasture seeds fitting the area are broadcasted at onset of rain and left to grow under rain-fed conditions. Seeds of fully matured vegetation are manually collected for being sown in the consequent year through the same procedure. This measure besides generating feed for livestock helps in soil conservation and efficient utilization of land and water resources.

In realizing these developmental measures, technical, financial, and skills of governmental institutes, donor/NGOs, private sector, agricultural cooperatives, and individual farmers are foreseen and highly expected. Each contributor can have its share and gain respective profits generated through operation of the facilities.

(10) Establishment of a farmer-house

To provide the farmers with a place to gather for meetings, lectures and training, a house will be built on low quality land ($50m^2$) preferably with easy access to roads. It is a simple precast structure equipped with basic furniture (e.g., tables and chairs), audiovisual instruments, board and other teaching materials. Later, the findings of research conducted at the research station will be conveyed and new farming techniques transferred to the farmers through this house. The house is expected to open in 2015 for the farmers.

(11) General guidance

To improve agriculture in Barikab so that it will become more sustainable, functional and productive, some general guidelines are provided below.

1) With the expansion of agriculture and introduction of machinery in farms, shops for provision of spare parts, repair and maintenance services for equipments and machinery need to be set up in the area through encouraging the private sector.
2) As strong wind is common in Barikab and application of farm machinery is planned, use of semi-dwarf crop varieties is recommended; tall variety is affected by wind, and dwarf variety disturbs operation of machinery.
3) Measures should be taken for rainwater harvesting and use in agriculture.
4) Upon confirmation of land suitability, potato should be incorporated as a strategic crop in farming system of Barikab; potato yield and income per hectare is 3-5 times higher than cereals (wheat), thus enabling to feed a larger population in drought and emergency cases.
5) MAIL and its local unit should encourage and support formation of agricultural cooperatives/farmer groups as well as provide extension services to them.
6) Incentives should be provided to encourage engagement of the private sector, particularly those affiliated to MAIL for accelerating the development process.
7) Attention should be paid to utilization of wind and solar energy in agriculture, such as lifting water from wells and simple processing.
8) About 25 brick-kilns, exploiting groundwater from 13 wells, presently operate in the area; these units utilized inferior materials as fuel and emit soot, which can impose adverse impacts on crops. Therefore, developers need to pay attention to this issue and deal with it in the course of development.

5.2 Industrial Development

5.2.1 Industrial parks development

(1) Dehsabz First industrial park

This industrial park is located in Dehsabz north area with the industrial area of 150 ha. Targeted sub-sectors are food and beverage industries. The total amount of employment is about 21,000 and the estimated amount of value-added is US$ 123 million.

(2) Dehsabz Second industrial park

This industrial park is located also in Dehsabz north area with the industrial area of 150 ha. Targeted core sub-sector is wearing apparel for domestic consumption and exports. The total amount of employment is about 20,000 and the estimated amount of value-added is US$ 100 million.

(3) Dehsabz Third industrial park

This industrial park is located in Dehsabz south area with the industrial area of 150 ha. Targeted sub-sector is high- and medium-high technology manufacturing such as electrical machinery and manufacturers of medical, precision and optical instruments. Also this park has the feature of industrial research park or multifunctional industrial park with other sectors such as knowledge-based service sector including health and education. The total amount of employment is about 18,000 and the estimated amount of value-added is US$ 114 million.

(4) Barikab industrial park

This park is located in the Barikab area. The industrial area amounts to 200 ha. The feature of this park is resource-based food processing industries for domestic market and exports. The total amount of employment is estimated at 24,000 and estimated amount of value-added is US$ 144 million.

Table 7 Summary of Proposed Industrial Parks

Industrial park	Status	Location	Area (ha)*	Features/major sub-sectors	Estimated employment opportunities	Estimated value-added US$10^6	Implementation entities & schedule
Dehsabz First	New	Dehsabz North	150	Food and beverages	21,000	123.2	Private Sector 2020-2025
Dehsabz Second	New	Dehsabz North	150	Apparel	20,000	100.2	Private Sector 2020-2025
Dehsabz Third	New	Dehsabz South	150	High/medium-high technology manufacturing (electrical machinery, etc.)	18,000	114.4	Private Sector 2020-2025
Barikab	New	Barikab	200	Resource-based food processing	24,000	143.9	Private Sector 2020-2025

* net industrial area

Source: JICA Study Team

5.2.2 Industrial zone in the 26 Dalwa project area

Under the 26 Dalwa residential project for some 800 ha with 150,000 population, which is located in the Dehsabz north area, implemented by MoUD, development of an industrial zone of about 60 ha for small and medium enterprises (SMEs) is designed. Although this area is slightly far from the center of Kabul city and it may be difficult to attract SMEs which want to relocate, it is possible for SMEs to start business in response to the demand in the new city.

5.2.3 Comprehensive SME development program

In Kabul, there are a large number of small/household industries such as manufacturers of carpets and rugs, pottery, food (e.g., confectionery), building materials, wooden furniture, and so on. Some of them are informal, unregistered and untaxed. Based on the industry survey, issues on regulations (tax and incentives), access to market (local, import, export) and financial constraints are raised among SME besides issues on land and electricity. These issues are interrelated and difficult to solve independently. Thus, a comprehensive SME development program should be formulated by MoCI, AISA, the Afghanistan Chamber of Commerce and Industries (ACCI) and other relevant agencies. The program should cover the followings.

(1) Business development

This component includes business development services (BDS), promotion of marketing, capacity building, and strengthening of business associations. Some of international NGOs and donor agencies such as USAID have already undertaking these tasks.

(2) Development of finance system

Establishment of an official fund or bank for SMEs should be taken into account in the program. The fund or bank which provides a loan with preferential interest rates can support firms which have an expansion or rehabilitation program on the long-term basis..

(3) Cooperation with legal and institutional reforms

The Government makes efforts to construct legal and regulatory frameworks such as the Law on Private Investment of Afghanistan and other commercial laws for private sector development. The program should incorporate the progress of the legal and institutional reforms.

5.2.4 Strengthening of vocational training system

The results of the industrial survey show that only 21% of respondents said that they had already paid for vocational training (in almost all fields of activity: textile, construction, machinery, furniture, and plastic production). Of the respondents, 77% did not provide any kind of training to their employees. Thus, the vocational training system should be strengthened to raise technical level of employees in cooperation with the central and local governments, donor agencies and private sector.

Establishment of a Skills Development Fund (SDF) is an option to provide technical training. The SDF aims to provide financial assistance to employers in SMEs to encourage them to train and upgrade the skills of their workers. Financial resources of the SDF may be supported by the Government and the private sector. In Yemen, the government levies a sort of vocational training tax on firms with certain number of employees and pays 50-80 percentages of training fees for owners who provide the vocational training to their employees.

5.3 Services Development

The new city would have to accommodate some 430,000 employment opportunities for commerce and services, excluding government employees, by offering various offices, commercial establishments, public and institutional entities, and education, research and other social facilities. Part of them is accommodated in multi-story buildings. As a function of the new city, it is expected to be a center for high-grade services such as finance, insurance and communication. In accordance with the development of new city, demand responsive services such as business and social and personal services including health and education may be flourished. Also, international conference business may be promising if security situations are improved.

6 LAND DEVELOPMENT PLAN

6.1 Land Development Plan for KMA

6.1.1 Land capability for development

A land use plan for the KMA is prepared to guide the urbanization for both the realization of more desirable urban spaces and the preservation of greenery and agricultural land as much as possible. The basic idea of the land use planning is to indicate broadly general uses of different areas allowed in line with the desirable urbanization pattern rather than to designate the precise land use for each area.

Along this idea, such areas that may be used for future development are identified by using several criteria. The more important criteria used for the present analysis are the topography or the slope of land, access from the existing urban areas directly or through artery roads, protection of agricultural land, geology or more specifically the vulnerability to earthquake risk, and the environmental consideration represented by the need to protect watershed areas. The specific criteria used for the analysis here and the land classification by each criterion are summarized in Table 8.

Table 8 Criteria and Classification for Land Suitability for Urban Use

Criteria	Land suitability classification	
A. Topography	1. Slope less than 4 degree 2. Slope between 4 and 10 degree 3. Slope larger than 10 degree	
B. Access	1. a & b 2. a or b 3. Otherwise	where a: within 1.5km band on both sides of main arteries or within 1.0km band on both sides of secondary arteries, and b: within 2km radius from main intersections or within 1.5km radius from secondary intersections, where main artery + main/secondary artery = main intersection, secondary artery + secondary artery = secondary intersection
C. Protection area	1. Existing agricultural land, except high potential areas 2. Other areas	
D. Geology	1. Outside the band of major fault lines (0.5km on both sides of major fault lines) 2. Within the band of major fault lines	
E. Watershed	1. Area with slope larger than 7 degree 2. Other areas	

Source: JICA Study Team

These criteria and classification are represented by GIS thematic maps. These maps are then overlaid by GIS to define land suitability for development. The urbanization areas where future urbanization would be allowed are generally outside the watershed areas, having favorable conditions such as relatively flat land, good access, free from existing agricultural land, and without direct threat from earthquakes. Within the watershed areas, limited areas are identified for careful development. The results are compiled by the GIS into a land suitability map (Figure 18).

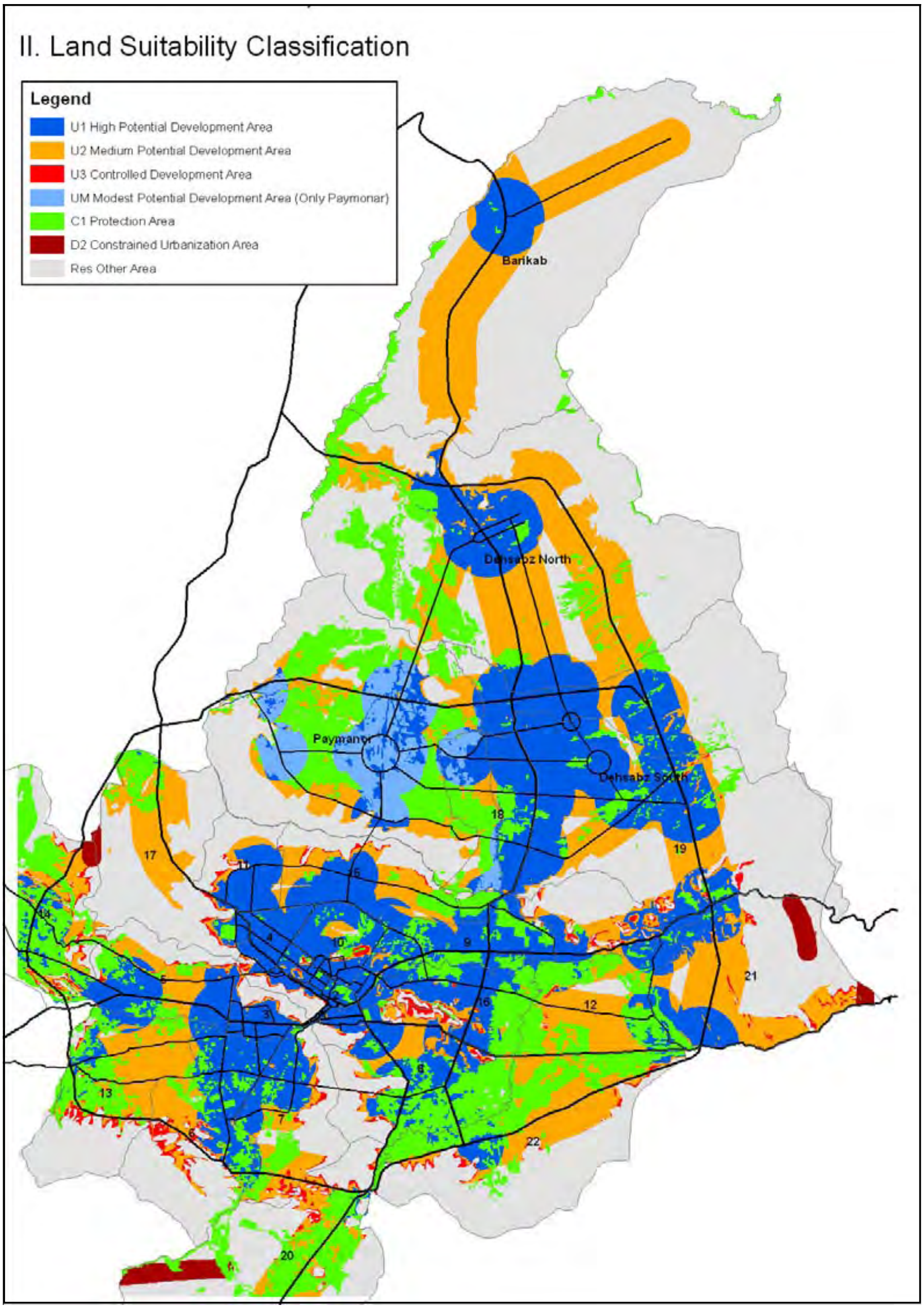

Figure 18 Land Suitability for Development in KMA

6.1.2 Directional land use plan for KMA

The existing land use map has been prepared based on satellite imagery as shown in Figure 19. This is overlaid with the land suitability map by the GIS, and a future land use map is prepared to indicate the desirable land use pattern to be realized in the long run. This is called a directional land use plan as opposed to a definitive land use plan (Figure 20).

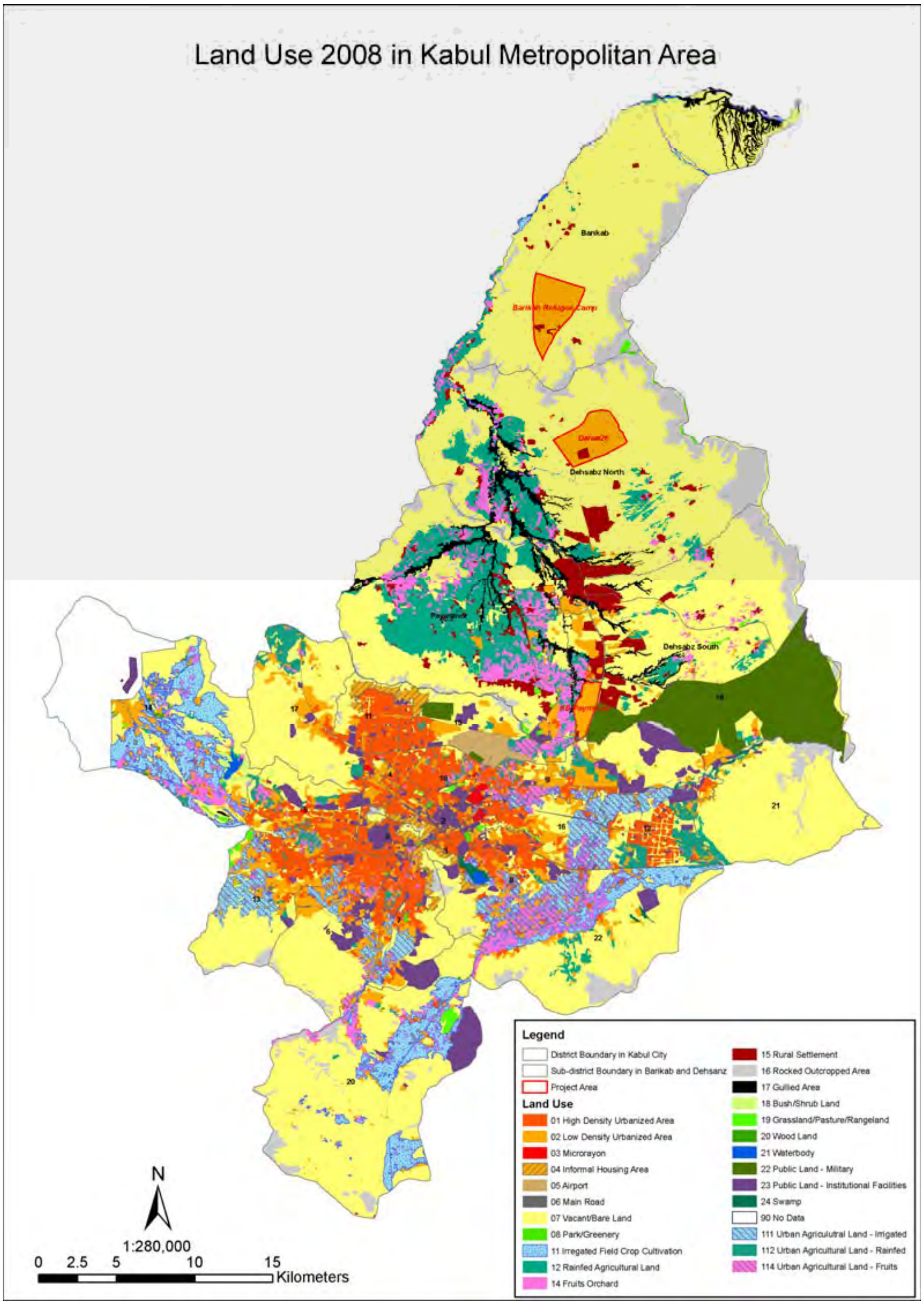

Figure 19 Existing Land Use in KMA

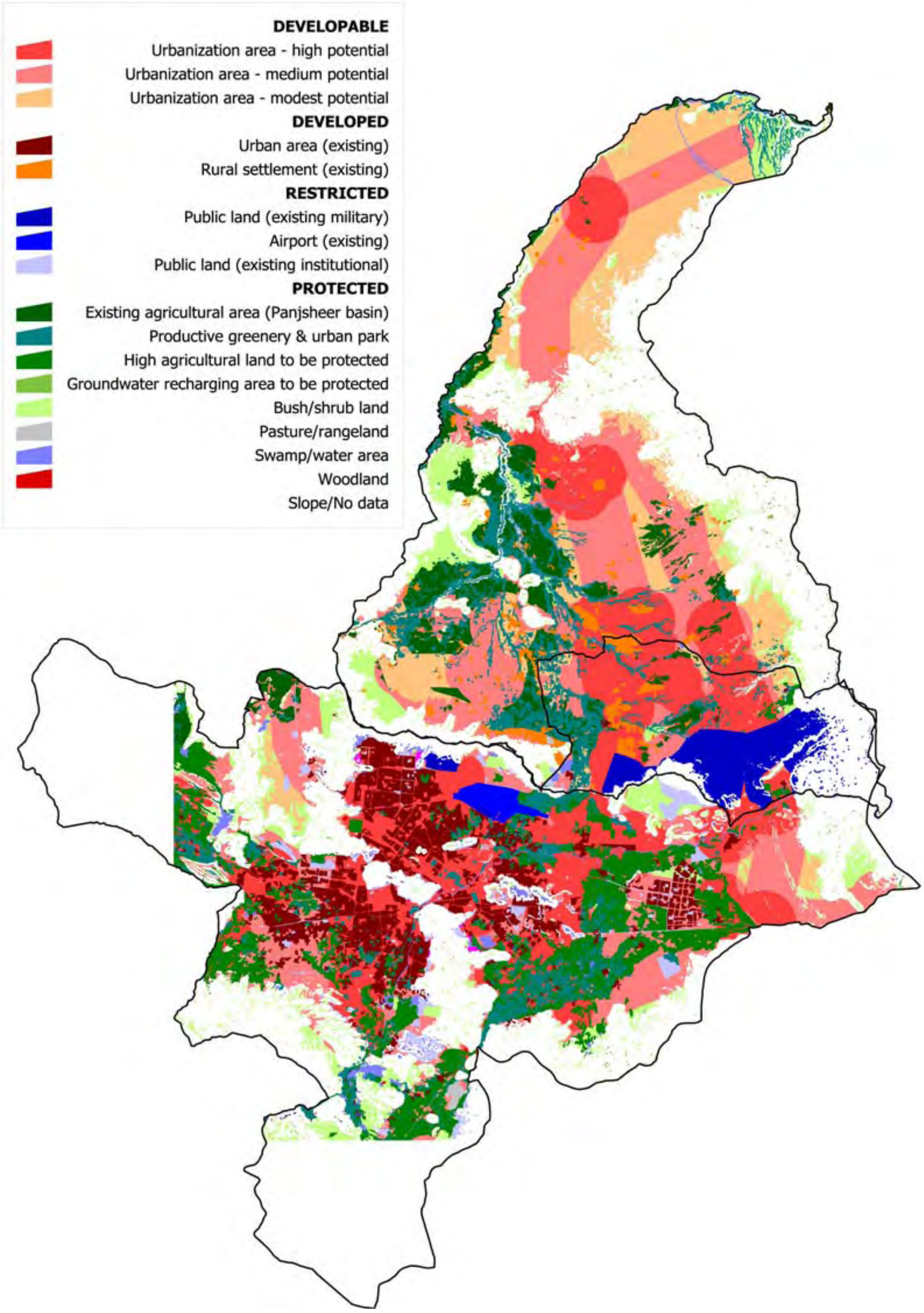

Figure 20 Directional Land Use Plan for KMA

6.2 Land Use Plan for the New City

6.2.1 Existing projects

Many development projects were planned and partly implemented in Dehsabz particularly along the Bagram road, mostly without official permissions (Figure 21). Most of them have been suspended except those undertaken by government agencies (Figure 22).

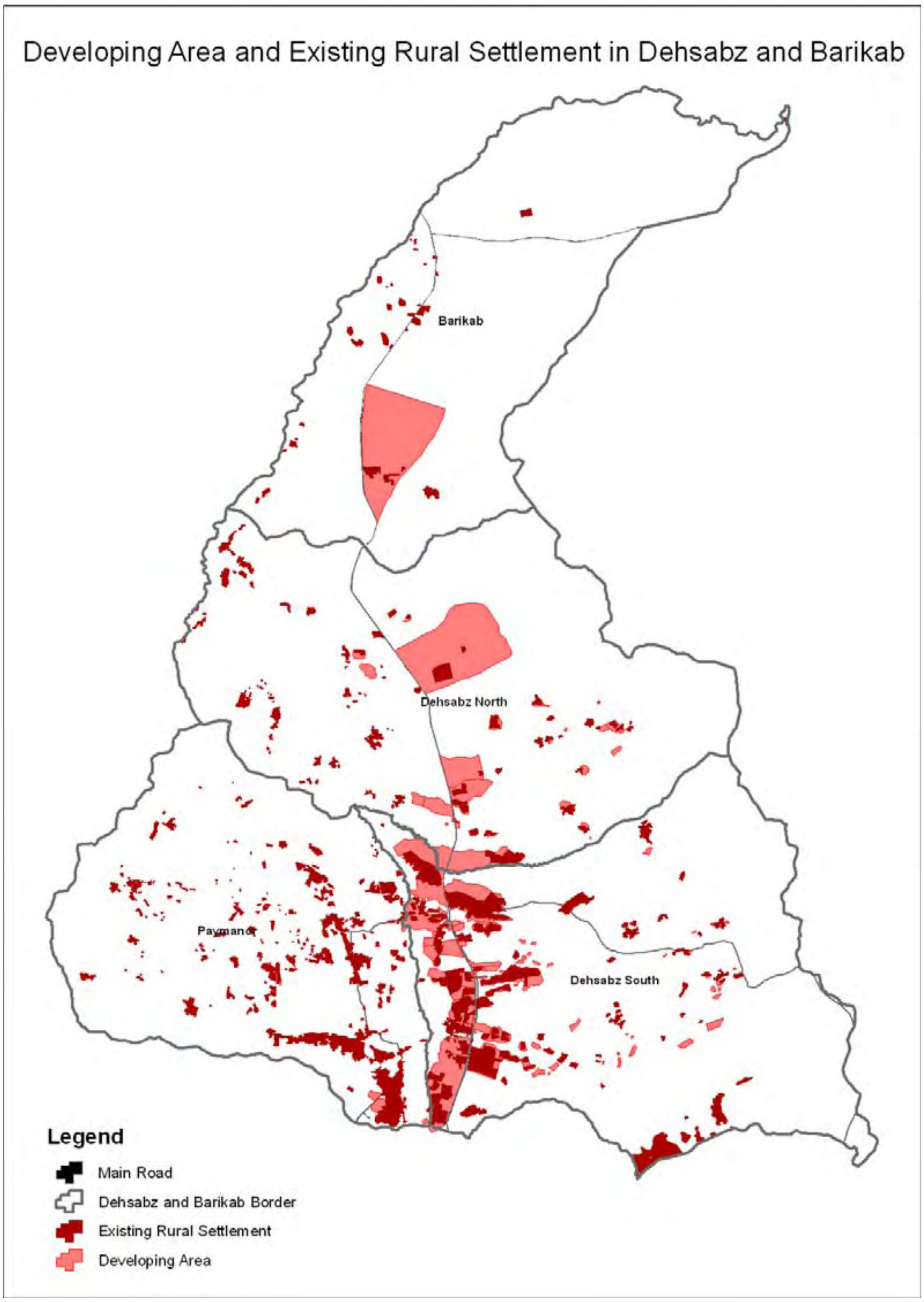

Figure 21 Distribution of Ongoing Development Areas in New City Area

(1) 26 Dalwa project

The project is planned by MoUD to provide 20,000 housing units for the planned resident population of some 150,000, mainly government officials and their families. The project site is located in the south of the borderline between Dehsabz and Barikab. The work in the field is in progress, and its completion is expected by 2015.

As of November 2008, grading of one district was completed with 10km of paved district road. Construction of part of medium to high-rise apartment buildings and grading of outer road is expected in 2009. Also an independent water supply system is planned by using wells around the Barikab river.

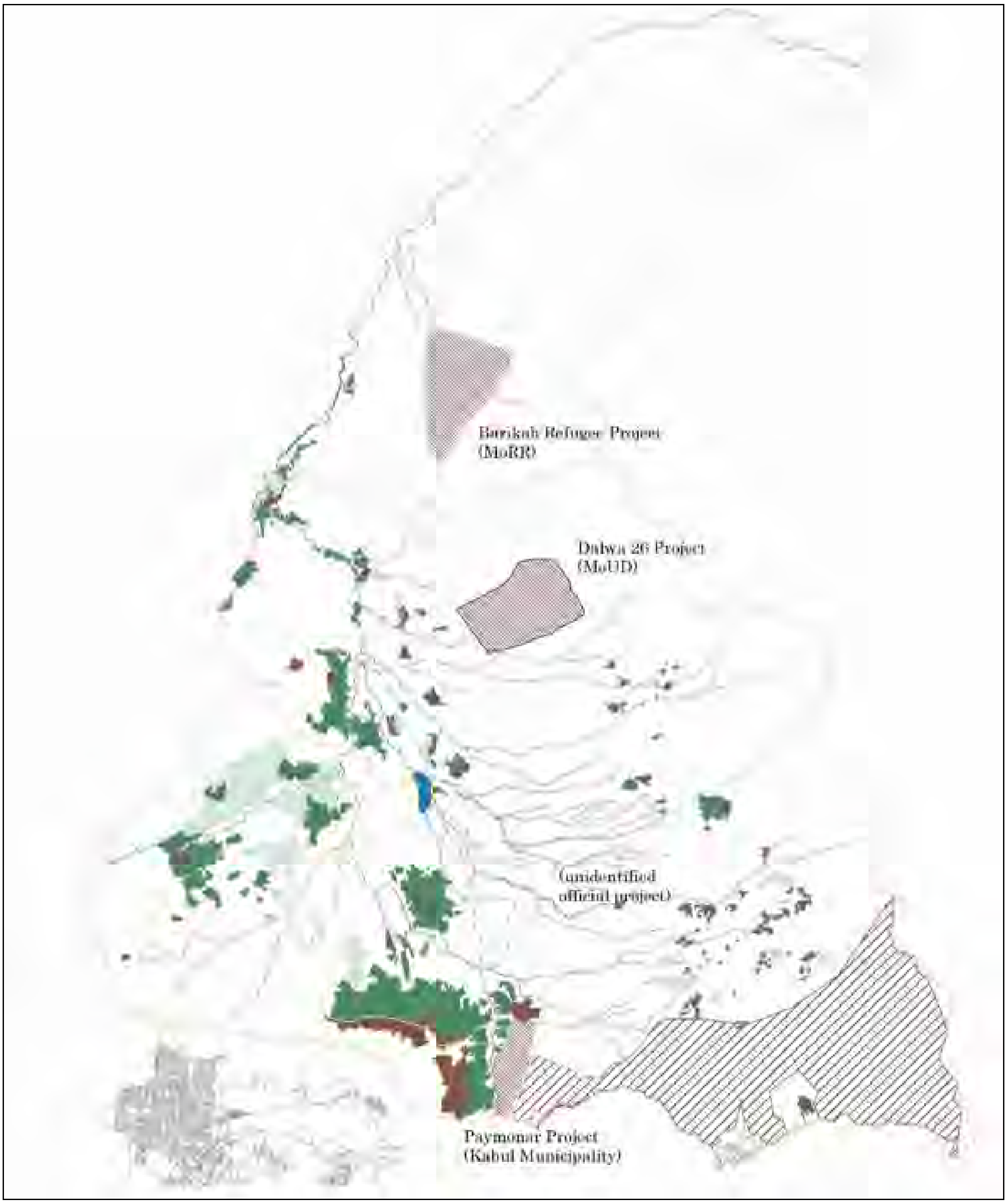

Figure 22 Locations of Development Projects by Government and Kabul Municipality

At this moment, the following two issues are pending. First, the Ministry of Education needs to be consulted for construction of new schools in the project site and arrangement of teachers to see if budgeting is done by MoE. Second, investments from abroad are expected for construction of medium to high-rise apartment buildings in the central area.

(2) Paymonar project

This project is for housing development by the initiative of the Kabul municipality. The site is located in District 18, adjacent to the Bagram road. The land area is 381 ha for 7,100 lots to be used for individual housing units of one or two stories and medium rise apartment buildings. The planned population is 51,721 persons. Planned land use of the project site is mostly residential. Workplaces and other activities are not planned, and residents are expected to commute to the central part of the Kabul city.

Construction works are planned to start from the 21st of March 2009 in its 1st phase areas, which occupies the southern part of the site. Construction of the northern part follows after the completion of the 1st phase area, and is expected to be completed within 10 years.

The most critical issue of the project is availability of water supply. No assurance has been obtained for water supply, and new residents are expected to sink their own wells in their lots until a piped water supply is provided. Also, there remains a necessity to negotiate with landowners about land acquisition for the 2nd phase area.

(3) Settlement for returned refugees in Barikab

The project is initiated by the Ministry of Refugees and Repatriation supported by UNHCR. The project site is located in the north of the borderline between Dehsabz and Barikab. The project will provide 7,262 housing lots in total and 40,000 to 50,000 residents are expected to settle. Planned land use of the project site is mostly residential, no workplace and other activities are planned and residents are expected to go to workplaces in towns in the vicinity.

Grading works for 450 lots have been completed until the end of 2008 and works for additional 1,100 lots are planned for 2009.

Due to difficult water availability, the total population will be limited to 20,000 until other new water resources are found and tapped. For securing additional water resources, the project office is prospecting with wells around the Barikab river. Farmers around the wells protest for water extraction and the conflicts seem difficult to be resolved in a short time.

6.2.2 Population and land distribution

(1) Population distribution

From the frameworks presented in Section 3.2(2), the population distribution in 2025 is as shown in Table 9.

Table 9 Population Distribution in New City Area

Category	Barikab	Dehsabz N	Dehsabz S	Paymonar	Total
Newly planned area	140,000	320,000	382,000	271,000	1,113,000
Ongoing/planned projects	45,000	150,000	51,721	0	246,721
Existing villages	9,841	31,376	27112	71671	386,721
Total	194,841	501,376	460,833	342,671	1,499,721

Source: JICA Study Team.

(2) Barikab

Assuming the average number of family members at 7.0 and the average land area per family at 2,000m^2, the total land area required for the planned population of 140,000 in 2025, the total land area necessary for housing is 4,000ha. This may be provided by the land for suburban residential area and part of agricultural expansion area. In general, rural households have much larger family members living in the same compounds, and thus the average size of semi-rural housing compounds may be much larger than 2,000m^2. It is expected that home gardening and orchards would be practiced in most of them.

(3) Dehsabz

To accommodate the planned population of 973,000 in 2025 in the newly planned development area at the average population density of 140/ha, the total land area of 6,950ha is required. The following conditions should be applied to the new residential area.

1) Of the gross area, 20% should be devoted to community roads and public facilities.

2) The per capita area of 12m^2 should be ensured for urban parks.

Then the net land available for the residential area is about 4,350ha. This may be distributed to the three sub-areas as follows: 1,450ha in Dehsabz north, 1,500ha in Dehsabz south, and 1,400ha in Paymonar.

(4) Distribution of residential area by type

The residential area in the new city is panned with three types of density: low, medium and high density. Each type of residential area accommodates low, medium and high-income families. The distribution of residential area by type is planned for 2025 as summarized in Table 10.

Table 10 Distribution of Residential Area by Type in New City

Type of housing	No. of units	Unit land area (m^2)	Gross land area (ha)
1. Low-density residential are			4,110
Detached housing for high-income families	16,000	1,000	2,150
Detached housing for low/medium-income families	27,000	500	1,960
2. Medium-density residential area			1,250
Detached housing for medium-income families	20,500	400	1,250
3. High-density housing			1,500
Apartments for high/medium-income families	48,000		1,000
Social housing for low-income families	40,000		500
Total	151,500		6,860

6.2.3 Land use plan

Within the framework presented in Section 3.2 and the conditions described above, the land use plan for the new city is prepared as shown in Figure 23. Concepts of different land uses are described. In particular, social considerations are reflected in the land use planning as follows:

1) Four sub-centers are defined to facilitate each to develop into a set of urban communities rather than one mega city.
2) There will be sufficient employment opportunities in each of sub-centers for respective residents.
3) The easy access to central greenery will be provided for daily use by residents in each sub-center together with some public facilities, while the central park serves mainly as weekend resorts for many including visitors from outside.
4) Shopping for daily needs of residents will be satisfied at district commercial zones.
5) Plenty of greenery will be provided in the central park and district parks, along artery roads and on the banks of enhanced gullies as well as in the villages surrounding the new city as a necessary condition for healthy urban life.

(1) Sub-centers

Sub-centers of Dehsabz south and Paymonar are planned with central greenery respectively in the core, where some cultural, education and administrative facilities are arranged. An excessive concentration of urban functions and population would be avoided by providing the low density core zone in the central part of each sub-center. Each core zone offers affluent urban space with service facilities accessible by residents in the respective sub-areas.

(2) Business and administrative zones

Business and administrative zones are arranged surrounding the central greenery of each sub-center. Each block is a zonal area with 200 to 300m depth. Governmental facilities, offices of private companies, central market and specialty stores are to be located in these zones.

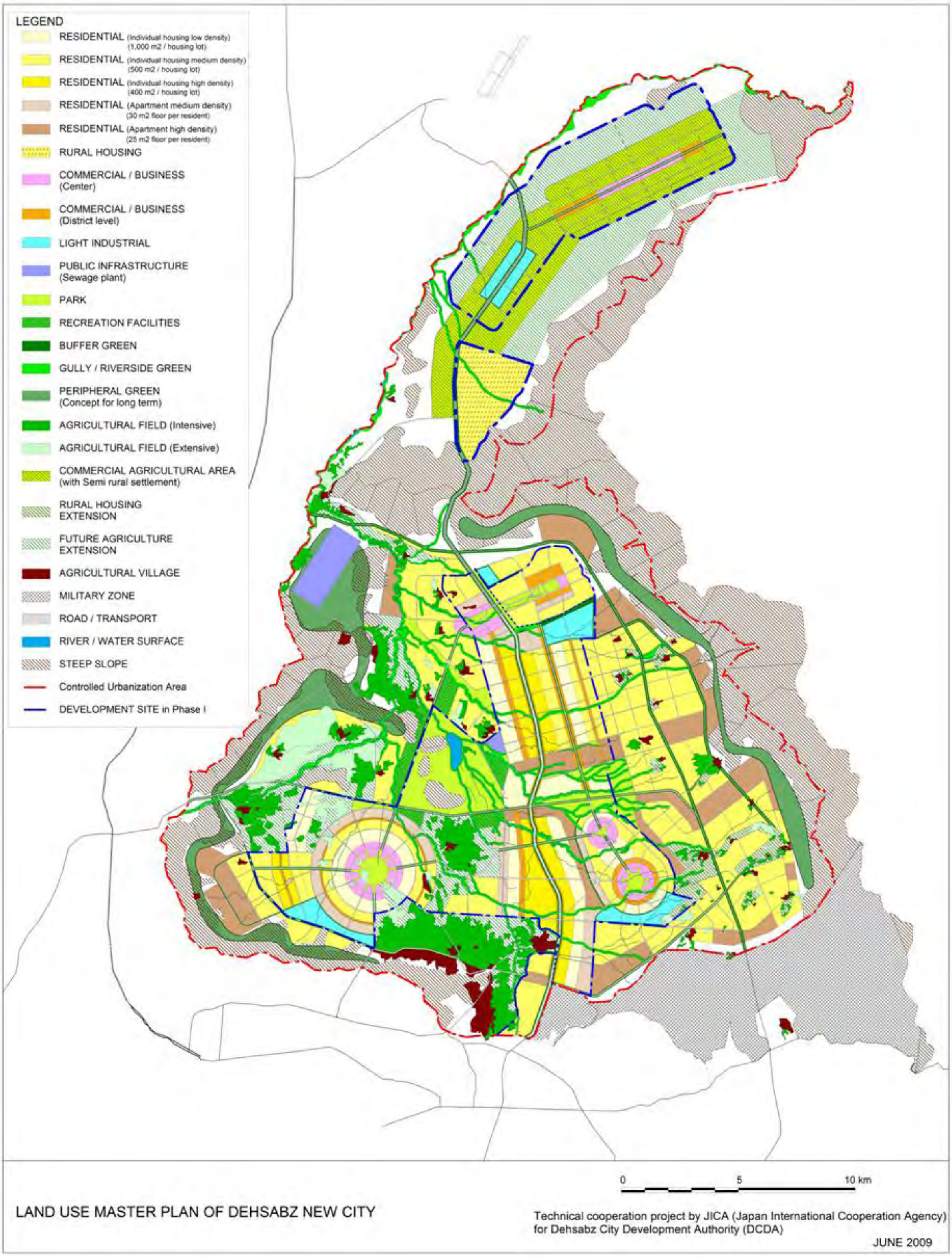

Figure 23 Land Use Plan for New City

(3) District commercial zones

In the Dehsabz and the Paymonar areas, district level commercial zones are planned as zonal areas with 50m depth. In the Barikab area, it is planned as extension of the central business and administration zone along the main street.

(4) Industrial zones

Industrial zones of various types are arranged in peripheries of the core of each sub-center. These sites are located adjacent to arterial roads. The vehicle access to the industrial zones and the core of each sub-center can be clearly divided by this zoning. Also, these sites are surrounded by buffer greenbelts for reduction of noise and other environmental problems. An alternative site for the industrial zone in Dehsabz south has been proposed along the southern border of the new city, but has not been formally approved by the DCDA Board. Alternative sites have also been suggested for industrial zones in Paymanor and Dehsabz north in peripheries, respectively.

(5) Greenbelts

The greenbelts in the new city are creates by linking existing agricultural fields and villages, and expansion of agricultural fields in the future by artery roads with road-side plantations. The latter should have at least 50m band on both sides of artery roads.

(6) Buffer green

Along arterial roads, green bands of 30-50m width are planned on both sides. Also, green belts of 30-50m width are arranged in outer areas of the industrial zones.

(7) Other greenery

Other greenery consists of riverbank greenery along gullies, the central park, recreation area planned for hotels, golf course, ecological theme park and other recreational facilities.

6.2.4 Commercial/business areas planning

(1) Classification

The new city is planned with the core commercial/business and the district commercial areas. The former is located in the core area of each sub-center, and the latter is located in each district rayon or neighborhood unit. The core commercial/business areas would accommodate large-scale buildings for large and medium enterprises. The district commercial areas would be for medium and small-scale buildings for medium and small enterprises and shops.

(2) Unit floor area requirements

The floor area requirements for business buildings are estimated based on the net unit floor area requirement of 18m^2/employee and the net/gross floor ratio of 0.8. For commercial facilities, the following gross unit floor area requirements per inhabitant apply: 0.30m^2/person at neighborhood level, 0.30m^2/person at district rayon level, and 0.35m^2/person at sub-center for the total of 0.95m^2/person.

(3) Floor area and land requirements in 2025

Of the total service sector employment, office worker type employees would be 740,000 in 2025, of which 80% would be in the core commercial/business areas and 20% in the district commercial areas. The distribution of employment, floor area and land area for commercial/business activities in 2025 is planned as summarized in Table 11.

(4) Floor area and land requirements at ultimate development

For the ultimate population of 3million, the number of office workers would be 1,480,000, of which 65% is in the core commercial/ business areas and 35% in the district commercial areas. The distribution of employment, floor area and land area for commercial/business activities at ultimate development is planned as summarized in Table 12.

(5) Development control

To avoid the speculative investments into commercial facilities, that may result in their over supply and price declines, the provision of commercial spaces should be controlled according to the demand. For the core commercial/business areas, planning indices should be promulgated to specify developable lots and their dimensions in advance. They may be changed in the long run as the demand increases significantly. For the district commercial areas, planning indices should be fixed and development area should be extended as the demand increases.

Table 11 Distribution of Commercial/Business Employment, Floor Area and Land Area in 2025

(Business / commercial area, 2025)

	Office employees (1,000)	Office space (gross, m^2)	Population (1,000)	Commercial floor area (gross, m^2)	Total floor area (m^2)	Business/ commercial area (gross, ha)	Land area (net, ha)	Floor area ratio (%)
Barikab	72	1,620,000	195	78,000	1,698,000	116.4	93.1	200
Dehsabz N	150	3,375,000	501	200,400	3,575,400	112.9	90.3	450
Dehsabz S	215	4,837,500	461	184,400	5,021,900	201.0	160.8	450
Paymonar	155	3,487,500	343	137,200	3,624,700	252.7	202.2	200
Total	592	13,320,000	1,500	600,000	13,920,000	683.0	546.4	

(District commercial area, 2025)

	Office employees (1,000)	Office space (gross, m^2)	Population (1,000)	Commercial floor area (gross, m^2)	Total floor area (m^2)	District/ commercial area (gross, ha)	Land area (net, ha)	Floor area ratio (%)
Barikab	10	225,000	195	117,000	342,000	87.3	69.8	150
Dehsabz N	20	450,000	501	300,600	750,600	323.4	258.7	150
Dehsabz S	20	450,000	461	276,600	726,600	238.3	190.6	150
Paymonar	20	450,000	343	205,800	655,800	93.9	75.1	150
Total	70	1,575,000	1,500	900,000	2,475,000	742.9	594.3	

Table 12 Distribution of Commercial/Business Employment, Floor Area and Land Area at Ultimate Development

(Business/commercial area, long-term)

	Office employees (1,000)	Office space (gross, m^2)	Population (1,000)	Commercial floor area (gross, m^2)	Total floor area (m^2)	Business/ commercial area (gross, ha)	Land area (net, ha)	Floor area ratio (%)
Barikab	95	2,137,500	390	156,000	2,293,500	116.4	93.1	250
Dehsabz N	200	4,500,000	1,002	400,800	4,900,800	112.9	90.3	550
Dehsabz S	375	8,437,500	922	368,800	8,806,300	201.0	160.8	550
Paymonar	300	6,750,000	686	274,400	7,024,400	252.7	202.2	350
Total	970	21,825,000	3,000	1,200,000	23,025,000	683.0	546.4	

(District commercial area, long-term)

	Office employees (1,000)	Office space (gross, m^2)	Population (1,000)	Commercial floor area (gross, m^2)	Total floor area (m^2)	District/ commercial area (gross, ha)	Land area (net, ha)	Floor area ratio (%)
Barikab	30	675,000	390	234,000	909,000	87.3	69.8	150
Dehsabz N	240	5,400,000	1,002	601,200	6,001,200	323.4	258.7	250
Dehsabz S	190	4,275,000	922	553,200	4,828,200	238.3	190.6	250
Paymonar	60	1,350,000	686	411,600	1,761,600	93.9	75.1	250
Total	520	11,700,000	3,000	1,800,000	13,500,000	742.9	594.3	

6.2.5 Land allocation at ultimate development

The land allocation to various uses at the ultimate development as expressed in Figure 23 is detailed in Table 13.

6.2.6 Location of infrastructure facilities

Location of infrastructure facilities as planned by sector in Chapter 7 is shown in Figure 24.

6.2.7 Greening program

The available water supply in Dehsabz and Barikab is limited until major water sources of the Panjshir river are developed. The greening program to create the greenbelts should be phased according to water supply development as follows (Figure 25).

Table 13 Land Allocation at Ultimate Development

Land use category	Barikab		Dehsabz North		Dehsabz South		Paymonar		Total	
	Gross area		Gross area		Gross area		Gross area		Gross area	
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Phase I development area										
Residential	0	0.0	2,231	35.9	2,401	46.8	2,106	43.7	6,738	33.5
Commercial agricultural area	2,297	57.9	0	0.0	0	0.0	0	0.0	2,297	11.4
Commercial/business	116	2.9	113	1.8	201	3.9	253	5.2	683	3.4
District commercial	87	2.2	323	5.2	238	4.6	94	1.9	743	3.7
Light industry	216	5.5	269	4.3	180	3.5	193	4.0	858	4.3
Recreation	0	0.0	137	2.2	67	1.3	208	4.3	411	2.0
Infrastructure	0	0.0	509	8.2	0	0.0	0	0.0	509	2.5
Parks	0	0.0	440	7.1	435	8.5	723	15.0	1,598	7.9
Gully/riverside green	442	11.1	866	13.9	523	10.2	376	7.8	2,206	11.0
Roadside buffer green	217	5.5	547	8.8	398	7.8	194	4.0	1,356	6.7
Rivers	110	2.8	189	3.0	156	3.1	133	2.7	588	2.9
Artery roads	479	12.1	597	9.6	529	10.3	544	11.3	2,149	10.7
Subtotal	3,965	100.0	6,221	100.0	5,127	100.0	4,823	100.0	20,136	100.0
Ongoing public projects										
Residential			590	61.1					590	26.4
Commercial/business			17	1.7					17	0.7
District commercial			111	11.5					111	5.0
Parks			125	13.0					125	5.6
Road side buffer green			9	1.0					9	0.4
Rivers			2	0.2					2	0.1
Artery roads			111	11.5					111	4.9
Rural housing	946	100.0							946	42.3
Unclassified					325	100.0			325	14.5
Subtotal	946	100.0	965	100.0	325	100.0	0		2,237	100.0
Phase II Development Area										
Future development area	886		4,152		3,691		1,504		10,233	
Artery roads	56		81		124		43		304	
Subtotal	942		4,232		3,815		1,547		10,537	
Agricultural area										
Agricultural field (intensive)	29		686		352		1,985		3,052	
Agricultural field (extensive)	0		149		98		999		1,246	
Rural housing/future agricultural extension	3,478		466		568		1,359		5,872	
Agriculture villages	5		185		153		475		819	
Subtotal	3,512		1,486		1,171		4,819		10,989	
Other										
Slope land	5,468		6,711		3,028		3,133		18,340	
Military zone	0		0		6,042		0		6,042	
Peripheral greenery	2,664		1,707		441.69		948.76			
Peripheral greenery (included in slope land)	0		618		319.95		357.43		1295.75	
Subtotal	8,132		8,417		9,511		4,082		30,142	
Total	17,499		21,322		19,949		15,271		74,040	

(1) Phase 1 (up to 2015)

Greening is undertaken along the Bagram road and in the areas surrounding the existing agricultural villages in the eastern part of Dehsabz south. During this period, it is important to undertake greening of areas that would benefit the existing farm villages.

(2) Phase 2 (2015 to 2025)

The green spaces prepared in the 1st phase will be widened. Also green bands along newly constructed arterial roads and parks will be created. The greening is limited within the water availability. The use of treated sewage should also be considered.

(3) Phase 3 (after 2025)

The greenbelts will be developed to cover all districts in the new city.

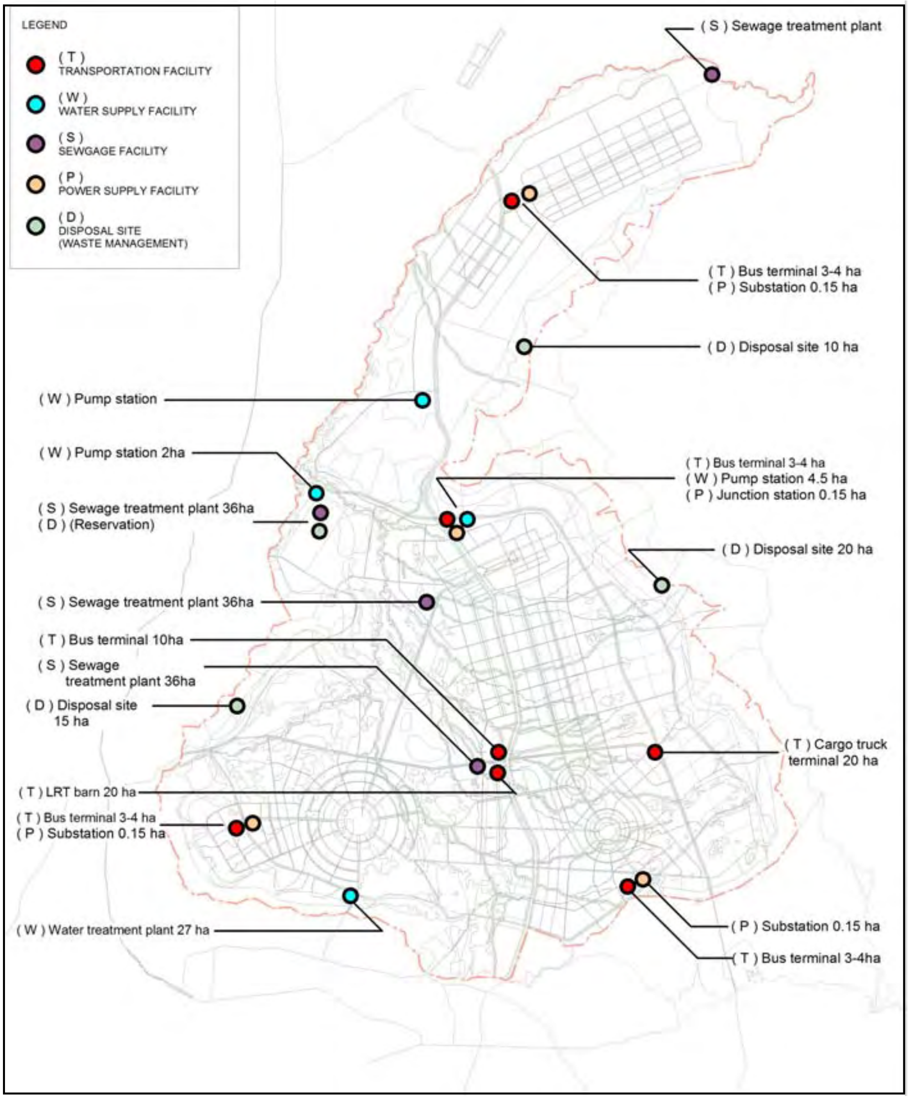

Figure 24 Proposed Locations of Infrastructure Facilities in New City

6.2.8 Early development

The land use plan has been prepared for the target year of 2025 and population of 1.5 million. Considering the developing process of the new city, the intermediate year of 2015 is most critical in determining the capacity of further development. Especially, the water availability in Dehsabz north and Barikab is quite severe until 2015. The early development of the new city is summarized in Table 14 with respect to water resources development, and illustrated in Figure 26.

Table 14 Early Development of the New City with Respect to Water Resources Development

Area	Population in 2015	Unit water use (LCD)	Water demand (MCM/year)	Water sources	Development potential
Barikab	100,000	25	0.913	Shallow wells in Barikab	1.095MCM/year (only for temporary use)
Dehsabz North	150,000	25	1.369	Shomali aquifer	8MCM/year (only for temporary use)
Paymonar	100,000	25	0.913	Shallow wells in 4km northeast of Paymonar	0.9125 MCM/y (only for temporary use)
Dehsabz South	100,000	25	0.913	Shallow wells in east of the Bachtyaran canal	0.9125 MCM/y (only for temporary use)
Existing villages	150,000	25	1.369	Existing springs and wells	Continued use
Total	600,000		5.477		

Source: JICA Study Team

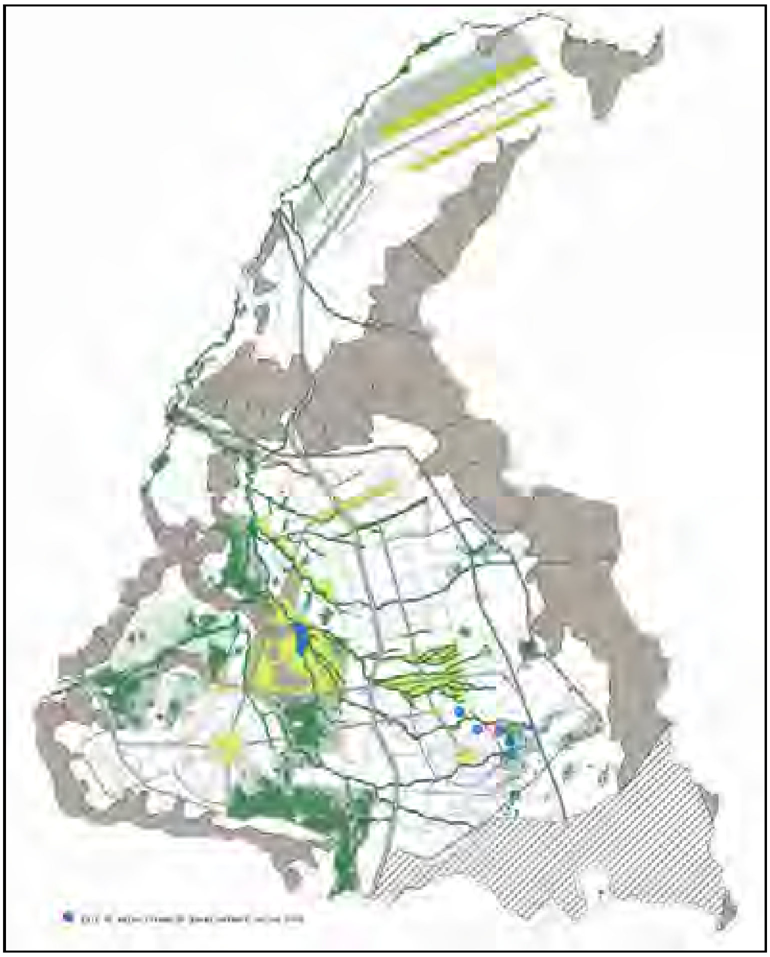

Figure 25 Greenbelts Development and Locations of Karez Outlets

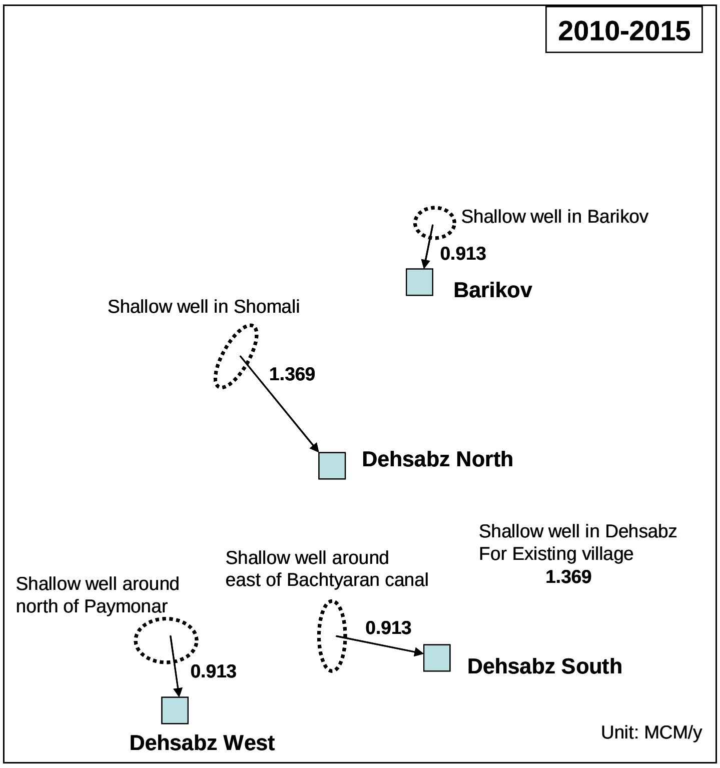

Figure 26 Estimated Water Resources Capacity for New City's Early Development