General Directorate of Urban Planning (GDUP)
Ministry of Municipalities and Tourism (KRG-Iraq)

Japan International Cooperation Agency (JICA)

PROJECT FOR UPDATE OF ERBIL CITY MASTER PLAN TOWARDS SUSTAINABLE CITY DEVELOPMENT IN THE KURDISTAN REGION OF THE REPUBLIC OF IRAQ

FINAL REPORT

October 2024

Japan International Cooperation Agency (JICA)

RECS International Inc.
Yachiyo Engineering Co., Ltd.
Japan Techno Co., Ltd.
ASIA AIR SURVEY CO., LTD.

IM
JR
24-119

Currency Equivalents (as of October 22, 2024)
US$1.00=IQD 1,290.71
US$1.00=JPY 150.022
JPY 1=IQD 8.60237
Source: OANDA.COM, http://www.oanda.com

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Abbreviations

AFOLU	Agriculture, Forestry and Other Land Use
BAU	Business As Usual
BCR	Building Coverage Ratio
BEI	Baseline Emission Inventory
BOI	Board of Investment
BOT	Board of Tourism (MOMT)
CDM	Clean Development Mechanism
CERs	Certified Emission Reductions
CF4, C2F6	Perfluorocarbons
CFCs	Chlorofluorocarbons
CH4	Methane
CMC	Communications and Media Commission
CO	Carbon monoxide
CO2	Carbon dioxide
COG	Council of Governorate
COM	Council of Ministers (KRG)
COPD	Chronic Obstructive Pulmonary Disease
DGRER	Directorate General of Real Estate Registration
DIP	Ductile Iron Pipe
DIT	Department of Information Technology
DMA	District Metered Area
DN	Diameter Nominal
DP	Detailed Plan
DRF	Duhok Governorate and a Refuse Derived Fuel
DSEP	Directorate of Services and Environmental Protection
DSEPSWT	Directorate of Services, Environmental Protection and Solid Waste Treatment
DSL	Digital Subscriber Line
ESD	Erbil Sewerage Directorate
ETS	Emission Trading Scheme
EWD	Erbil Water Directorate
EWSD	Erbil Water and Sewerage Directorate
F/S	Feasibility Study
FAR	Floor Area Ratio
FMIS	Fakhir Mergasori International School
FOC	First Order Decay
FTTG	Fiber to the Government
FTTH	Fiber to the Home
GB	Green Belt
GDB	Geodatabase
GDEM	General Directorate of Erbil Municipality (MOMT)
GDIE	General Directorate of Investment Erbil (BOI)
GDUP	General Directorate of Urban Planning
GDWS	General Directorate of Water and Sewerage
GHG	Greenhouse Gas
GRP	Gross Regional Product
GRP	Grass Reinforced Pipe
HC	Hydrocarbons
HFCs	Hydrofluorocarbons
IDPs	Internally displaced people
IFT	Intermediate Waste Treatment Facilities
IMF	International Monetary Fund
IOM	International Organization for Migration
IP	Internet Protocol
IPCC	International Panel on Climate Change
IQD	Iraq Dinar
ISIL	Islamic State of Iraq and the Levant
ITF	Intermediate Treatment Facility
ITU	International Telecommunications Union
IUCN	International Union for Conservation of Nature and Natural Resource
JHIC	Health Ministry of Planning Joint Humanitarian Information Center
KRG	Kurdistan Regional Government
KRI	Kurdistan Region of Iraq
KRSO	Kurdistan Region Statistics Office
LTE	Long-Term Evolution
LUP	Local Urban Plan
MMSCF	Million Standard Cubic Foot
MOA	Ministry of Agriculture
MOAWR	Ministry of Agriculture and Water Resources
MOCH	Ministry of Construction and Housing
MOCY	Ministry of Culture and Youth
MOE	Ministry of Electricity
MOE	Ministry of Education
MOERA	Ministry of Endowment & Religious Affairs
MOF	Ministry of Finance
MOFE	Ministry of Finance and Economy
MOH	Ministry of Health
MOHESR	Ministry of Higher Education and Scientific Research
MOI	Ministry of Interior
MOJ	Ministry of Justice
MOL	Ministry of Labor
MOLSA	Ministry of Labor and Social Affairs
MOMT	Ministry of Municipalities and Tourism
MOP	Ministry of Planning
MOPDC	Ministry of Planning and Development Cooperation
MOTAC	Ministry of Transportation and Communications
MP	Master Plan
N2O	Nitrous oxide
NPECs	National and Provincial Environmental Councils
NRW	Non-Revenue Water
O3	Ozon
OD	Origin-Destination
OECD	Organisation for Economic Co-operation and Development
PC	Parcel Coverage
PCM	Presidency of the Council of Ministers (KRG)
PDD	Project Design Document
PEM	Presidency of Erbil Municipality (MOMT)
PLU	Local Urban Plan
PPAMP	Prefectural Planning Area Master Plan
RD	Record of Discussions
REIP	Refugee Education Integration Policy
REDD+	Reduced Emissions from Deforestation and forest Degradation
RoW	Right of Way
RW	Ring Way
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SCADA	Supervisory Control and Data Acquisition
SEA	Strategic Environmental Assessment
SEAP	Sustainable Energy Action Plan
SEP	Sky Exposure Plane

SMART	Specific, Measurable, Achievable, Realistic and time-bound Terms
TDS	Total Dissolved Solids
UCA	Urbanization Control Area
UNCTAD	United Nations Conference on Trade and Development
UNFCCC	United Nations Framework Convention on Climate Change
UNHABITAT	United Nations Human Settlements Programme
UPA	Urbanization Promotion Area
UPDG	Urban Planning Directorate of Governorate
UPDOE	Directorate of Urban Planning in Erbil (MOMT)
USAID	United States Agency for International Development
WHO	World Health Organization
WLC	Weighted Linear Combination
WtE	Waste-to Energy
WTP	Water Treatment Plant
WWTP	Wide area sewerage system and Wastewater Treatment Plant
ZS	Zoning Scheme

CHAPTER 1
INTRODUCTION

1.1 Background

The City of Erbil, with an area of 500 km^2 under the jurisdiction of the Kurdistan Regional Government (KRG), has been promoting urban administration in a relatively stable security environment. Considering the situation that the City of Erbil has been the center of the international and domestic transportation and distribution networks that connect not only the Kurdistan region and central and southern Iraq, but also neighboring countries such as Turkey, Iran and Syria, the role of Erbil city is expected to be more important. The development of Erbil City will contribute to the stability of the region in terms of relationships with neighboring countries, and as Erbil City is a core city that drives the economic development of Iraq, the development will also contribute to the enhancement of investment environment.

General Directorate of Urban Planning (GDUP) in the Ministry of Municipalities and Tourism (MoMT) prepared an urban development master plan for Erbil City (Erbil Master Plan) between 2007-2009 in consideration of future growth of Erbil City. However, since it was formulated, the urbanization in Erbil City has been accelerated in a way deviating from the master plan, due to the construction rush caused by the increase in investments from Turkey and the Gulf countries and the unexpected population increase. The situations have caused various problems, such as urban sprawls and environmental deterioration. In order to address the urban problems, it has become important to update the master plan with a clear implementation mechanism based on the current situation.

The National Development Plan (2018-2022), which was approved by the Cabinet in April 2018, shows the basic policy of Iraq's development. It presents the strategic goals to be achieved including an item "consistency between the national development plan and the development plan in each city". The long-term policy objective of Kurdistan Regional Strategic Development Vision 2020 and the medium-term development target Kurdistan Regional Development Strategy 2013-2017 formulated by the Ministry of Planning of KRG mention the necessity of update of the master plan. Also, it has been an important issue to ensure the consistency of various policies with regard to land use plans and investment plans for urban growth management.

Based on the backgrounds, GDUP, on behalf of KRG, made an official request to the Government of Japan for the technical cooperation for updating the master plan and promoting the implementation of the updated Master Plan.

1.2 Goals and Outputs

(1) Goals of the project

As specified in the Record of Discussions (RD) agreed upon between the MoMT of KRG-Iraq and JICA on January 9, 2022, the goal of the Project is that “the updated Master Plan contributes to sustainable city development through the promotion of low-carbon urban development and the creation of multi-core urban structure”.

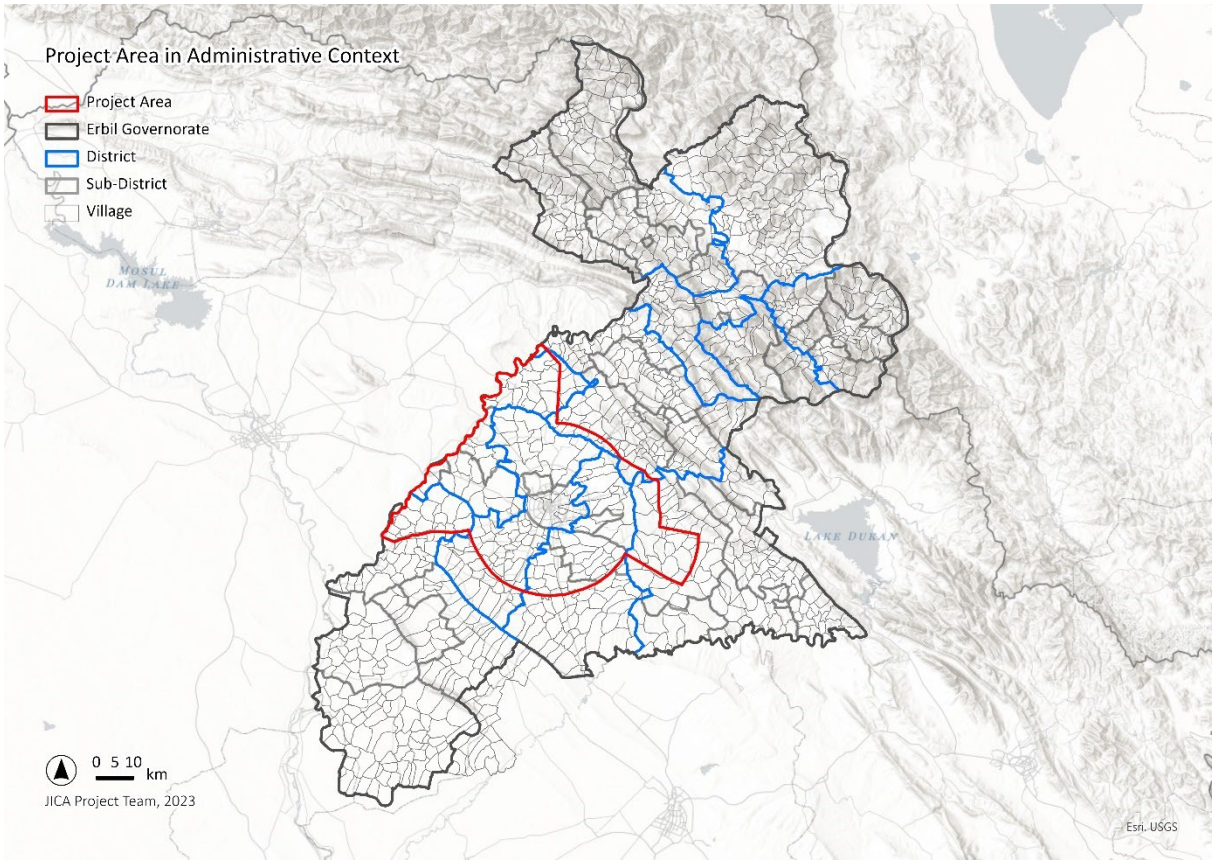
(2) Expected outputs of the project

The expected outputs, as stated in RD, are as follows:

1) Erbil City Master Plan is updated;
2) A mechanism of implementation is developed to promote urban development based on the updated Master Plan;
3) Tools and measures to implement the updated master plan are prepared;
4) Capacity Development programs to strengthen the skill of formulation, update, and implementation of urban development Master Plan are conducted.

1.3 Project Area

The target area of the current Project, shown in Figure 1.1.1 below, is similar to the one of existing Erbil Master Plan. It consists of 2,800 km2 and includes Erbil City and surrounding areas.



Source: JICA Project Team based on GDUP data

Figure 1.1.1 Project Area in Administrative Context

1.4 Updated Work Flow

The Scope of Work of this Project is in line with the Special Specifications provided by JICA and with the RD, but has been reorganized and rationalized into 9 different Steps including 15 Activities as shown in the Inception Report and reminded below. In order to be properly achieved, the Project Activities are broken down into several Tasks. Figure 1.1.2 on the next page shows the Work Flow that describes the timing of implementation of all Steps, Activities and Tasks performed throughout the Project. The Project period has been extended until October 2024 upon common agreement between JICA and GDUP in June 2024.

STEP 1: Preparation, Explanation and Discussions on the Inception Report

STEP 2: Update of Erbil Master Plan

Activity 2-1: Understanding Erbil current situation and analyzing urban issues
Activity 2-2: Set-up Vision and strategies
Activity 2-3: Formulation of Spatial Plan and Land Use Plan
Activity 2-4: Formulation of Sector Development Plans

STEP 3: Formulation of Zoning Scheme (ZS) and Pilot ZS on Priority Area in Erbil

Activity 3-1: Selection of Priority Area in Erbil for formulation of Pilot Zoning Scheme
Activity 3-2: Examination of the scope of Zoning Scheme (process, contents, formulation process etc.)
Activity 3-3: Formulation of Pilot Zoning Scheme on Priority Area in Erbil

STEP 4: Strengthening of Urban Planning Implementation Promotion

Activity 4-1: Establishment of Urban Planning Implementation Promotion System
Activity 4-2: Introduction of Urban Planning Implementation Promotion Tools and Measures

STEP 5: Implementation of Strategic Environmental Assessment (SEA)

STEP 6: Support Capacity Development and Technology Transfer

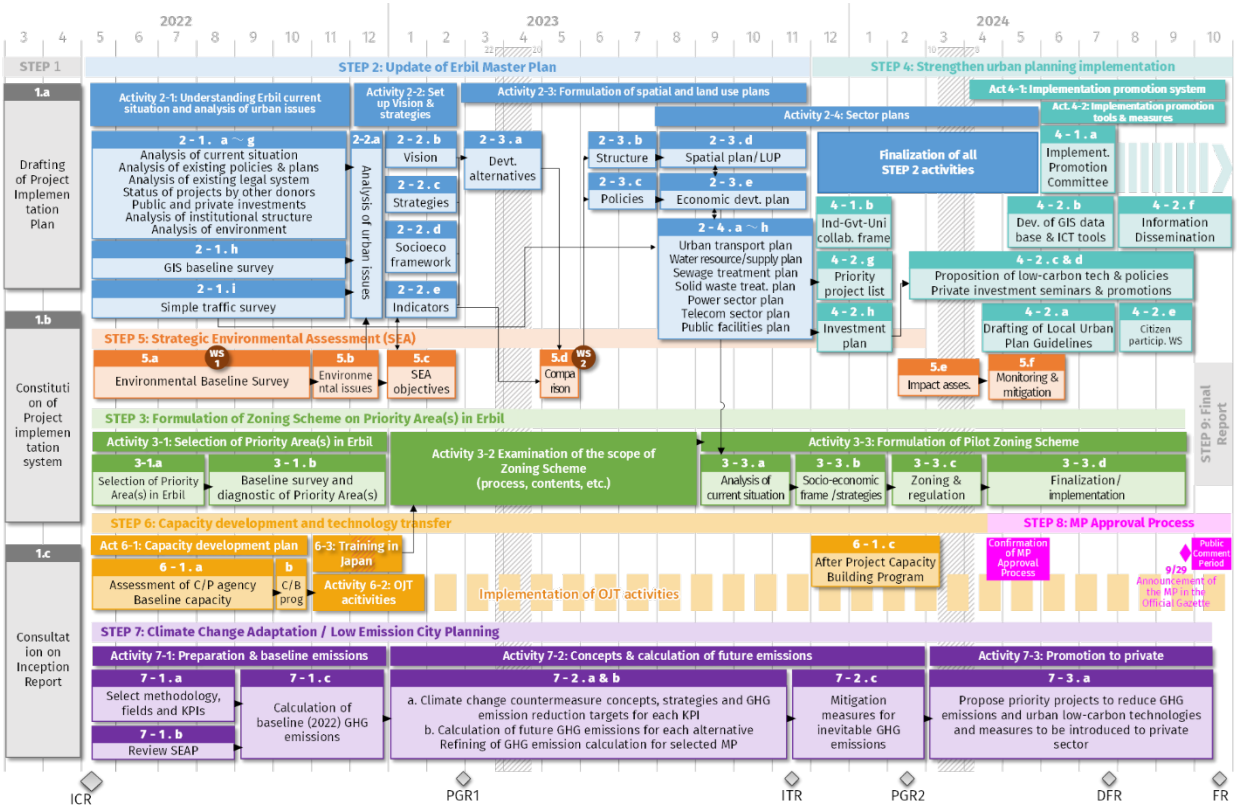
Activity 6-1: Assessment of Baseline Capacity and Elaboration of Capacity Development Plan
Activity 6-2: Preparation and Implementation of OJT Activities
Activity 6-3: Implementation of Training in Japan

STEP 7: Climate Change Adaptation / Low Emission City Planning

Activity 7-1: Preparation and calculation of baseline emissions
Activity 7-2: Concepts and calculation of future emissions
Activity 7-3: Promotion to private sector

STEP 8: Confirmation of Approval Process for Erbil Master Plan

STEP 9: Preparation, Explanation and Discussions on the Final Report



Source: JICA Project Team

Figure 1.1.2 Project Work Flow Updated as of October 2024

1.5 Target Year

Based on the discussions carried out during 2nd Joint Coordination Committee (JCC) Meeting on May 12th, 2022 and on the consultation of MoMT Minister and Prime Minister of KRG, the upmost target year of the Project has been fixed to 2050, broken down into a short term in 2030, medium term in 2040, and a long term in 2050. The Table 1.1.1 below summarizes the target years to be considered for each of main Project outcomes.

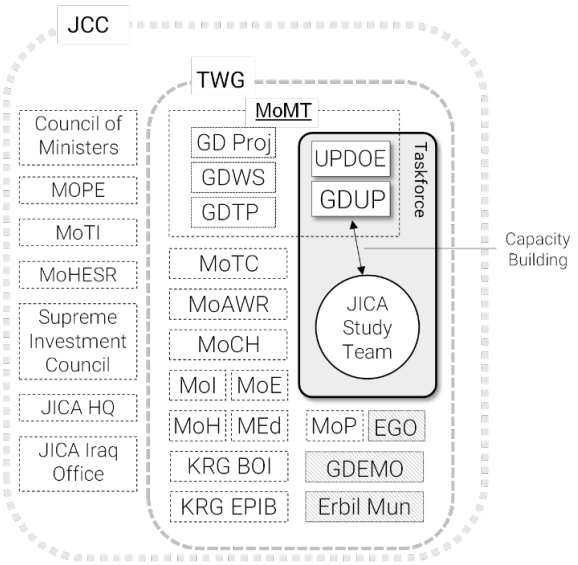
Table 1.1.1 Target Year to be considered in each Project Outcomes

Project Outcome & Activities		Short term (2030 / 5 years)	Medium term (2040 / 15 years)	Long term (2050 / 25 years)
STEP 2	**CONCEPTS (qualitative)**			
2-2.b	Long-term Vision			●
2-2.c	Strategies		●	●
STEP 2	**FRAMEWORK (quantitative)**			
2-2.d	Socio-Economic Framework		●	●
2-2.e	Indicators (targets)	●	●	●
2-3.a	Development Alternatives			●
STEP 2	**SPATIAL PROPOSITIONS (qualitative)**			
2-3.b	Urban structure			●
2-3.c	Spatial Policies / Orientations		●	●
STEP 2	**SPATIAL PLANS (quantitative)**			
2-3.d	Spatial Plan / Land Use Plan		●	●
2-3.e	Economic Development Plan		●	●
2-4.a-h	Sector Development Plans		●	●
STEP 2	**TOWARDS IMPLEMENTATION**			
4-2.h	Priority Project List	●		
4-2.g	Financial Analysis	●	●	●
STEP 3	**Zoning Scheme**			
3-3	Formulation of Pilot Zoning Scheme		●	

Source: JICA Project Team

1.6 Implementation Structure

The implementation structure of the Project is shown in Figure 1.1.3 below as specified in the RD.



Joint Coordination Committee (JCC)
- To approve work plan and review overall progress;
- To conduct monitoring and evaluation of the Project;
- To facilitate inter-organizational coordination;
- To examine, discuss and comment draft final report;
- To discuss and make decisions on major issues;
- It is assumed that JCC will shift to permanent coordination body after the completion of the Project.

Technical Working Group (TWG)
- To facilitate necessary arrangements for smooth implementation of the Project;
- To examine technical aspects of the reports;
- To coordinate stakeholders of the Project and ensure involvement of the concerned authorities;
- To prepare materials (reports/presentations) for JCC;
- To correspond to technical inquiries made by JCC;
- It is assumed that TWG will shift to permanent coordination body after the completion of the Project.

Source: JICA Project Team

Figure 1.1.3 Implementation Structure

1.7 Reports

The JICA Study Team is submitting the reports listed in Table 1.1.2 below, as part of the Project outputs.

Table 1.1.2 Project Reports

Report	Main Contents (Among Others)	Number of Copies	Due
Inception Report (ICR)	Methodology of work implementation, technical and managerial approaches, work schedule, staffing and assignment schedule.	• English: 25 copies • Japanese: electronic file	April 2022
Progress Report 1 (PGR1)	- Work progress - Activity 2-1 outputs (understanding Erbil current situation) including results of subcontracted surveys (environmental baseline, GIS baseline, traffic surveys) - Activity 2-2 tentative outputs (Vision, Strategies, Socio-economic Framework, Indicators)	• English: 31 copies (26 delivered to KRG) • Japanese (summary): electronic file	January 2023
Interim Report (ITR)	- Work progress - Activity 2-3 tentative outputs (Development Alternatives, Urban Structure, Strategic Orientations, Land Use Plan, Economic Development plan, Sector Development Plans)	• English: 31 copies (26 delivered to KRG) • Japanese (summary): electronic file	November 2023
Progress Report 2 (PGR2)	- Work progress - Activity 2-3 revised outputs - Activity 2-4 outputs - Progress of Activity 4-2 (Priority Project List)	• English: 31 copies (26 delivered to KRG) • Japanese (summary): electronic file	February 2024
Draft Final Report (DFR)	Overall results of the work.	• English: 31 copies (26 delivered to KRG) • Japanese (summary): electronic file	June 2024
★ **Final Report (FR)**	Overall results of the work (finalization based on the reflection of the comments from JICA, GDUP and JCC members on the Draft Final Report).	• English: 31 copies (26 delivered to KRG) • Japanese (summary): 5 copies	October 2024
Erbil 2050 Master Plan Summary Documents for Approval (added by the consultant)	Summary document with essential contents of updated Erbil Master Plan in English and Kurdish language supported by large format printed synthesis maps in the perspective of approval of both documents by relevant authorities of KRG.	• Kurdish / English: 100 copies • Kurdish / English: electronic file	October 2024

Source: JICA Project Team

1.8 Erbil 2050 MP Approval Process

On September 29, 2024, the Erbil 2050 MP, prepared in the framework of the STEP 2 of the Project, has been announced in the Official Gazette of KRG, i.e. Xebat newspaper.

The announcement of the MP in the Official Gazette marks the beginning of a 30-days public comment period, allowing all stakeholders and the general public to provide their feedback on the MP.

The announcement is considered as the main milestone for the official approval of the Erbil 2050 MP. It also demonstrates the strong sense of ownership that the Kurdish side had in the work carried out within the framework of the Project, not only the counterpart agency GDUP, but also the main organization in charge of the implementation of the MP, i.e. Presidency of Erbil Municipality (PEM).

Final Report

PART I: ERBIL MASTER PLAN

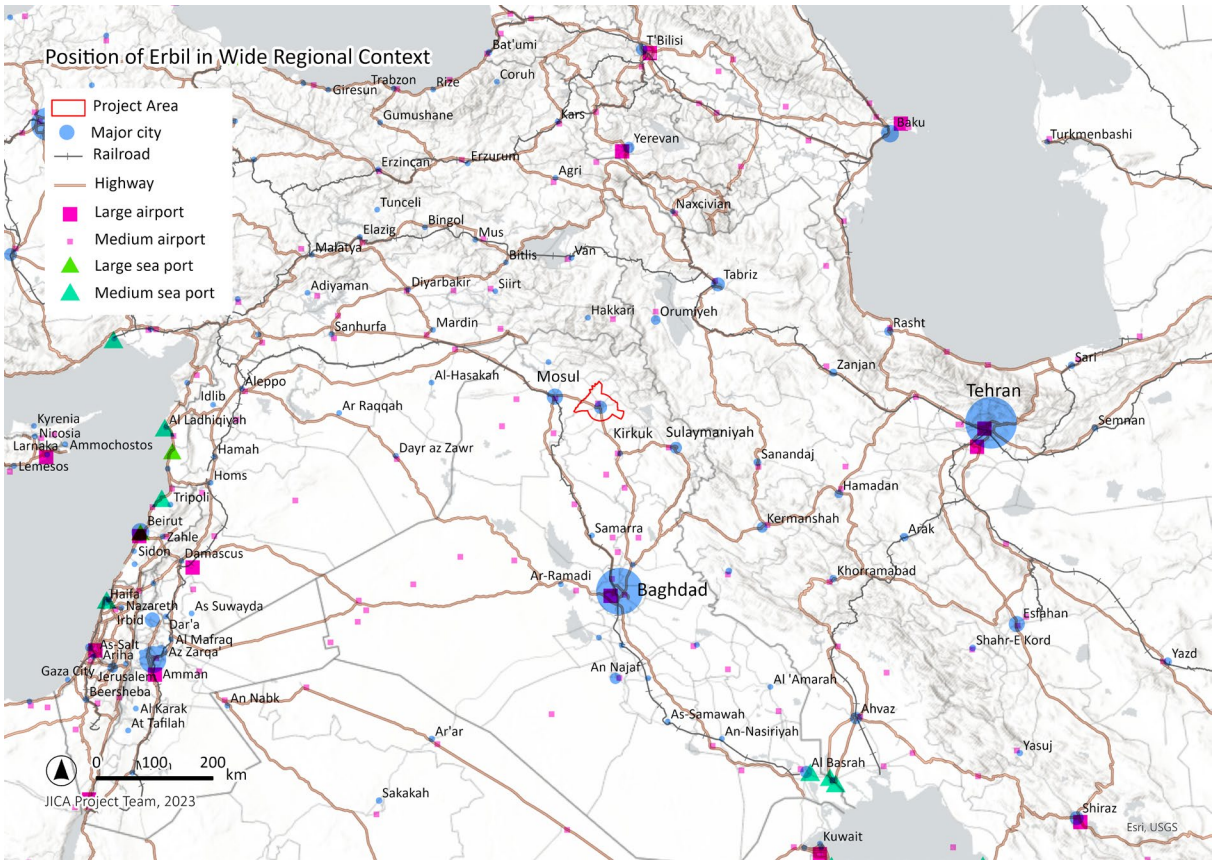
CHAPTER 2
EXISTING CONDITIONS

2.1 Position of Erbil in Regional Context

Erbil became one of the first areas of agricultural settlement during the Neolithic period, then became the heart of the Assyrian kingdom. The city was surrounded by extensive farmland, which sustained the livelihoods of its citizens. Agriculture has been a significant sector in Erbil since then. Today, Erbil has a population of more than one million and serves as the capital of the Kurdistan region and as a cultural, economic, industrial, educational and medical center.

2.1.1 Position of Erbil in Wide Regional Context

The current position of Erbil in the wide regional context of the Middle-East, as shown in Figure 2.1.1, can be summarized as follows.



Source: JICA Project Team

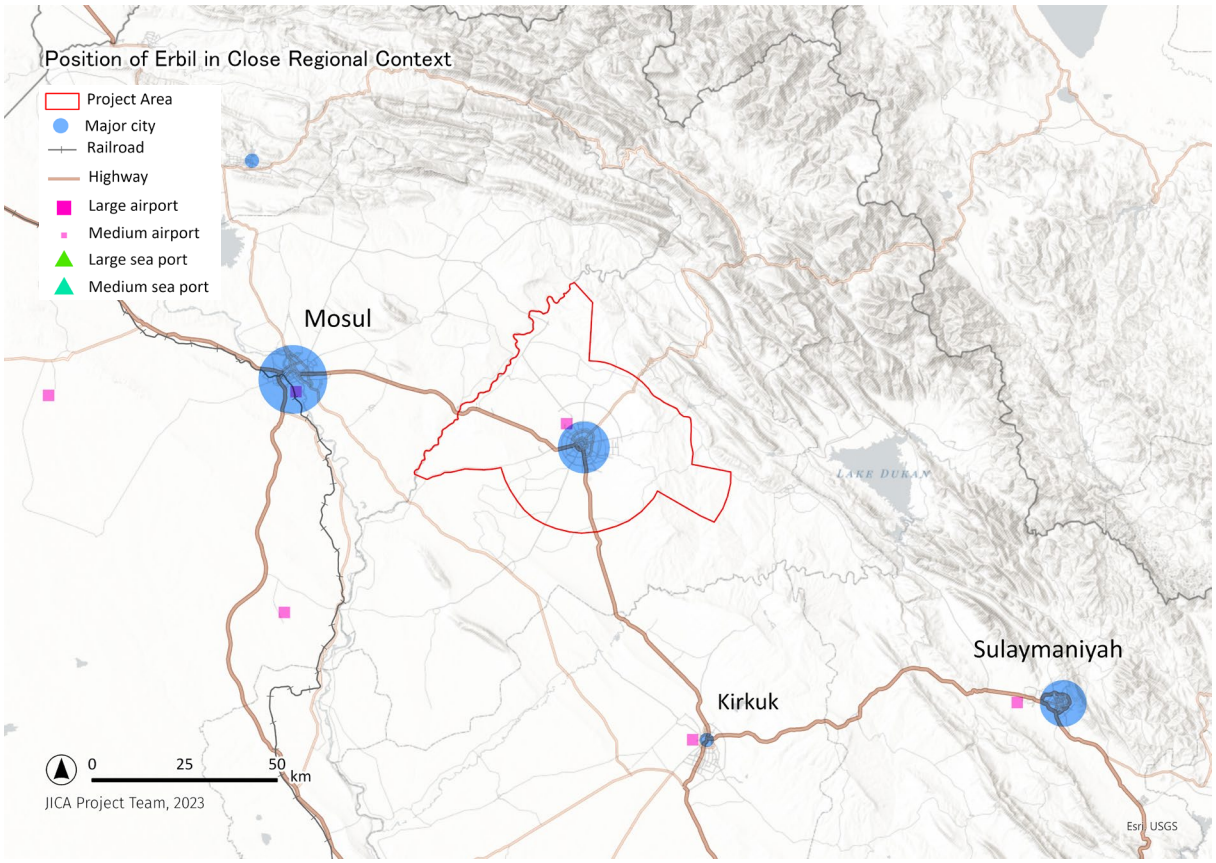
Figure 2.1.1 Position of Erbil in Wide Regional Context

- **Intersectional position**: The position of Erbil in the wide context of Middle East can be considered at the intersection of several important trade routes and its proximity to several major cities such as Baghdad in Southern part of Iraq (360 km in Southern direction), Tehran in Iran (910 km in Eastern direction) and Beirut in Lebanon (1,000 km in Western direction);
- **Strong relations with neighbors**: Erbil's strategic location has also allowed it to establish strong relations with neighboring countries. The city has a close relationship with Turkey, which has invested heavily in the Kurdistan Region's infrastructure and economy. Additionally, Erbil has also developed strong ties with Iran, which has helped to boost trade and economic cooperation between the two countries.

- **Landlocked city**: Nevertheless, this intersectional nature shall be nuanced by the fact that Erbil is a landlocked city with no access to sea and consequently it is off-centered from major trading networks of the region. Additionally, the Zagros Mountains surrounding the city in its Eastern part, act as a natural barrier for communication and trade with Iran;
- **Access to regional sea ports**: Despite its landlocked nature, the city has managed to establish itself as a relative major trading hub by utilizing the nearby sea ports of Turkey and Iran. The city is connected to the port of Mersin in Turkey through the Habur border crossing, which is a major trade route for goods from the Kurdistan Region. Additionally, Erbil is also connected to the Iranian port of Bandar Abbas through the Parwezkhan border crossing, which is another important trade route for the city;
- **Grand Faw Port**: In addition to other regional sea ports, Erbil's trade and export capabilities are expected to be augmented by the Grand Faw Port, a major new port in Iraq, which is planned to be operational by 2028 and located near the existing port of Faw in the southern province of Basra. It will become one of the biggest and most important ports in the Middle East, serving as a hub for the movement of goods and services. Due to its proximity, this new port development may help Erbil to develop its trading potential and open up new opportunities for the city and the Kurdistan Region;
- **International potential of highway**: Other than the trading routes from sea ports, one of the most significant terrestrial trading routes is the Baghdad-Erbil-Istanbul highway, which connects Erbil to the Turkish border, and provides a direct link to the Mediterranean Sea and Europe. This highway is a key transportation corridor for the Kurdistan Region, as it allows for the export of oil, natural gas, and other goods to Turkey and beyond.

2.1.2 Position of Erbil in Close Regional Context

The position of Erbil in close regional context, as shown in Figure 2.1.2, can be summarized as follows.



Source: JICA Project Team

Figure 2.1.2 Position of Erbil in Close Regional Context

Erbil close regional context is characterized by the proximity of 3 cities of great importance:

- **Mosul** (approx. 1.7 million inhabitants) located 80km to the West, being controlled by ISIS for approximately three years from June 2014 to July 2017, has played a destabilizing role in the region. Nevertheless, in recent years, the reconstruction efforts of Mosul, especially through the development of large-scale infrastructures such as Mosul International Airport supported by international finance, are expected to enhance Mosul's attractiveness. Consequently, this could lead to increased competition with Erbil and potentially reduce Erbil's economic appeal;
- **Sulaymaniyah** (approx. 1 million inhabitants) located 180km to the East, is the second biggest city of Iraqi Kurdistan. Whether it is through cultural exchange, political cooperation, or economic integration, the strong relationship between Erbil and Sulaymaniyah has played a key role in shaping the future of the KRI;
- **Kirkuk** (approx. 900,000 inhabitants) located 95km to the South, has a rich history, with evidence of human habitation in the area dating back over 6,000 years, just like Erbil. Kirkuk is also home to several important oil fields, making it a strategically and economically significant city in the region.

Due to the absence of a physical regional plan that would include Erbil city, in order to review the position of Erbil city in the close regional context (see Section 2.6), a session was convened by representatives of ministries and governmental organizations focusing on the economic, environmental and social aspects. Since these representatives had not considered Erbil from the perspective of regional balance or regional comparative advantages with other cities, no opinions based on regional balance were obtained in the session. However, the following points were raised in relation to the role and strongpoints of Erbil:

- **Centre for production and consumption of agricultural produce**: since agriculture has been advantageous in terms of creating the city, agriculture must be an important element in ensuring the future success of the city. The concept of a greenbelt surrounding the city should be realized, which was proposed in the previous urban master plan;
- **Centre for light and heavy industry**: Erbil is the place from which to export industrial products to the south of Iraq and neighboring countries. Heavy, agro-processing and medical industries are key for the industrialization of the city and Erbil currently has many foreign and domestic investors who are instrumental in the process of industrialization;
- **Centre for basic and higher education**: the number of universities has been increased to provide vocational training for teachers:
- **Centre for the health service**.

Opinions about the strengths of Erbil also take into account the following factors.

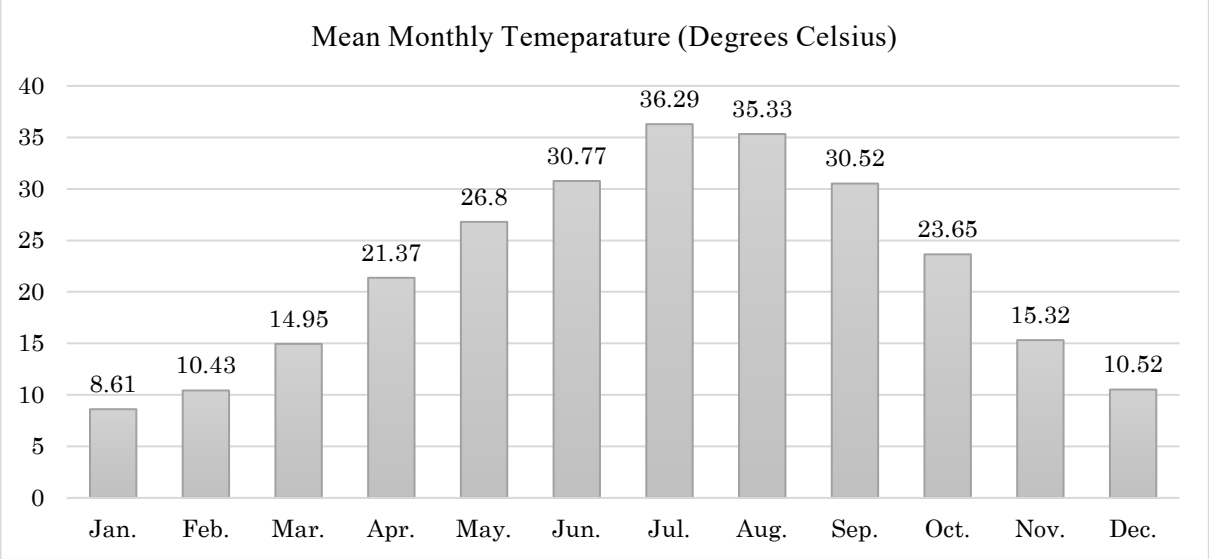
- Security must be stable compared to other areas in Iraq;
- Erbil extends a culture of friendliness to outsiders;
- Erbil boasts diversity in terms of cultures;
- Social stability and inclusiveness in relation to diverse cultures are considered as Erbil's strengths.

2.2 Natural Conditions

2.2.1 Climate

(1) Temperature

The Erbil City is characterised by a semi-arid climate, with hot dry summers and cool winters. The average temperature in Erbil ranges from around 10-12°C in the winter months (November to February) to around 30-35°C in the summer months (June to September) as shown in Figure 2.2.1.



Source: JICA Project Team

Figure 2.2.1 Monthly Mean Temperature for Erbil Meteorological Station from 2010 -2020

The monthly maximum temperatures in Erbil city consistently exceed 30°C from May to September as observed from 2010 to 2015. However, in recent years, there has been a trend towards prolonged heat waves, with some maximum temperatures approaching or exceeding 30°C being recorded in October. Additionally, the average monthly temperatures during the transitional period from summer to autumn, which previously exhibited a difference of less than 7°C, have also been fluctuating rapidly, with a decrease from around 30°C to the low 20°C in recent years, with some years showing a difference of more than 8°C (Table 2.2.1).

Table 2.2.1 Min., Max., and Average Monthly Temperature in Erbil City from 2010 to 2020

Year		Months													
		Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Min.	Max.
2010	Min	8.7	8.7	12.0	14.3	20.4	26.1	28.5	29.9	25.3	19.4	13.0	8.2	8.2	29.9
	Max	15.0	15.9	20.5	24.3	31.4	38.9	42.2	42.4	38.2	30.1	25.5	18.4	15.0	42.4
	Avg.	11.8	12.3	16.4	19.3	25.9	32.5	35.3	36.1	31.7	24.7	19.2	13.3	11.8	36.1
2011	Min	5.4	6.3	9.0	14.9	19.8	25.7	29	28.2	23.6	17.3	8.1	5.5	5.4	29.0
	Max	12.4	13.8	18.9	23.9	30.3	37.7	41.9	40.7	35.7	27.4	17.0	16.0	12.4	41.9
	Avg.	8.9	10.0	13.9	19.4	25.0	31.7	35.4	34.4	29.6	22.3	12.5	10.7	8.9	35.4
2012	Min	4.6	5.6	5.9	16.9	21.7	27.2	30	28.8	24.4	19.1	13.3	4.6	4.6	30.0
	Max	11.8	13.5	15.5	27	32.5	39.1	41.8	41.5	37.2	29.8	21	4.9	4.9	41.8
	Avg.	8.2	9.5	11.2	21.9	27.1	33.1	35.9	35.1	30.8	24.4	17.1	6.0	6.0	35.9
2013	Min	2.2	7.7	10	14.5	19.4	24.8	27.3	27.1	22	17.5	12.8	5.6	2.2	27.3
	Max	12.7	16.4	19.9	26.2	31.2	38.0	41.3	41.0	35.6	28.9	21.9	13.6	12.7	41.3
	Avg.	7.45	12	14.9	20.3	25.3	31.4	34.3	34	28.8	21.9	17.4	9.6	7.4	34.3
2014	Min	6.1	6.2	11	14.5	20.8	25.1	28.2	27.9	23.1	17.7	9.7	7.6	6.1	28.2
	Max	15	16.8	20.7	26.7	33.7	38.5	41.8	42.7	36.0	27.9	19.5	15.9	15.0	42.7
	Avg.	10.6	11.5	15.8	20.6	27.3	31.8	35	35.3	29.6	22.8	14.6	11.7	10.6	35.3
2015	Min	4.5	6	8.7	13.4	21.2	25	28.9	28.3	25.9	19.6	10.3	5.6	4.5	28.9
	Max	13.6	16	19.7	25	33.6	38	43.4	42.6	38.6	29.6	19.8	14.2	13.6	43.4
	Avg.	9.05	11	14.2	19.2	27.4	31.5	36.1	35.4	32.2	24.6	15.0	9.9	9.0	36.1
2016	Min	4.1	7.3	10	14.5	19.9	26.9	28.6	28.9	23	18	9.1	4.6	4.1	28.9
	Max	11.7	17	25.2	24.8	32.3	38.2	42.3	43.4	36	31	22.0	12.7	11.7	43.4
	Avg.	7.9	12.1	17.6	19.6	26.1	32.5	35.4	36.1	29.5	24.5	15.5	8.6	7.9	36.1
2017	Min	3.2	3.4	9.7	13.5	20.3	24.6	29.5	28.9	25.1	17.8	11.9	8.9	3.2	29.5
	Max	20.1	18.3	24.6	42.9	38.7	43.8	43.5	39.8	29.4	29.4	21.7	18.7	18.3	43.8
	Avg.	11.6	10.8	17.2	28.2	29.5	34.2	36.5	34.3	27.3	23.6	16.8	13.8	10.8	36.5
2018	Min	6.6	8.1	13.5	15.7	20.6	25.7	28.9	27.6	25.4	20.9	12.2	8.6	6.6	28.9
	Max	14.7	16.7	23.2	26.7	31	37.9	42	41.5	38.3	30.5	19.7	14.4	14.4	42.0
	Avg.	10.6	12.4	18.3	21.2	25.8	31.8	35.4	34.5	31.8	25.7	15.9	11.5	10.6	35.4
2019	Min	6.00	6.7	8.5	10.9	19.8	25.7	25.4	29.5	23.5	19.9	11.0	8.5	6.0	29.5
	Max	13	14.9	16.3	20.4	32.6	40.3	40.8	40.2	36.8	30.9	22.2	16.0	13.0	40.8
	Avg.	9.5	10.8	12.4	15.7	26.2	33	33.1	34.8	30.1	25.4	16.6	12.2	9.5	34.8
2020	Min	5.6	6.5	19.4	13.4	19.5	30.7	30	27.3	26.1	19.2	13.3	7.1	5.6	30.7
	Max	12.5	13.2	11.6	24.0	32.3	37.7	42.7	39.4	39.3	32.4	20.9	16.4	11.6	42.7
	Avg.	9.05	9.8	15.5	18.7	25.9	34.2	36.3	33.3	32.7	25.8	17.1	11.7	9.0	36.3

Source: JICA Project Team

(2) Rainfall

Table 2.2.2 reveals that the Erbil region exhibited a relatively high average annual precipitation of 418.85 mm, surpassing the threshold of 250 mm commonly used to differentiate desert and non-desert regions. However, despite this relatively high annual precipitation, the region experiences a scarcity of rainfall during the summer months, when temperatures can reach as high as 40 C°. Spatial distribution of rainfall in Project Area is shown in Section 8.7.1 relating to flood management.

Table 2.2.2 Mean Monthly Rainfall in Erbil City from 2010 to 2020

Year	**Months**												**Sum**
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2010	34.9	74.3	71	5.2	25.6	T.R	0	0	1.2	4.9	0	43.3	260.4
2011	113.9	42.8	30.5	101.5	12.7	0	0	T.R	T.R	9.2	7.4	25	343
2012	56.1	31.5	72.1	14.5	26.8	T.R	T.R	0	0.2	23.4	45.9	95.9	366.4
2013	174.4	55.8	17.7	37.4	40.6	0	0	0	T.R	0.2	19.1	86.6	431.8
2014	74.9	8.2	93.4	14.7	2.5	0	0	1	0.0	68.7	69.2	56.0	388.6
2015	37.4	44.3	56.8	17.3	5.4	0	0	0	4.5	36.4	104.4	115. 8	422.3
2016	45.6	33.0	103.5	46.4	6.4	2.5	0	0	0	T.R	22.3	116. 1	375.8
2017	37.9	23.4	77.8	55.8	4.4	T.R	0.0	0.0	0.0	T.R	37.6	29.4	266.3
2018	44.0	164.4	8.0	77.9	74.6	1.7	0.0	0.0	0.0	42.3	132.9	187. 8	733.6
2019	119.1	64.2	220.1	123.5	5.4	0.7	0.0	T.R	0.0	19.3	3.9	45.8	602
2020	101.4	55.7	126.5	43.2	14.3	1.5	0.1	0.0	0.0	0.2	45.4	28.9	417.2
Mean	76.33	54.33	79.76	48.85	19.88	0.80	0.01	0.11	0.66	22.73	44.37	75.5 1	418.8

Source: JICA Project Team

(3) Humidity

Monthly mean values for relative humidity in the study area were ranged from 22.1 to 82.1%. Highest values of relative humidity recorded in wet seasons particularly during December to April from 2010-2020 while the lowest levels recorded during dry seasons with an annual mean value of 48.8%.

Table 2.2.3 Average Monthly Relative Humidity (RH) % in Erbil Metrological Station from 2010-2020

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
2010	67	66	60.2	58.6	40.1	27	26.2	24.6	30.7	45.6	45.2	59.3	45.88
2011	75.4	73	65.5	58.4	45.3	39.1	25.7	27.3	34.1	43.6	55.6	56	49.92
2012	74.4	63.6	61.7	49	41.5	25.8	22.1	28.5	29	48.6	64.6	77.2	48.83
2013	73.9	75.6	61.6	53.9	47.7	31.2	29.1	28.7	37.8	39.4	67.9	66	51.07
2014	72.1	56	66.2	48.6	39.8	30.3	29.1	28.3	39.8	58.6	65.6	74.7	50.76
2015	72.5	68.4	64.3	52.2	34.5	33.2	25.4	30.8	29.9	54.6	69.8	67.7	50.28
2016	76.4	65.3	55.2	53.9	40.5	32	27.3	30.5	39.4	41	47.5	76.4	48.78
2017	68.84	63.5	65.52	58.3	38.06	34.97	32.19	31.25	31.3	44.06	62.03	60.1	49.18

Source: JICA Project Team

(4) Wind

Wind data from the Erbil weather station show that the dominant winds are from the South. In summer months they come from the Southwest and in the winter months from the Southeast.

Table 2.2.4 shows the average monthly wind speeds and the maximum average monthly wind speed between 2010 and 2020. In general, light winds are common throughout the year. The frequency of stronger winds of 3.5 m/s exist for the Project area. The average monthly minimum wind speed for the study area is 1.59m/s, which can generally be considered weak to moderate, indicating relatively calm conditions compared to other regions.

Table 2.2.4 Average Monthly Wind Speed m/s in Erbil City 2010-2020

YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	3.4	2.3	3.4	2.6	2.9	2.5	2.2	3	1.6	1.6	1.4	1.5
2011	1.9	2.3	2.6	3.5	2.5	2.6	1.9	1.7	1.4	2.2	1.9	1.2
2012	1.5	2.3	1.9	2.9	2.4	2.8	2.5	1.8	1.9	2	1.7	1.7
2013	2.2	1.6	1.9	1.8	1.9	1.4	1.2	1.1	0.8	1.5	1.1	1.1
2014	1	1.4	2	0.8	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2
2015	0.2	0.1	0.2	0.2	0.2	1.7	1.3	1.3	1.9	2.3	1.3	1.5
2016	1.4	1.5	1.9	1.7	1.7	2.2	1.2	1.1	1.2	1.4	1.1	1.5
2017	1.13	1.2 1	2.03	1.6 0	1.98	1.19	1.45	1.01	0.7	1.30	1.45	6.7 0
2018	1.7	1.3	1.6	1.6	1.7	1.3	1.1	0.9	1.0	2.0	1.6	1.3
2019	1.7	0.9	1.9	1.8	1.9	1.8	1.2	1.6	1.4	1.9	1.5	1.4
2020	1.7	1.9	1.8	1.9	1.6	1.4	1.3	1.3	1.1	1.1	1.7	1.2
Mean	1.62	1.53	1.93	1.8 5	1.73	1.73	1.40	1.36	1.2 0	1.58	1.36	1.75

Source: JICA Project Team based on data from Erbil Meteorological Station

(5) Dust Storm

The dust storm is a global phenomenon in regions characterized by aridity and semi-aridity. Dust storms have become increasingly prevalent in Erbil City. The distribution of dust storms in Erbil is observed throughout the year, with the highest dust storms in May, June, July, and August and the lowest in January, February, November, and December.

Even though there is no specific data on the case of Erbil, it is likely that the frequency of dust storms events has increased rapidly in recent decades due to climate change in the whole Middle East region, with assumed increase of 50% between 2000 and 2009 in Iraq[1].

[1] Al-Ansari, N., & Al-Hussaini, M. (2010). Dust storms in Iraq: Characteristics and trends. Atmospheric Environment, 44(24), 2851-2858.

Source: Kurdistan24 (Rebaz Siyan: 2022/04/07 published on Kurdistan 24 English's Tweeter)

Figure 2.2.2 Landscape of Erbil City under Dust Storm

(6) Air Quality

The air quality in Erbil is generally poor, presenting moderate level of pollution with an annual average particulate matter (PM2.5) concentration of 35 µg/m³ in 2022, according to IQAir information. This level is about 7 times higher than the World Health Organization's annual air quality guideline value of 0-5 µg/m³. This level of pollution poses health risks to residents. In 2023, Erbil has ranked 592 out of 7,812 cities worldwide for poor air quality, placing it in the 8% of the most polluted cities globally.

As shown in Figure 2.2.3 below, throughout 2023, the air quality has fluctuated, with PM2.5 concentrations peaking in November at 45 µg/m³ and having lower levels in April at 22.1 µg/m³, showing a 103.6% variation. Those monthly fluctuations in air quality can be attributed to several factors, including seasonal changes, weather patterns, and human activities. In colder months, the use of heating systems and burning of fuels can increase particulate matter in the air. Agricultural activities, such as crop burning, and industrial emissions may also contribute to higher pollution levels during specific times of the year. Additionally, meteorological conditions such as wind speed and direction, temperature inversions, and rainfall can influence the dispersion and concentration of pollutants.

Rank	City	2023	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2022
592	Erbil, Iraq	30.4	38.8	26.7	26.3	22.1	25.9	27.4	24.5	24.5	28.6	34.8	45	39	35

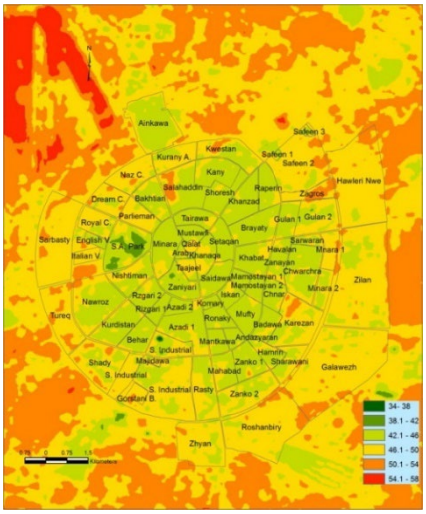
Source: IQAir Website

Figure 2.2.3 Annual Average PM2.5 Concentration (µg/m³) in Erbil

(7) Urban Heat Island Effect

Scientific research on Erbil's surface temperature distribution reveals an inverse relationship between building density and surface temperature. In the city centre and high-density traditional urban areas, surface temperatures are lower compared to the surroundings, a phenomenon known as the Surface Urban Cool Island (SUCI) effect. Conversely, the outskirts and lower-density modern districts experience higher surface temperatures, indicating a Surface Urban Heat Island (SUHI) effect.

Therefore, more than the presence or absence of green areas (see Section 10.1.1), density, typology and form of the urban fabric is therefore considered as the primary factor, in addition to surface wetness and bareness, influencing land surface temperature variations. As shown in Figure 2.2.4 on right, the recent neighbourhood of Sarbasty in the western outskirt, despite having numerous green areas, is hotter than city centre.



Source: Azad Rasul & others, 2015

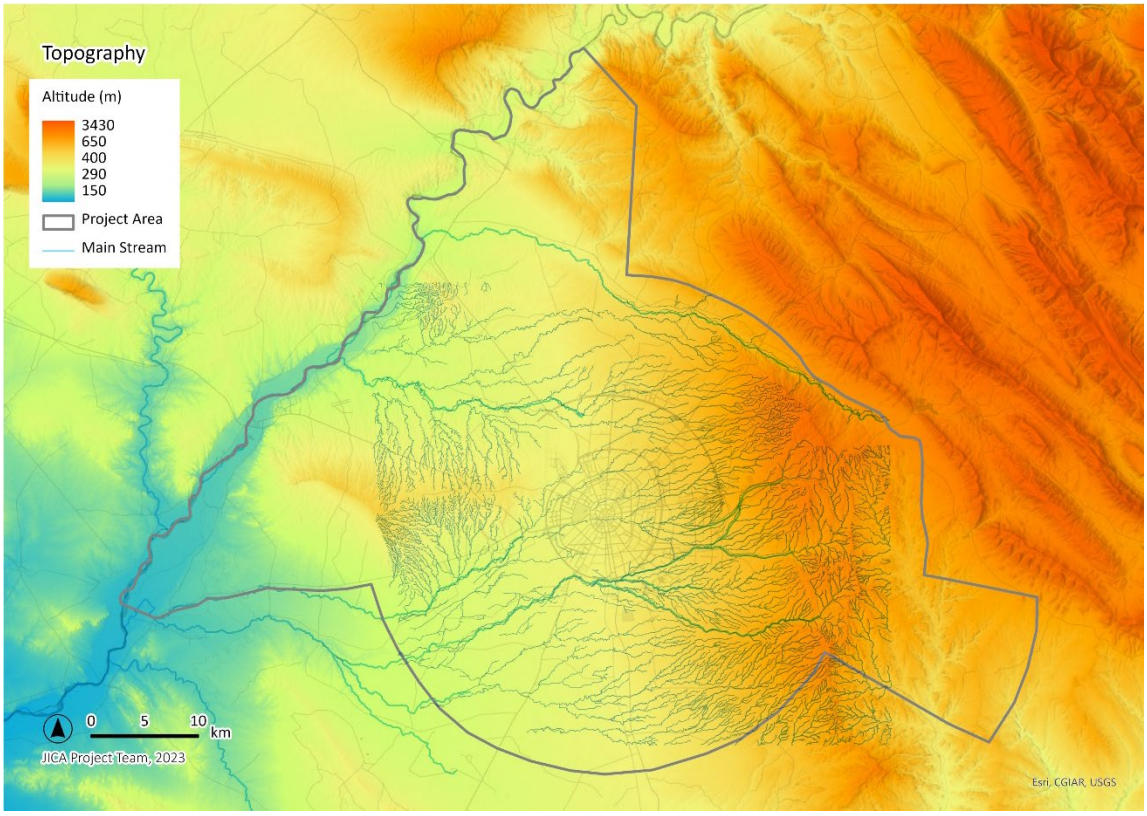
Figure 2.2.4 Land Surface Temperature

2.2.2 Physical Conditions

(1) Topography and Hydrography

In topographic terms, the Project Area, the City of Erbil, is located mostly in the Erbil Plain. The city of Erbil, the Project area, slopes up towards Hasarost Mount and Qarachogh Mountain which located the north-west of outside of the Project Area. The highest point in the Project area is a slightly higher than 1,000 meters. The city of Erbil is mainly located in 390 meters above sea level in the center of the Erbil Plain, a sizable plateau. The highest point inside of the city of Erbil is Castle in Citadel, 414 meters.

In hydrologic terms, Erbil is defined by its rivers, streams, and groundwater resources. The Greater Zab and Lesser Zab rivers, significant tributaries of the Tigris River, are crucial for irrigation and water supply, while numerous smaller seasonal streams enhance the region's hydrographic network. Groundwater, accessed through various aquifers and wells, is a key resource for drinking water and agriculture. See Section 8.1.1 for details in terms of existing conditions of water resources.

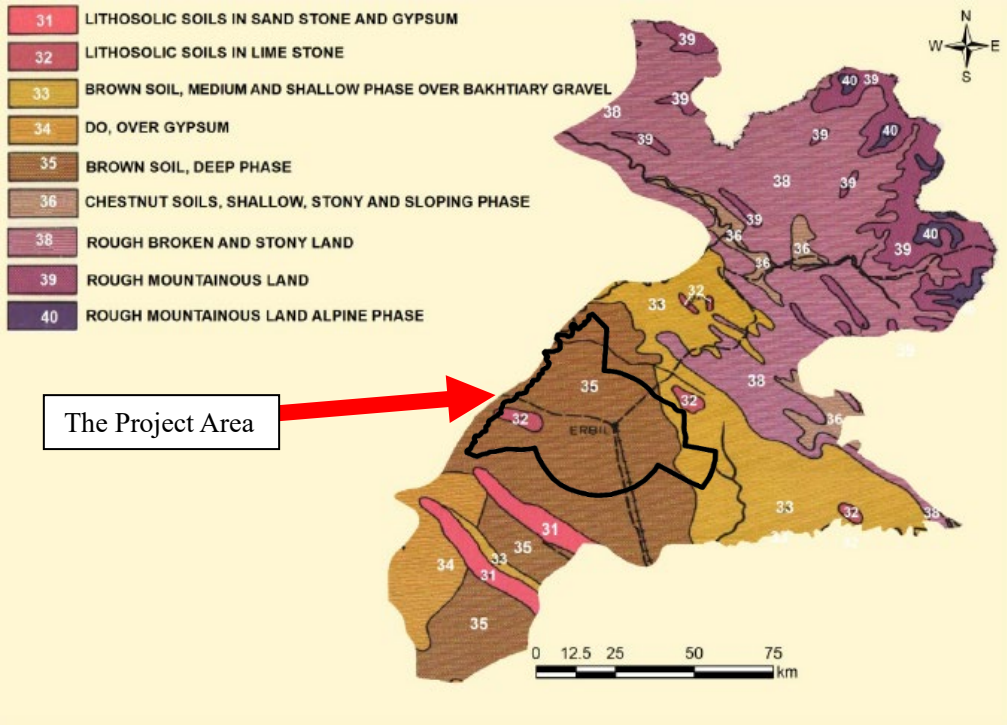


Source: JICA Project Team based on NASA Shuttle Radar Topography Mission (SRTM), 2013

Figure 2.2.5 Topography and Hydrography of the Project Area

(2) Geology & Soil

Erbil city is situated on a plateau, which is characterized by a mix of rock types and soil types. The area is primarily composed of sedimentary rocks such as limestone, sandstone, and shale. The soil in the area is primarily of the calcareous type, which is formed from the weathering of limestone. The Project Area lies across three different categories of soil conditions: (1) Brown soil and deep phase in most area, (2) Lithosolic soils in limestone in a part of west area, and (3) Brown soil, medium and shallow phase over bakhtiary gravel in east area (Figure. 2.2.6)



Source: JICA Project Team based on Agricultural Research and Projects of Ministry of Agriculture (Buringh, P. 1960)

Figure 2.2.6 Soils of Erbil Governorate

2.2.3 Biodiversity

1) Flora and Vegetation

A total of 182 plant species have been recorded in the Project Area, such Pine tree, cypress, olives, poaceous, amaranthaceous, solanaceae, lamiaceae etc. Agricultural crops are planted seasonally.

Although parts of Erbil governorate fall within environmentally protected areas such as Barzan, Zurga Zraw, Sakran etc. Protected Areas, the dominant habitat type (Oak Forest) is rare in Iraq. Although the Project Area does not include any of protected areas, consideration for surrounding protected areas is essential.

2) Endangered Species

According to the International Union for Conservation of Nature and Natural Resource (IUCN), as shown in Table 2.2.5, a total of 27 species considered as endangered may be existing in the Project Area. 2 species (1 bird and 1 fish) are Critically Endangered (CR), 6 species (4 bird, 1 reptile, 1 plant) are Endangered (EN), 9 species (5 birds, 1 fish, 3 mammals) are Vulnerable (VU), and 10 species (9 birds and 1 Mammal) are Near Threaten (NT).

A significant proportion of these fauna and flora comprise of migratory bords, who are not permanent inhabitants of the Project Area. On the other hand, certain species including turtles and fish, reside in riparian.

Table 2.2.5 Endangered species in Project Area

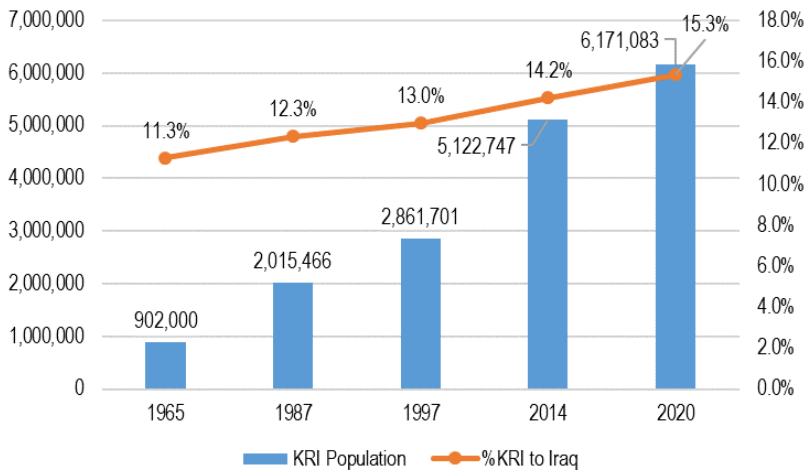
General Animal Classification	Comment name	Status	Population Trend	Note
Critically Endangered (CR)				
Bird	Sociable Lapwing	Extant (Passage)	Decreasing	Habitat: steppes, arid grasslands, cultivated fields. Erbil region is on its migration route.
Fish	Leopard barbel	Probability Extant (Resident)	Decreasing	
Endangered (EN)				
Bird	Egyptian Vulture	Extant (Passage)	Decreasing	Extant (Resident) in near Project Area
	Saker Falcon	Extant (Passage)	Decreasing	
	Steppe Eagle	Extant (Passage)	Decreasing	
	White-headed Duck	Extant (Passage)	Decreasing	
Reptile	Euphrates Softshell Turtle	Extant (Resident)	Decreasing	
Plant	Allium noeanum	Extant (Resident)	Unknown	
Vulnerable (VU)				
Bird	Asian Houbara	Extant (Breeding)	Decreasing	
	Eastern Imperial Eagle	Extant (Passage)	Decreasing	
	European Turtle-dove	Extant (Breeding)	Decreasing	
	Greater Spotted Eagle	Extant (Passage)	Decreasing	
	Lesser White-fronted Goose	Extant (Passage)	Decreasing	
Fish	Binni	Possibly Extinct	Decreasing	
Mammal	Goitered Gazelle	Extant (Resident)	Decreasing	
	Marbled Polecat	Extant (Resident)	Decreasing	
	Leopard	Extinct	Decreasing	Extant (Resident) in Near Project Area
Near Threatened (NT) Fauna				
Bird	Black-tailed Godwit	Extant (Passage)	Decreasing	
	Cinereous Bunting	Extant (Passage)	Decreasing	
	Cinereous Vulture	Extant (Passage)	Decreasing	
	Eurasian Curlew	Extant (Passage)	Decreasing	
	Ferruginous Duck	Extant (Passage)	Decreasing	
	Great Snipe	Extant (Passage)	Decreasing	
	Marbled Teal	Extant (Passage/Resident)	Decreasing	
	Pallid Harrier	Extant (Passage)	Decreasing	
	Redwing	Extant (Passage)	Decreasing	
Mammal	Striped Hyaena	Extant (Resident)	Decreasing	

Source: JICA Project Team based on IUCN database
Note: It does not include species which have no spatial data of mapping on IUCN database

2.3 Socio-Economic Conditions

2.3.1 Demography

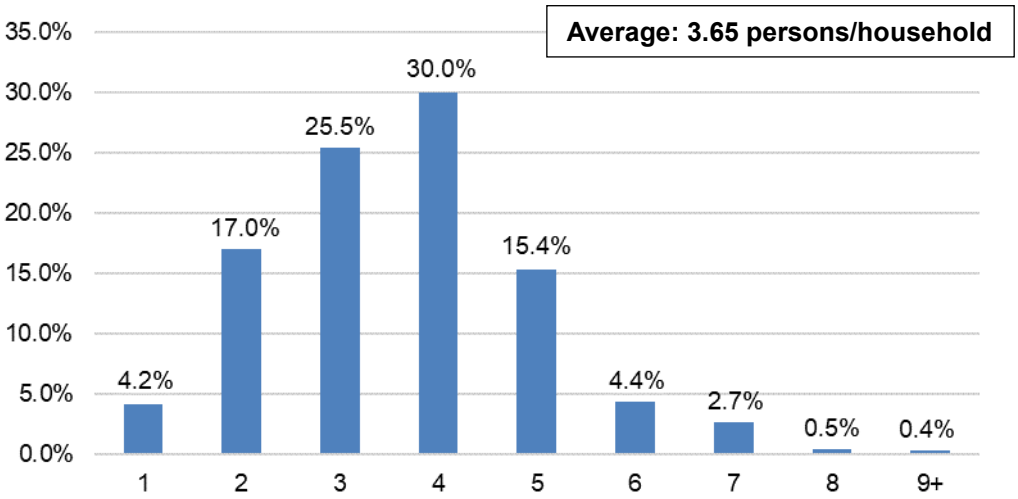
The population census of Iraq has not been conducted since 1987, and all populations since 1998 have been estimated. A population census was conducted in 1997, but the KRI region was not included, and an estimated 2,861,701 was calculated. This represented 13.0% of Iraq's total population of 22,046,244. The latest value for 2020 is over 6 million, increasing its share of the entire Iraqi population to 15.3% (see Figure 2.3.1). And the annual average population growth rate was 3.4% from 1997 to 2020.



Source: International Organization for Migration (IOM), 2018 "DEMOGRAPHIC SURVEY Kurdistan Region of Iraq"

Figure 2.3.1 KRI Population

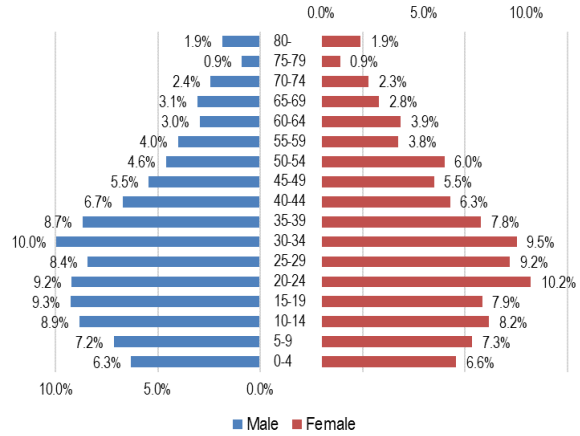
The household size was interviewed in the household survey conducted in this study. According to the result, the average number of persons per household is 3.65 shown in Figure 2.3.2.



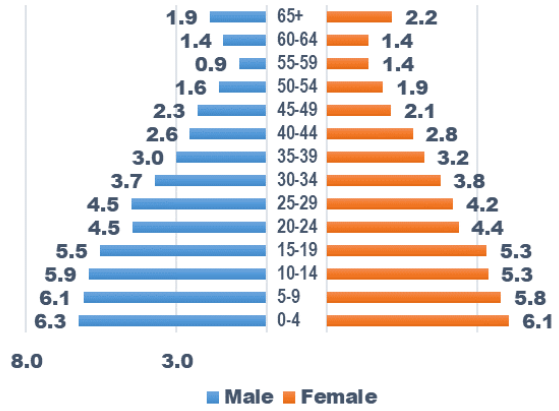
Source: Household Survey, JICA Project Team

Figure 2.3.2 Number of Household Members

Figure 2.3.3 shows the population pyramid by sex and age group. According to the results of the Household Survey conducted for this study, males slightly outnumber females, at 51% of the total (while the KRSO statistics show 50% each). In addition, the age structure indicates that the target area has an aging population compared to the Erbil governorate.



Source: Household Survey, JICA Project Team



Source: Erbil Province Statistics 2021

Figure 2.3.3 Population Pyramid by Sex and Age (%)

2.3.2 Internally Displaced Persons (IDPs) and Refugees

The displacement caused by ISIL[1]'s invasion of Iraqi and Syrian territory has generated changes in the demographic composition of the KRI since 2014. Following ISIL's rapid expansion and heavy fighting, new migrants reached a peak of 2.2 million in 2014. According to a survey[2] conducted in 2017, nearly 60% of the IDPs got to the KRI in 2014, reaching 1.1 million individuals in 2016. As shown in Table 2.3.1, the 6.9 million KRI population in 2016 consisted of 1.1 million IDPs (16% of the KRI population) and 200,000 refugees (3% of the KRI population). The percentage of IDPs is higher in Duhok at 28.6% compared to 10.7% in Erbil and 9.8% in Sulaymaniyah. ; of the IDPs, Duhok hosts 625,000, or 56% of 1.1 million IDPs living in KRI.

Table 2.3.1 KRI Population by Residence Type (2016)

	Erbil		Duhok		Sulaymaniya		Total	
	Population	%	Population	%	Population	%	Population	%
Host	2,060,000	86.0%	1,470,000	67.2%	2,080,000	88.9%	5,610,002	81.0%
IDP	257,424	10.7%	625,000	28.6%	229,000	9.8%	1,111,424	16.1%
Refugees	77,637	3.2%	93,000	4.3%	31,000	1.3%	201,637	2.9%
Total	2,395,061	100.0%	2,188,000	100.0%	2,340,000	100.0%	6,923,063	100.0%

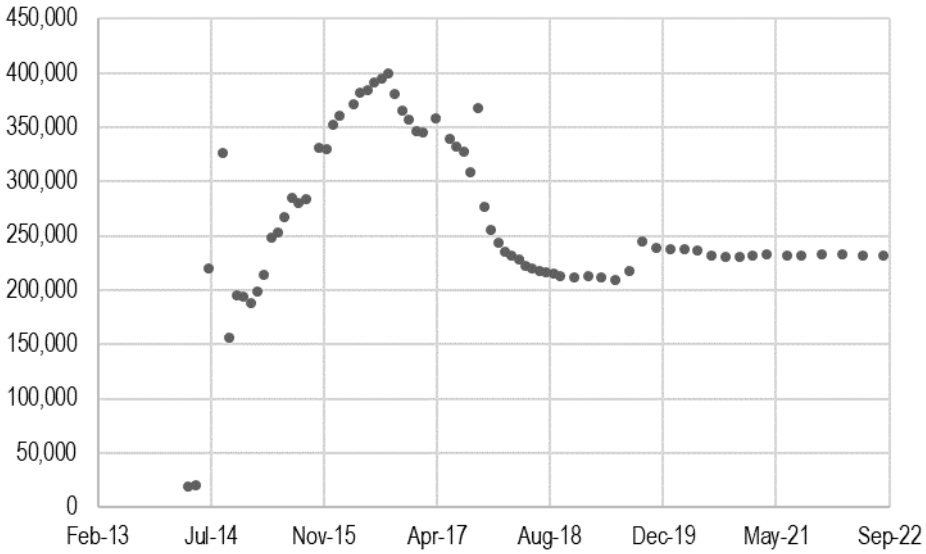
Source: Demographic Survey Kurdistan Region of Iraq, KSRO (2018)

Based on data from the IOM, the number of internally displaced persons (IDPs) within the Erbil governorate since 2014 peaked around 2016 and began to decline, currently hovering around slightly over 230,000 (see Figure 2.3.4).

The distribution of IDPs in Erbil Governorate is shown in Figure 2.3.5, with most of them living in and around Erbil City and more than 20,000 IDPs living in Khabat District near the Great Zab River.

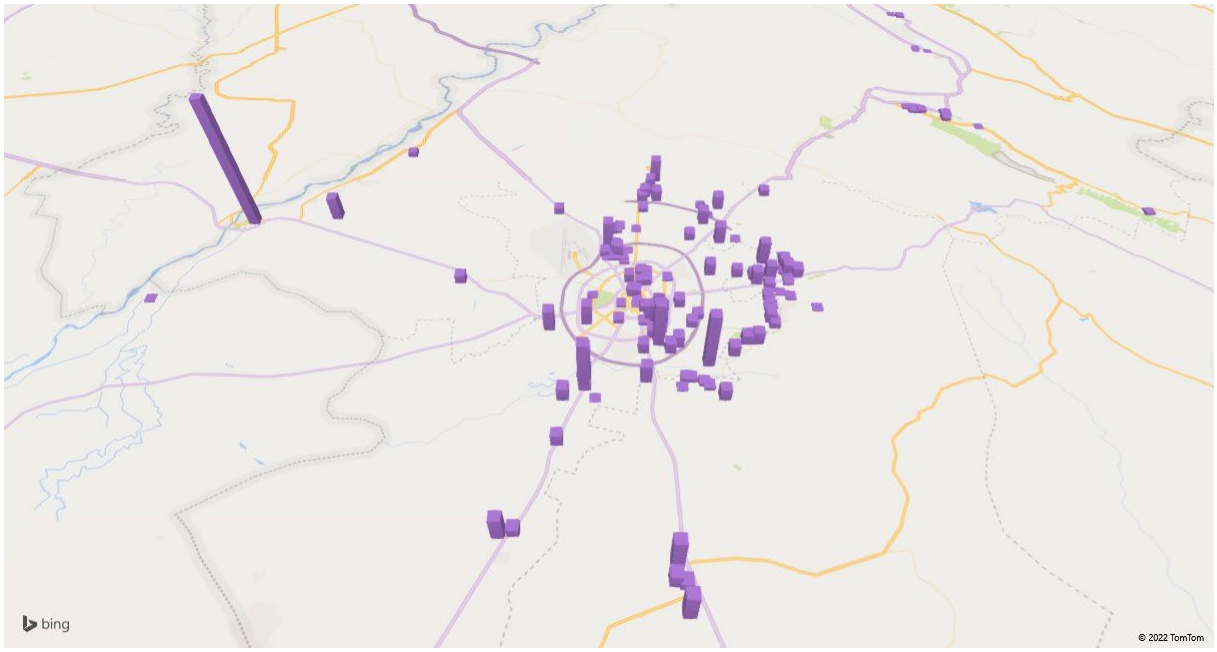
[1] ISIL (Islamic State in Iraq and the Levant) is an Islamic extremist group operating in the region straddling Iraq and Syria to campaign for the establishment of an Islamic state. As of November 2022, it has lost nearly all of its occupied territories in Iraq and Syria and has been virtually destroyed.

[2] Demographic Survey Kurdistan Region of Iraq, KSRO (2018)



Source: IOM, UN Migration

Figure 2.3.4 Internally Displaced Persons (IDPs) in Erbil Governorate



Source: IOM, UN Migration

Figure 2.3.5 Distribution of IDPs within Erbil Governorate (as of March 2022)

2.3.3 Economy

(1) Employment Structure

According to the results of the Household Survey conducted for this study, 69.0% of the male population and 22.2% of the female population between the ages of 15 and 64 in the target area are in the labor force (employment + unemployment looking for work), showing a considerable gender gap. The unemployment rate was 11.9% for men and 4.2% for women. By age group, the labor force is significant for both men and women in the 25-59 age groups (the main working age groups). On the other hand, unemployment is higher among the youth group aged 20-34 (see Table 2.3.2)

Table 2.3.2 Employment Structure in the Target Area

	Male					Female				
	Total	Employment		Unemployment		Total	Employment		Unemployment	
15-19	175	22	(12.6%)	11	(6.3%)	140	5	(3.6%)	5	(3.6%)
20-24	174	53	(30.5%)	33	(19.0%)	182	25	(13.7%)	21	(11.5%)
25-29	159	85	(53.5%)	31	(19.5%)	164	36	(22.0%)	12	(7.3%)
30-34	188	141	(75.0%)	23	(12.2%)	170	41	(24.1%)	7	(4.1%)
35-39	164	131	(79.9%)	14	(8.5%)	139	35	(25.2%)	3	(2.2%)
40-44	127	94	(74.0%)	15	(11.8%)	112	25	(22.3%)	0	(0.0%)
45-49	103	76	(73.8%)	15	(14.6%)	98	19	(19.4%)	0	(0.0%)
50-54	87	67	(77.0%)	3	(3.4%)	107	19	(17.8%)	2	(1.9%)
55-59	76	57	(75.0%)	5	(6.6%)	67	15	(22.4%)	2	(3.0%)
60-64	56	21	(37.5%)	6	(10.7%)	69	5	(7.2%)	1	(1.4%)
Total	1,309	747	(57.1%)	156	(11.9%)	1,248	225	(18.0%)	53	(4.2%)

Source: Household Survey, JICA Project Team

(2) GRP and Productivity by Industry

The Gross regional product (GRP) by sector in Iraq and the KRI is shown in Table 2.3.3. In Iraq and the KRI, "Mining and quarrying (crude oil production)" is the largest sector, accounting for 46.5% of the total in Iraq and the largest in the KRI, with a share of 34.1%. The following largest sectors in KRI are "Transport, communication and storage (17.6%)," "Wholesale and retail business, hotels and the like (11.5%)," and "Social and personal development services (10.1%)," with these four sectors accounting for about 3/4 (73.3%) of the total. Compared to Iraq as a whole, the "Manufacturing industry (accounting for 30.3% of Iraq's total)," "Building and construction (20.5%)," "Transport, communication and storage (23.2%)," and " Wholesale and retail business, hotels and the like (21.1%)" account for relatively large percentages, which is sound compared to the composition of industries that are dependent on oil production.

Table 2.3.3 GRP of Iraq and Kurdistan Region

(Unit: million dinars)

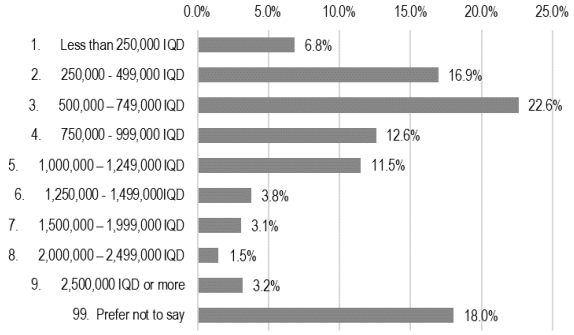
	Economic activity	Kurdistan region	%	Iraq	%	The ratio of Kurdistan to Iraq (%)
1	**Agriculture, forestry and hunting**	**1,054,596.5**	**3.3%**	**7,572,265.1**	**2.9%**	**13.9**
2	**Mining and Quarrying**	**10,789,611.4**	**34.1%**	**120,578,168.9**	**46.5%**	**8.9**
2.1	Crude Oil	10,640,225.3	33.6%	120,174,322.1	46.4%	8.9
2.2	Other types of mining	149,386.1	0.5%	403,846.8	0.2%	37.0
3	**Manufacturing industry**	**1,656,742.0**	**5.2%**	**5,464,371.6**	**2.1%**	**30.3**
4	**Electricity and water**	**995,608.8**	**3.1%**	**7,150,179.1**	**2.8%**	**13.9**
5	**Building and Construction**	**2,477,709.8**	**7.8%**	**12,110,663.3**	**4.7%**	**20.5**
6	**Transport, communication and storage**	**5,568,239.1**	**17.6%**	**23,958,751.5**	**9.2%**	**23.2**
7	**Wholesale and retail businesses, hotels and the like**	**3,650,887.6**	**11.5%**	**17,311,459.4**	**6.7%**	**21.1**
8	**Finance, insurance and real estate services**	**2,272,330.7**	**7.2%**	**17,311,459.4**	**6.7%**	**13.1**
8.1	Banking and insurance					
8.2	Residence Ownership	2,272,330.7	7.2%	16,315,895.9	6.3%	13.9
9	**Social and Personal Development Services**	**3,202,043.8**	**10.1%**	**47,583,378.2**	**18.4%**	**6.7**
9.1	General Government	1,995,656.0	6.3%	38,919,671.8	15.0%	5.1
9.2	Personal Services	1,206,387.8	3.8%	8,663,706.4	3.3%	13.9
	Total	**31,667,769.7**	**100.0%**	**259,040,696.5**	**100.0%**	**12.2**

Source: Ministry of Planning, Kurdistan Region Statistics Office

2.3.4 Living Conditions

(1) Average Household Income

Figure 2.3.6 shows the distribution of average household income. Monthly incomes between 500,000 and 750,000 IQD are the highest, at 22.6% of the total, and households with incomes below 1.25 million IQD account for about 70% of the total.

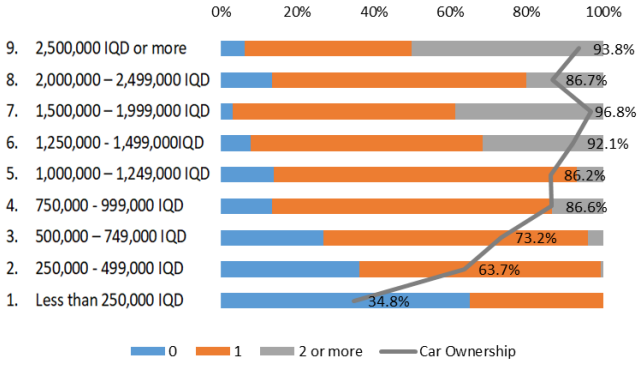


Source: Household Survey, JICA Project Team

Figure 2.3.6 Average household income

(2) Car Ownership Rate

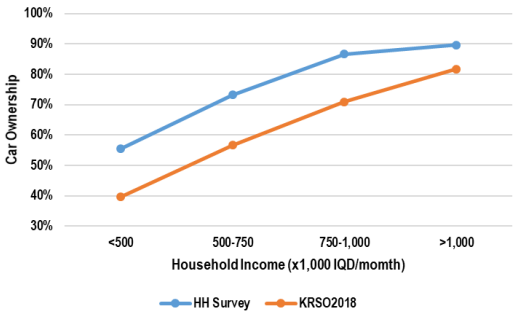
According to the results of the survey on car ownership, more than 70% of all households own at least one car, indicating an extremely high car ownership rate. Figure 2.3.7, which shows the relationship between household income and car ownership, clearly demonstrates that the higher the household income, the higher the car ownership rate, but when household income exceeds 250,000 IQD/month (about $170), more than half of the households own a private car.



Source: Household Survey, JICA Project Team

Figure 2.3.7 Car Ownership Rate

Figure 2.3.8 compares the results to the overall Erbil Governorate household ownership rate of private cars by household income conducted by KRSO in 2018, and clearly, this result shows a higher ownership rate, so a sample bias as well as a regional bias can be assumed.



Source: JICA Study Team

Figure 2.3.8 Car Ownership Rate Comparison

2.4 Land Use & Urbanization

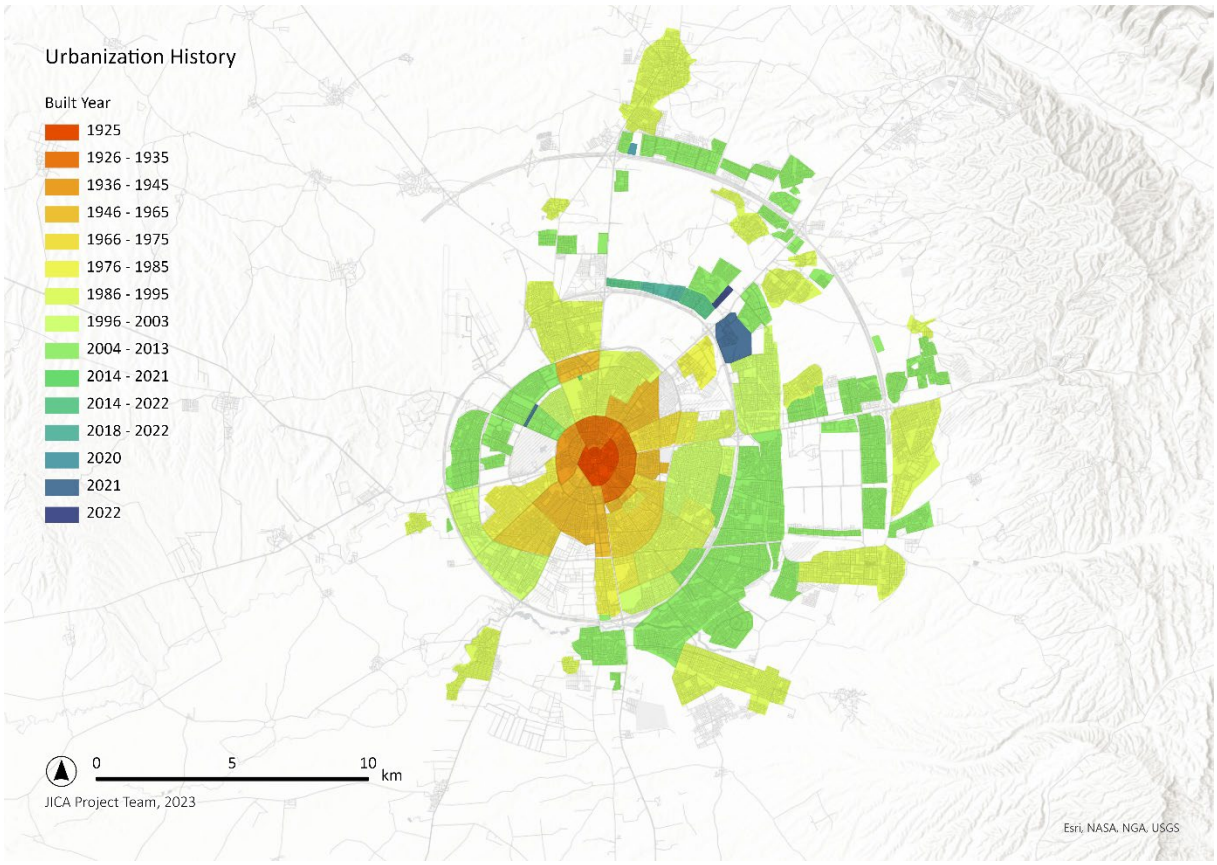
2.4.1 Urbanization History

Human settlement in Erbil may be dated back to the fifth millennium BC, with the Qalat Citadel which was built more than 6,000 years ago. For millenniums, the population of Erbil stayed inside the Citadel, but as the population grew, residents began to construct their homes outside the Citadel's walls. The circular shape of the city then logically expanded in all directions, as Erbil was surrounded by open spaces with minimal mountainous terrain, making it easy to develop residential and industrial areas.

Erbil then underwent significant changes in its urbanization history. In addition to the ancient Citadel, several new neighborhoods were developed, including Khanaka, Tajil, and New Arab neighborhoods in the west and south during the modernization period in the early 1930s. Due to Kurdish migration to the city between the 1930s and 1960s, the population of Kurdish settlers increased and new neighborhoods such as Tayrawa (al-Mustawfi), Seydawa, Sheyhulla, and Sadunawa were established in the north and east of the city.

The city continued to grow in the following decades, with many new neighborhoods being constructed, particularly after the 1950s. With the important afflux of new population, the city of Erbil continued to expand quite in all direction and uniformly in shape from the 1960s to the 2000s, with the construction of ring roads and radials as the major backbone for this round-shaped urban development.

Nevertheless, from the early 2000s, more and more housing development operations were implemented in the outskirts of the city, especially in the Northern and Eastern directions, far from the current urban front but close to expected opportunities given by future ring road developments, leading to a scattered and discontinued urbanization pattern. Figure 2.4.1 shows the urbanization history of Erbil.



Source: Urban Typology, JICA Project Team

Figure 2.4.1 Urbanization History of Erbil

2.4.2 Existing Land Use Land Cover

The land use classes have been updated from Erbil 2030 MP to reflect the current situation. The land use categories are basically inherited from those of proposed land use classes inside the Ring Road 5. To reflect the expansion of urbanizations since 2007, the existing land use classes of this Project covers the area within RW8. Existing Land Use Land Cover Classes and Nomenclature used in Erbil 2050 MP is shown in Table 2.4.1 below.

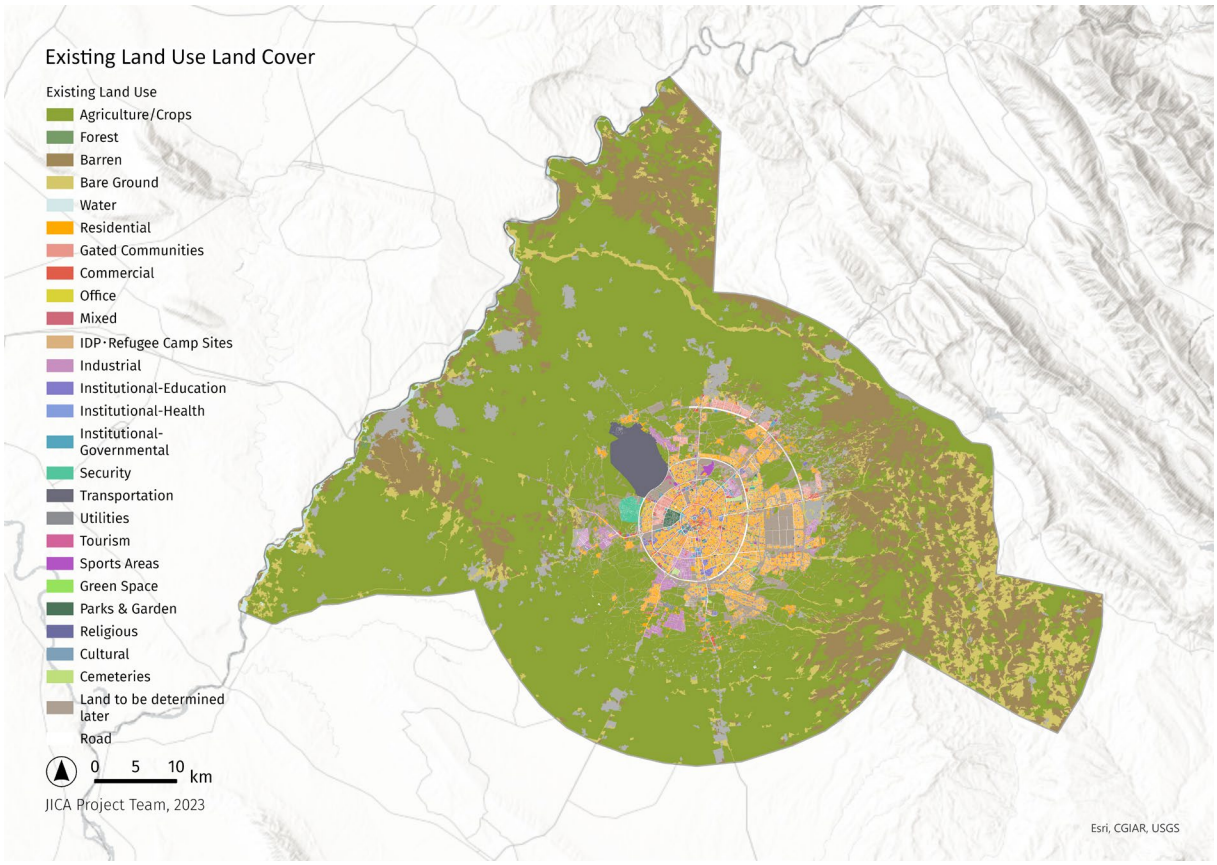
Table 2.4.1 Existing Land Use Land Cover Classes and Nomenclature

Group	#	Code	Category	Sub-code	Sub-category Name	Definitions or Examples
Rural Area (outside of RW8)	1	Un010	Agriculture/Crops	Un011	Active (used)	Area of human planted/plotted cereals, grasses, and crops not at tree height. Example: Arable lands, permanent crops
				Un012	Inactive (unused)	Recognized as agricultural area but not actively used
	2	Un020	Forest	Un021	Broadleaf forest	Any significant clustering of tall (5m or higher) dense vegetation
				Un022	Conifer forest	
	3	Un030	Barren	Un031	Shrub	Open area with sparse or little (below 5m in height) vegetation. Sub-category is available for around inner GreenBelt
				Un033	Grassland	Open area covered in grasses Sub-category is available for around inner GreenBelt
	4	Un040	Bare Ground	Un040	-	Areas of rock, soil, or sand with no vegetation for the entire year
	5	Un050	Built-up	Un050	-	Areas covered in man-made structure
	6	Un060	Water	Un060	-	Self-explanatory
Urban Area (inside RW8)	7	Ub010	Residential	Ub010	-	Areas dominated with residential housing or human settlements
	8	Ub020	Gated communities	Ub020	-	Areas surrounded by walls, protected by guards and surveillance cameras, these gilded enclaves provide a whole range of services often grouped by specialty https://www.jadaliyya.com/Details/35015
	9	Ub030	Commercial	Ub030	-	Areas dominated with gas stations, retails, shops, restaurants, hotels, shopping malls, supermarket, markets and other commercial activities
	10	Ub040	Office	Ub040	-	Areas dominated with offices or business district
	11	Ub050	Mixed	Ub051	Office & Commercial	Areas that are being used for multiple purposes among residential, commercial, office
	12			Ub052	Commercial & Residential	
	13			Ub053	Office & Residential	
	14	Ub060	IDP・Refugee camp sites	Ub061	IDP camp sites	Areas for IDP or Refugee camp
				Ub062	Refugee camp sites	
	15	Ub070	Industrial	Ub070	-	Areas dominated with factories and industrial parks
	16	Ub080	Institutional - Education	Ub081	Kindergarten	Building (parcel) or block that are used as the following facilities: primary schools, junior high schools, senior high schools, universities, colleges, vocational schools, other various schools, preschool (both public and private)
				Ub082	Primary school	
				Ub083	Junior and senior high school	
				Ub084	College and university	
				Ub085	Vocational school	
	17	Ub090	Institutional - Health	Ub091	General hospital	Building (parcel) or block that are used as the following facilities: Hospital, pharmacy, vaccination center, clinic, health center (both public and private)
				Ub092	Clinic and health center	
				Ub093	Vaccination center, specialties (densist, ophthalmologist, oncologist etc)	
				Ub094	Pharmacy	
	18	Ub100	Institutional - Governmental	Ub101	National and regional government (national & regional	Building (parcel) or block that are used as the following facilities: offices for local, regional, national government and other public organizations such as government offices, city halls, town halls, post offices, courthouses, tax offices, revenue offices

Group	#	Code	Category	Sub-code	Sub-category Name	Definitions or Examples
					government, national research institute, courthouse)	
				Ub102	Local government (local government, town hall, community facilities)	
				Ub103	Urban services (post office, tax office)	
	19	Ub110	Security	Ub111	Military	Building (parcel) or block that are used as the following facilities: police stations, gendarmerie offices, military sites, prisons, fire stations, military camp, military training
				Ub112	Police	
				Ub113	Fire stations	
	20	Ub120	Transportation	Ub121	Bus terminals	Building (parcel) or block that are used as the following facilities: stations, bus terminals, water-bus terminals, truck terminals, port facilities, airport facilities, car parks, depots, warehouses
				Ub122	Airport	
				Ub123	Parking	
				Ub124	Warehouses	
	21	Ub130	Utilities	Ub131	Water	Building (parcel) or block that are used as the following facilities: wastewater treatment plants, power plant, water tanks, sanitary facilities, waste disposal sites, final landfill sites, substations, slaughterhouses, broadcast stations, telecommunications
				Ub132	Sewage	
				Ub133	Waste	
				Ub134	Electricity	
				Ub135	Telecommunication	
	22	Ub140	Tourism	Ub141	Commercial Tourism (hotels, amusement park, leisure facilities)	Building (parcel) or block that are used as the following facilities: tourist facilities, historic sites, citadel
				Ub142	Cultural and historical heritage (citadel, world heritage, archeological sites)	
	23	Ub150	Sports Areas	Ub150	-	Building (parcel) or block that are used as the following facilities: stadium, grounds, gymnasiums, pools, golf courses
	24	Ub160	Green Space	Ub160	-	Natural green space that is observed no particular activities/usages
	25	Ub170	Parks & Garden	Ub171	Parks and kids' playground	Building (parcel) or block that are used as the following facilities: green zones for particular usage/activity, gardens, parks, children's playgrounds
				Ub172	Botanical garden and zoo	
	26	Ub180	Religious	Ub181	Mosques	Building (parcel) or block that are used as the following facilities: Churches, mosques, temples, other religious facilities
				Ub182	Churches	
				Ub183	Other religious facilities	
	27	Ub190	Cultural	Ub190	-	Building (parcel) or block that are used as the following facilities: museum, art galleries, libraries
	28	Ub200	Cemeteries	Ub200	-	Self-explanatory
	29	Ub210	Land to be determined later	Ub211	Vacant	Empty space
				Ub212	Unused	areas that building construction is completed but with no current use
				Ub213	Under Construction	Areas that building construction is incomplete
	30	Ub220	Road	Ub221	Main road	Main road, secondary road, ring road, sidewalk
				Ub222	Secondary road	
				Ub223	Ring road	
				Ub224	Sidewalk	

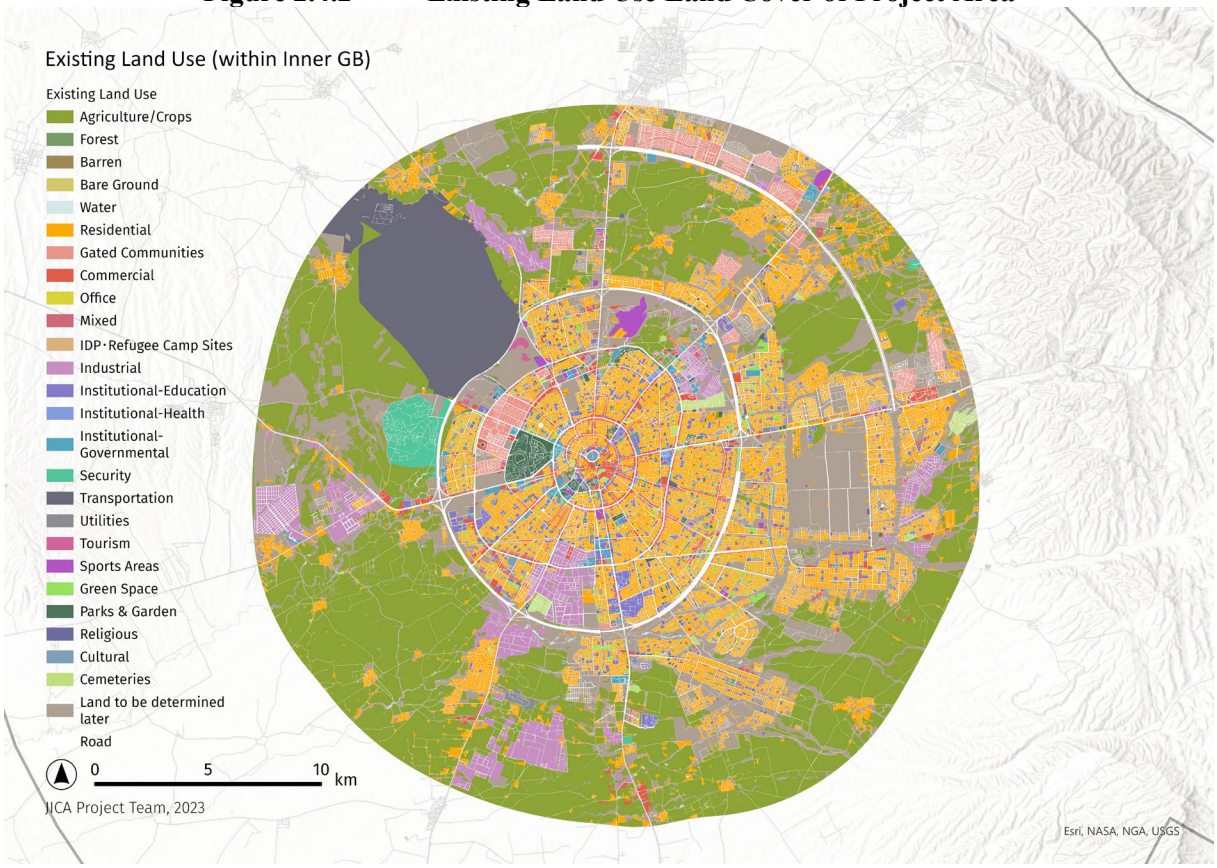
Source: JICA Project Team

Existing Land Use Land Cover over the whole Project Area and Existing Land Use within Inner Green Belt are shown in Figure 2.4.2 and 2.4.3 respectively.



Source: JICA Project Team

Figure 2.4.2 Existing Land Use Land Cover of Project Area



Source: JICA Project Team

Figure 2.4.3 Existing Land Use (within Inner Green Belt)

Table 2.4.2 Total Area by Land Use Class for the Whole Project Area

Land Use Class	Total Area (km2)	Share
Agriculture/Crops	1,610.07	58.9%
Barren	477.26	17.5%
Built-up	450.39	16.5%
Bare Ground	181.65	6.6%
Water	14.06	0.5%
Forest	1.10	0.0%
Total	2,734.54	100%

Source: JICA Project Team

Table 2.4.3 Total Area by Land Use Class inside Inner Green Belt

Land Use Class	Total Area (km2)	Share
Agriculture/Crops	178.03	33.4%
Land to be determined later	116.27	21.8%
Residential	83.63	15.7%
Road	53.15	10.0%
Transportation	29.90	5.6%
Industrial	19.43	3.6%
Commercial	10.62	2.0%
Gated communities	8.03	1.5%
Institutional - Education	6.69	1.3%
Security	4.73	0.9%
Parks & Garden	4.16	0.8%
Green Space	4.07	0.8%
Institutional - Governmental	3.21	0.6%
Sports Areas	2.07	0.4%
Water	1.92	0.4%
Cemeteries	1.90	0.4%
Religious	1.41	0.3%
Utilities	0.97	0.2%
Institutional - Health	0.90	0.2%
Mixed	0.59	0.1%
Tourism	0.35	0.1%
Office	0.24	0.0%
Cultural	0.23	0.0%
IDP - Refugee camp sites	0.04	0.0%
Total	532.54	100%

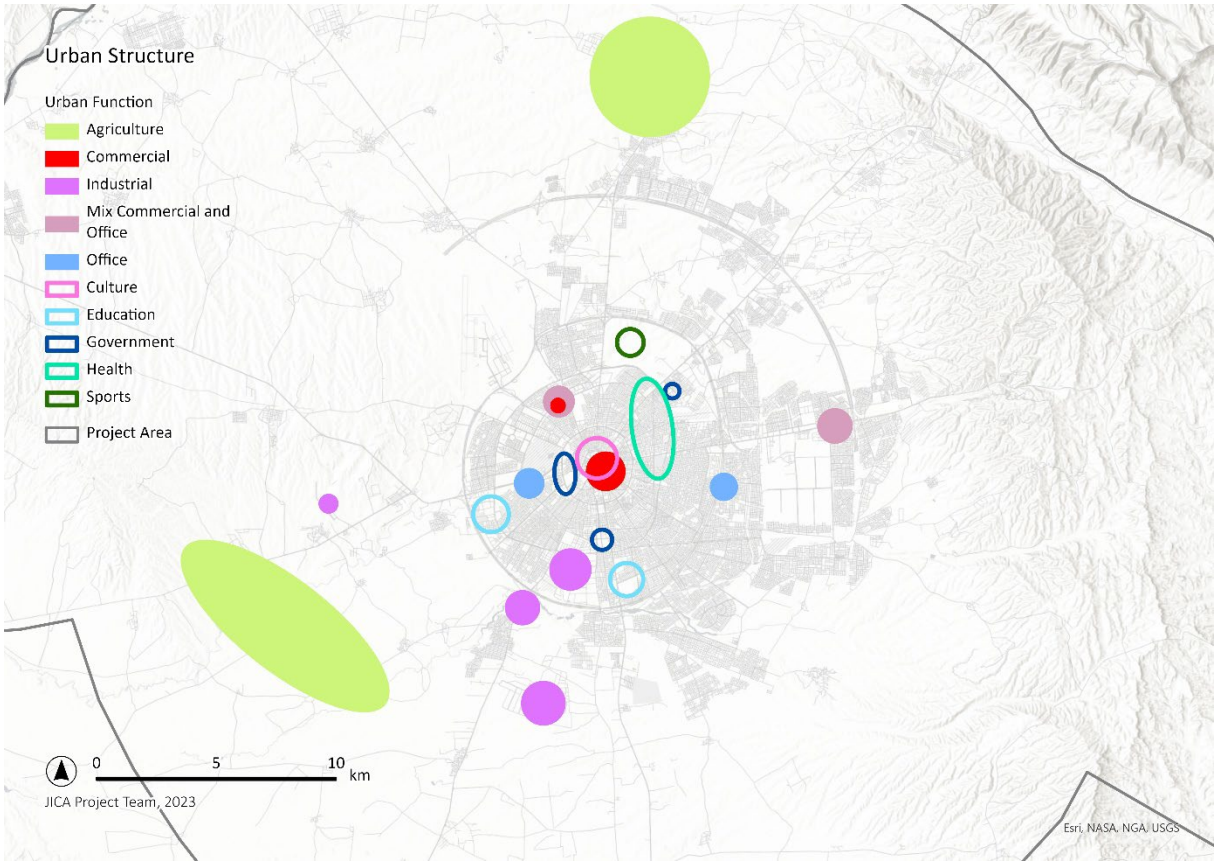
Source: JICA Project Team

The following are some of the conclusions from the analysis of current Land Use Land Cover data.

- Agricultural land accounts for the highest percentage of the land use categories. The detail of existing Agricultural Land Cover classes is given in Section 6.1.1.
- Even within Inner Greenbelt, agricultural land is the category that accounts for the highest percentage of land use, followed by Land to be determined. This suggests that a lot of areas have not been developed for any man-made structure;
- Small size built-up areas are scattered throughout the Project Area;
- Followed by Agricultural, Land to be determined later, and Residential class, Road, Transportation, Industrial, Commercial are the fourth, fifth, sixth, and seventh classes, respectively. This suggests that these classes are related to economic activities, which represents a characteristic of the city;
- On the other hand, total area of open space and parks is limited throughout the city. There are also few areas of dense forest with tall trees, except for one large park called Sami Abdulrahman Park located in the west within RW5.

2.4.3 Existing Urban Structure

The analysis of existing urban structure is crucial for understanding the distribution of urban functions and the dynamics of urban development throughout the city. Figure 2.4.4 shows the major cores of each key urban function, namely economic activities and public urban services. This map was produced through a density analysis for each class using existing Land Use Land Cover GIS data. Area or volume of each polygon was taken into account as weights in the density calculation.



Source: JICA Project Team

Figure 2.4.4 Existing Urban Structure

The existing urban structure of Erbil city can be analyzed as follows:

- Erbil has a dispersed urban structure, without a clear Central Business District (CBD), which typically concentrates a variety of urban functions such as commercial, financial, cultural and administrative activities. The scattering of all those activities has a dual explanation: the historic spontaneous urbanization and the adoption of a very functional type of urban planning in recent years;
- The oldest area after the Citadel, situated inside 60m ring road, is characterized by the concentration of small shops and businesses as well as government facilities;
- Beyond the 60m ring road, small shops and businesses are dispersed throughout the area, however, there are several high-density clusters of office buildings, commercial centers, and mixed-use developments such as the Justice Tower and Andazyaran Apartment;
- In the southwestern part around 120m ring road, large facilities like universities and industrial sites are located. Industrial clusters are expanded in the southern direction;
- Along Gulan St. between Pirman St. and Koya St., there is a higher concentration of health facilities including small clinics and pharmacies as well as two major hospitals Raparin Children Maternity Hospital and Rizgary Teaching Hospital;
- Outside of 150m ring road, lands especially to the north and southwest remains relatively agricultural.

2.4.4 Existing Housing Typology

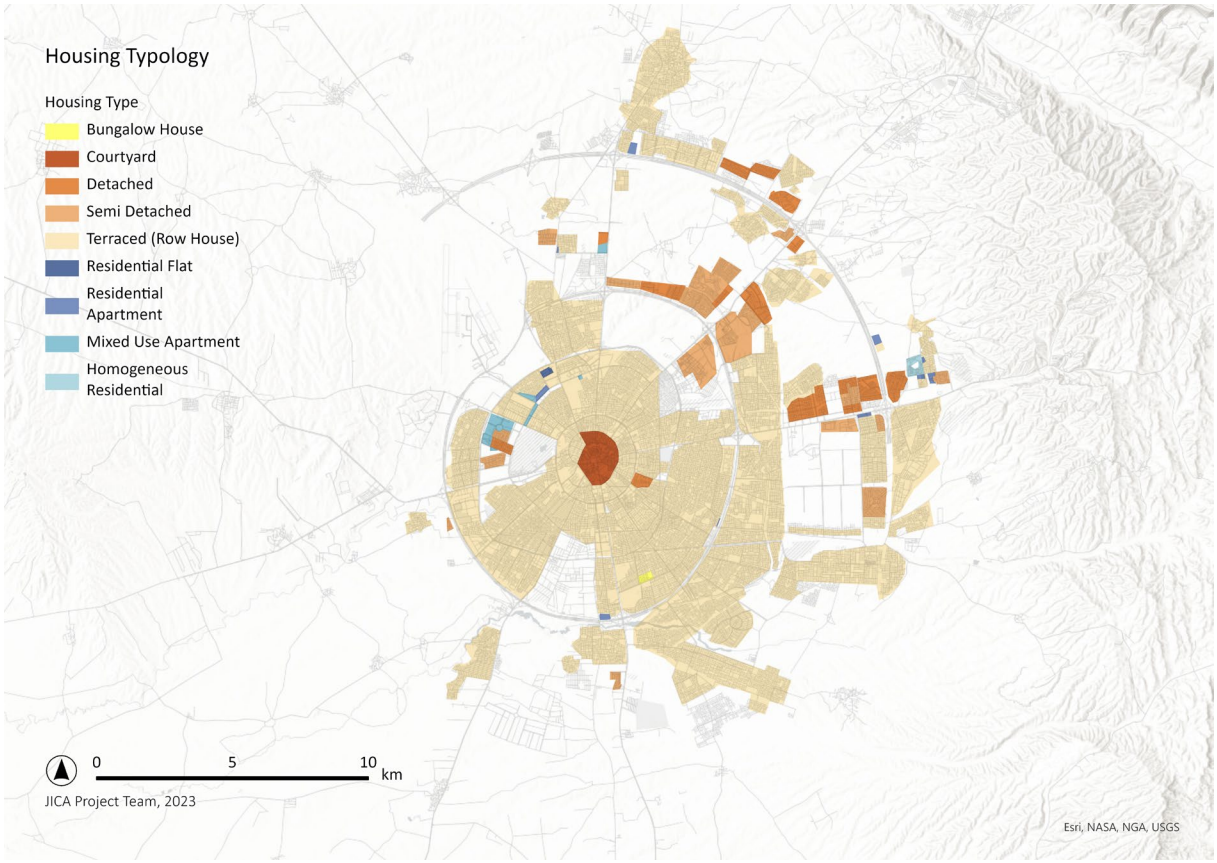
Studying the housing typology helps planners to understand the historical and cultural context of a city, so decisions regarding new developments are in line with the existing character of a city. Also, housing typology can be used to identify areas of a city that may be in need of redevelopment or revitalization, as well as areas that are at risk of gentrification. In Erbil, the influence of the different cultures of its residents led to a diverse mix of housing styles in the city, distinct from the traditional courtyard houses.

The earliest types of houses of Erbil, built inside and at the foot of the Citadel are mentioned as courtyard type, connecting to the homes on all sides, providing an open area (a court) in the middle of the dwelling. Having being built-up prior to the modern era, courtyard type housing does not include a parking spot, are generally not suitable for modern lifestyle requirements, and are at an advanced stage of deterioration, which can justify revitalization and modernization operations of the whole neighborhood.

As shown in Table 2.4.4 below, the vast majority of residential areas in Erbil is constituted by single-family terraced houses (or row house), built from the modernization era in the 1930s in the extension of the Citadel. Those are one-story or two-story houses, sharing side walls, usually providing one parking area without garden, and it is targeting relatively modest households.

In recent years, in areas on the outskirts of the city, particularly in the East and North, detached and semi-detached housing has become the new standard for higher-income households. Detached housing consists in single-family free-standing residential building with parking spot or even a garage, while semi-detached type, common in gated communities, consists of two houses that are built next to each other and share a common wall, typically with each unit having a layout that is a mirrored version of the other.

Multi-family housing such as residential flats, collective housing apartments or mixed-use towers have started to be developed only from the early 2000s and is still very limited until now, but more and more investors are now betting on collective housing and mixed-use towers, as explained in section below.



Source: Housing Typology, JICA Project Team

Figure 2.4.5 Existing Housing Typology

Table 2.4.4 Existing Housing Typology Figures

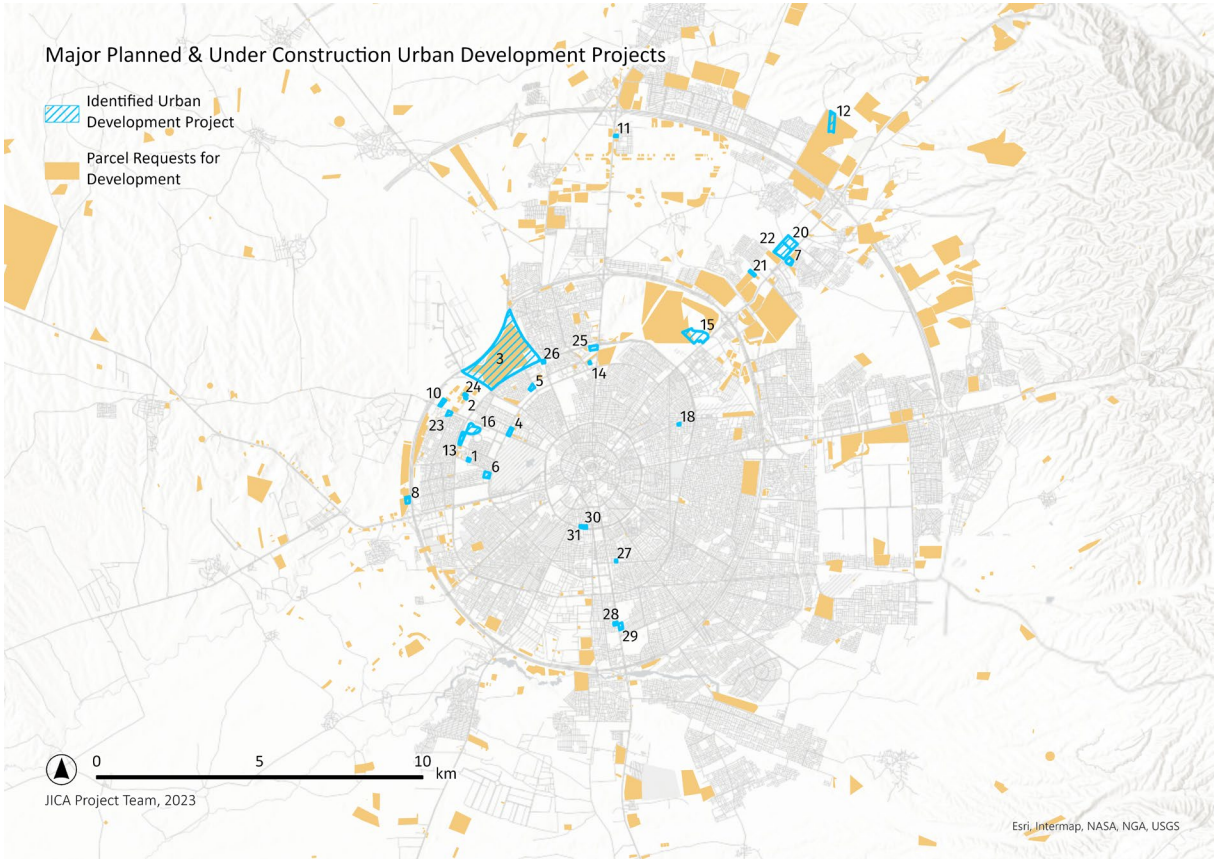
Category	Housing Typology	Residential Area in 2022 (ha)	Share (%)
Individual Housing	Terraced (Row houses)	13,665	85.8%
	Semi-Detached	1,066	6.7%
	Detached	734	4.6%
	Courtyard	223	1.4%
	Bungalow Houses	15	0.1%
Collective Housing	Mixed-Use Apartment	105	0.7%
	Residential Apartment	67	0.4%
	Homogeneous Residential	37	0.2%
	Residential Flat	11	0.1%
Total		15,923	100%

Source: JICA Project Team

2.4.5 Major Planned Urban Development Projects

The majority of major urban development projects planned and under construction as of January 2023 is located in the North of Erbil, due to the favorable climatic condition and easier access to water and other infrastructure. A concentration is especially observed in the northwestern quarter of the 120 m road ring area. Others are located along the major road leading to the northeast and close to ring roads.

Due to the lack of information available on urban development investments, basic information such as project type, planned number of floors and of dwelling units as well as location of major urban development projects has been collected from investors websites, as shown in blue hatch in Figure 2.4.6 and detailed in Table 2.4.5 below. In addition, land parcels currently requested by private investors to UPDOE, that might be developed in the near future, are shown in light orange in Figure 2.4.6.



Source: JICA Project Team

Figure 2.4.6 Map of Major Planned Urban Development Projects in Study Area

Basic information on major urban development projects will continue to be collected from the General Directorate of Investment Erbil and other relevant government offices and other related organization. Information regarding urban development projects to be implemented in short and medium terms is essential to be able take them into account in the drafting of realistic development alternatives and future land use plan.

Table 2.4.5 List of Major Planned Urban Development Projects in Study Area

	Name	Type*	State**	Bldg	Floor	Units	Other Info
1	English Tower	MU	UC	3	30	627	4 types of apartments proposed
2	Saloor Towers	MU		1	18		9 types of offices proposed
3	Pavilion Erbil	MU	UC			855	6 types of villas proposed
4	Tulip Towers	RA	UC	4	40	1,220	
5	Queen Towers	RA	UC				
6	Candle Residence Tower		UC	4	40	2,250	17 types of apartments proposed
7	Var Park Towers	RA		8	40		4 types of apartments proposed
8	BCD Signature Towers	MU	UC	3			
9	Rena Towers	RA		5	26		
10	White Towers	RA		2	17		
11	Capital Towers	MU		2	30&25		
12	Golden Towers	RA		11	12		5 types of apartments proposed
13	Empire World West Wing	RA	UC	15	9~27		6 types of apartments proposed/ The project includes villas, apartments, business complex and hotels.
14	Florence Towers	RA		2	33	420	
15	Diplomatic City	MU	CO	7	24, 28, 30		
16	Empire Pearl Tower	RA/C	CO	7	23	1,680	
17	H Tower	MU	UC	3	30	627	Same as English Tower
18	Brayati Towers		UC	2	52		
20	Asco International City	RA		12	20-26		
21	4 Seasons Park	RA		4	16, 20, 23, 26	500	
22	Qaiwan Mirador	MU	UC	8	29, 40		5 types of apartments proposed
23	Centro Tower Erbil	RA	UC	2			
24	Green World	RA	UC	5	22		
25	Sky Tower	RA/C		3	33	1,104	Ground and first floor: Commercial
26	Zagros Tower	RA		3	35, 29, 32		7 types of apartments and 60m2 studio proposed
27	Bakhtyary Twin Towers	RA/C		2	31		Ground floor : Commercial
28	Rona Towers	RA		2	30		
29	Rena Towers	RA		5	26		
30	E1 Tower	RA	CO	1	48		
31	Zanyary Towers	RA/C	CO	3	25		

Note: (*) RA: Residential Apartment, RV: Residential Villa, MU: Mixed Use, C: Commercial, R: Recreation
(**) UC: Under Construction, PL: Planned & Construction not started, CO: Completed

Source: JICA Project Team

2.4.6 Urbanization Potential Analysis

(1) Methodology of Urbanization Potential Analysis

In the perspective of selection of the preferential future extension zones of the city of Erbil, an analysis of the potential of urban expansion, according to public authorities on one hand and to private investors on the other hand, of the surroundings of the city has been carried out, on the basis of purely geographical factors. The factors considered in the analysis are relating to both natural and socio-economic environment and are either attractive or repulsive for urbanization. Development intentions based on the viewpoint of public authorities, with the GDUP at the end of the line, has been developed to serve as the foundation for further spatial analysis in the formation of the Erbil 2050 MP. Oppositely, development intentions based on the viewpoint of private investors has been imagined forecasting the zones that will

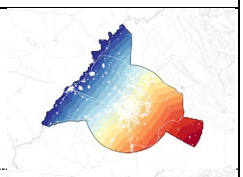
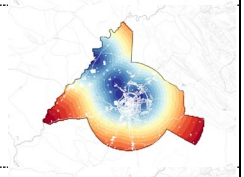
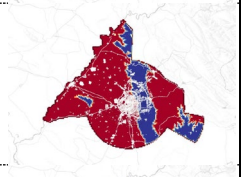
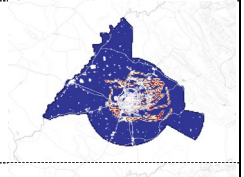
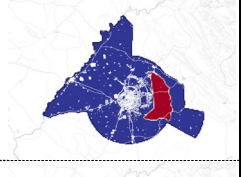
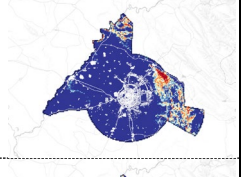
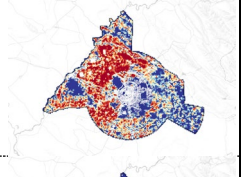
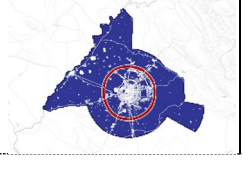
become attractive for urban development investment in the near future. The confrontation of both viewpoints will give a clear idea of the areas that will be disputed for urban development in near future.

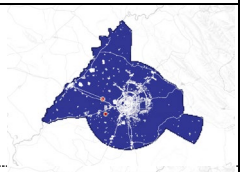
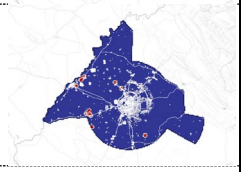
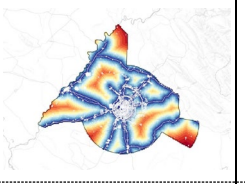
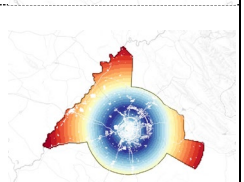
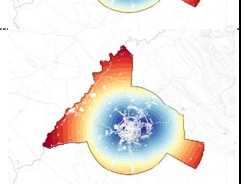
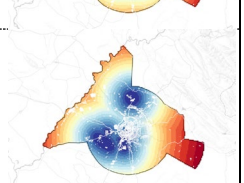
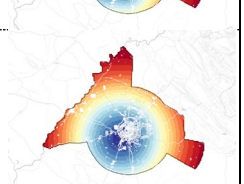
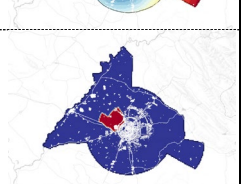
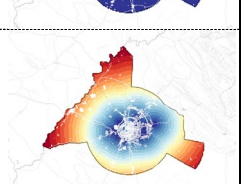
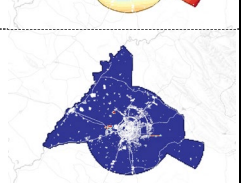
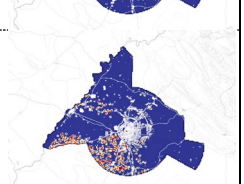
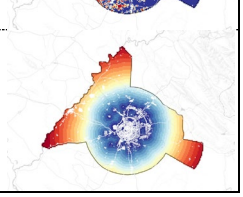
In terms of methodology, a 500-meter grid will be first generated throughout the Project Area. According to the Weighted Linear Combination (WLC) aggregation method, each square of the mesh receives an urban expansion potential score calculated on the basis, on the one hand, of the attractive (pull) or repulsive (push) character of the factors, but also of its weighting.

(2) Definition of the Factors used in the Urbanization Potential Analysis

A total of 19 factors has been fixed, and the most accurate GIS data to be used in the analysis has been searched for each factor, as shown in Table 2.4.6 below. The attractiveness and repulsiveness values are spatially represented on the maps for each criterion in blue and red, respectively.

Table 2.4.6 Definition of the Factors used in the Urbanization Potential Analysis

	Factor	Definition	Spatial Extent
Natural Environment	01. River proximity	Proximity of Great Zab River is **attractive** for urbanization and especially for recreation and residential projects.	
	02. Water Supply Source Proximity	Proximity of water supply sources such as Ifraz 1, 2, 3, future Ifraz 4 and storage tanks is **attractive** for urbanization since it is assumed that development costs will be less expensive (less need for piping).	
	03.Temperatures	Cooler temperatures are generally more **attractive** for urbanization: the 1st sub-factor of cooler temperatures is simply the proximity to the North direction. the 2nd sub-factor of cooler temperatures is high altitude, from 450 m to 600 m (50 to 250 meters higher than city center altitude) and from 600 m and higher (more than 250 meters higher than city center altitude).	
	04. Streamline water corridor	Overlap of streamline water corridors is **repulsive** for urbanization since it can result in modification of riverbed shape and water flow, erosion, flooding or runoff water contamination.	
	05. Groundwater recharge zone	Overlap of groundwater recharge zone is **repulsive** for urbanization, since soil imperviousness prevents water infiltration and recharge of groundwater.	
	06. Slope	Overlap of slope of 12 degrees or more is **repulsive** for urbanization since it implies relatively difficult and expensive construction, soil erosion and challenging water management.	
	07. Farmlands	Overlap of farmlands is **repulsive** for urbanization since it results in loss of agricultural productivity and biodiversity, increase of impervious surface resulting in less water infiltration and more runoffs and flooding.	
	08. Inner Greenbelt	Overlap of Inner Greenbelt is **repulsive** for urbanization, since the conservation of the natural ecosystems, agricultural fields and future plantation on the greenbelt has been approved officially by KRG.	

Factor		Definition	Spatial Extent
Human / Socio-Economic Environment	09. Landfill / WWTP (existing & future)	Direct proximity of 1 km circumference from solid waste landfill and Wastewater Treatment Plant (WWTP) is **repulsive** for urbanization, due to the released air pollution and bad smells.	
	10. Oil refineries	Direct proximity of 1 km circumference from oil refineries is **repulsive** for urbanization, due to the released air pollution nuisance.	
	11. Major existing and future roads	Proximity of existing (left map) and future (right map) main roads and especially 150-meter Ring Road will be **attractive** for urbanization since it allows better accessibility, ensures visibility for businesses and brings infrastructure development. 	
	12. Primary employment cores	Proximity of primary employment cores that gathers businesses in the tertiary sector (office and commercial) is **attractive** for urbanization.	
	13. Secondary employment cores	Proximity of secondary employment cores that gather businesses in the primary and secondary sectors (agriculture and industry) is relatively **attractive** for urbanization.	
	14. International inter-city railroad station	Proximity of future inter-city railroad station (F/S study ongoing) will be **attractive** for urbanization since it will allow better accessibility to surrounding cities of Kurdistan and other regions.	
	15. Airport Zone and surrounding forbidden zone	Erbil International Airport zone as well as surrounding forbidden zones are not permitted to be urbanized and are thus naturally critically **repulsive** for urbanization.	
	16. Future urban public transport stations (LRT, bus)	Proximity of future urban public transportation stations (LRT or bus) will be **attractive** for urbanization since it will allow better accessibility to city center and jobs.	
	17. Underground mining	Overlap of underground mining area is **repulsive** for urbanization, since costly environmental remediation is priorly needed to accommodate housing development.	
	18. Archeological sites	Overlap of archeological sites is **repulsive** for urbanization, in order to preserve as much as possible the remaining of the past. Most of the archeological sites are gathered in the south-western part of the Project Area, and some between the EIA and Great Zab River.	
	19. Large public facilities	Proximity of large public facilities such as schools, hospitals and other urban services is **attractive** for urbanization since it allows more rational and cheap development supported by the convenience given by existing facilities.	

(3) Scoring of the Urbanization Potential Analysis Factors

The weighting of the factors, which has been established on a scale of 1 to 10, was decided through several working sessions with the KRG side from July to December 2022. Table 2.4.5 reflects the consensus built on the scoring of the Urbanization Potential Analysis Factors. Two versions of the scoring have been performed, one reflecting the development intentions of the public authorities of KRG, led by GDUP, and another one showing theoretically the interests of the private investors.

Table 2.4.7 Scoring of the Urbanization Potential Analysis Factors

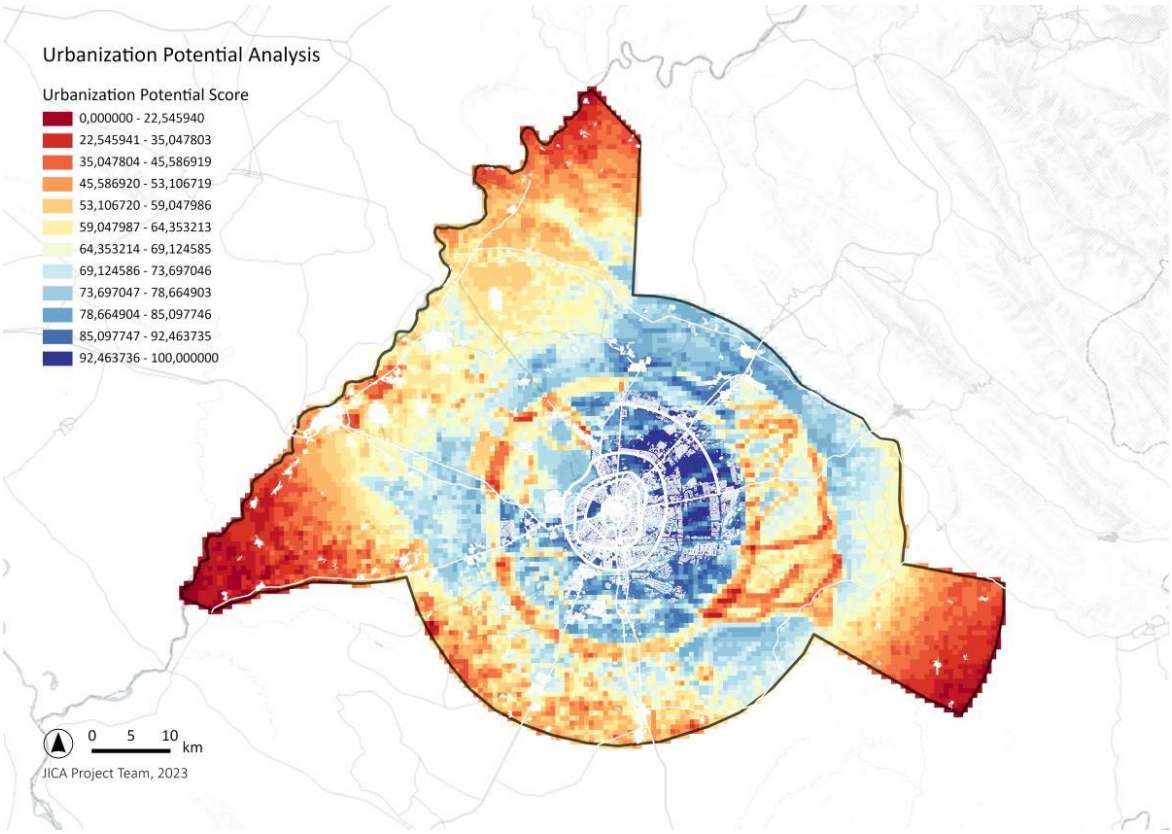
Factor		Development Intentions				Spatial influence	Note/Obstacle in Data Access
		Public authorities		Private investors			
		Effect	Weight	Effect	Weight		
01	River proximity	Pull	4	Pull	5	Proximity	**Included.** Potential of riverside for recreation activities or residential projects.
02	Water Supply Source Proximity	Pull	6	Null	-	Proximity	**Included.** Proximity to water supply sources Ifraz 1, 2, 3 & 4, Maroda PS, Dawajin TR, Storage Tanks as cheaper development cost
03	Temperatures	Pull	4	Pull	3	Direction Overlap	**Included.** Contains two sub-factors: (03a) North direction and (03b) Altitude 50 m and 200 m higher than city center (450 m & 600 m)
04	Streamline water corridor	Push	10	Null	-	Overlap	**Included.** Data from Directorate of Water Resources
05	Groundwater recharge zone	Push	9	Null	-	Overlap	**Included.** Polygon delineated by JICA Project Team (see Section 8.1.2 (2))
06	Slope	Push	2	Push	1	Overlap	**Included.** Slope more than 12 degrees is considered unsuitable. Created based on DEM.
07	Farmlands	Push	6	Null	-	Overlap	**Included.** Data from LULC/JICA.
08	Inner Greenbelt	Push	9	Null	-	Overlap	**Included.** Data from GDUP/MoMT.
09	Landfill / WWTP (existing & future)	Push	10	Push	5	Proximity	**Included.** Zone of 1,000 m of pollution nuisance has been delineated
10	Oil refineries	Push	10	Push	5	Proximity	**Included.** Zone of 1,000 m of pollution nuisance has been delineated
11	Major existing and future roads	Pull	8	Pull	5	Proximity	**Included.** Existing and future roads.
12	Primary employment cores	Pull	9	Pull	5	Proximity	**Included.** Tertiary sector (office, commercial and mix) employment.
13	Secondary employment cores	Pull	7	Pull	2	Proximity	**Included.** Secondary and primary sector (industry & agriculture) employment.
14	International inter-city railroad station	Pull	6	Pull	3	Proximity	**Included.** Based on Erbil 2030 MP. An update after the F/S may be necessary.
15	Airport Zone and surrounding forbidden zone	Push	10	Null	-	Overlap	**Included.** Data of Airport Zone and surrounding forbidden (military) zones from Open Street Map.
16	Future urban public transport stations (LRT, bus)	Pull	8	Pull	2	Proximity	**Included.** Information from Ministry of Transport & Communication (See Section 7.1.2 (4))
17	Underground mining	Push	8	Null	-	Overlap	**Included.** Data from Open Street Map.
18	Archeological sites	Push	8	Null	-	Overlap	**Included.** Data obtained from Harvard University (See Section 5.3.2).
19	Large public facilities	Pull	8	Null	-	Proximity	**Included.** Data from LULC/JICA.

Source: JICA Project Team

(4) Results of the Urbanization Potential Analysis

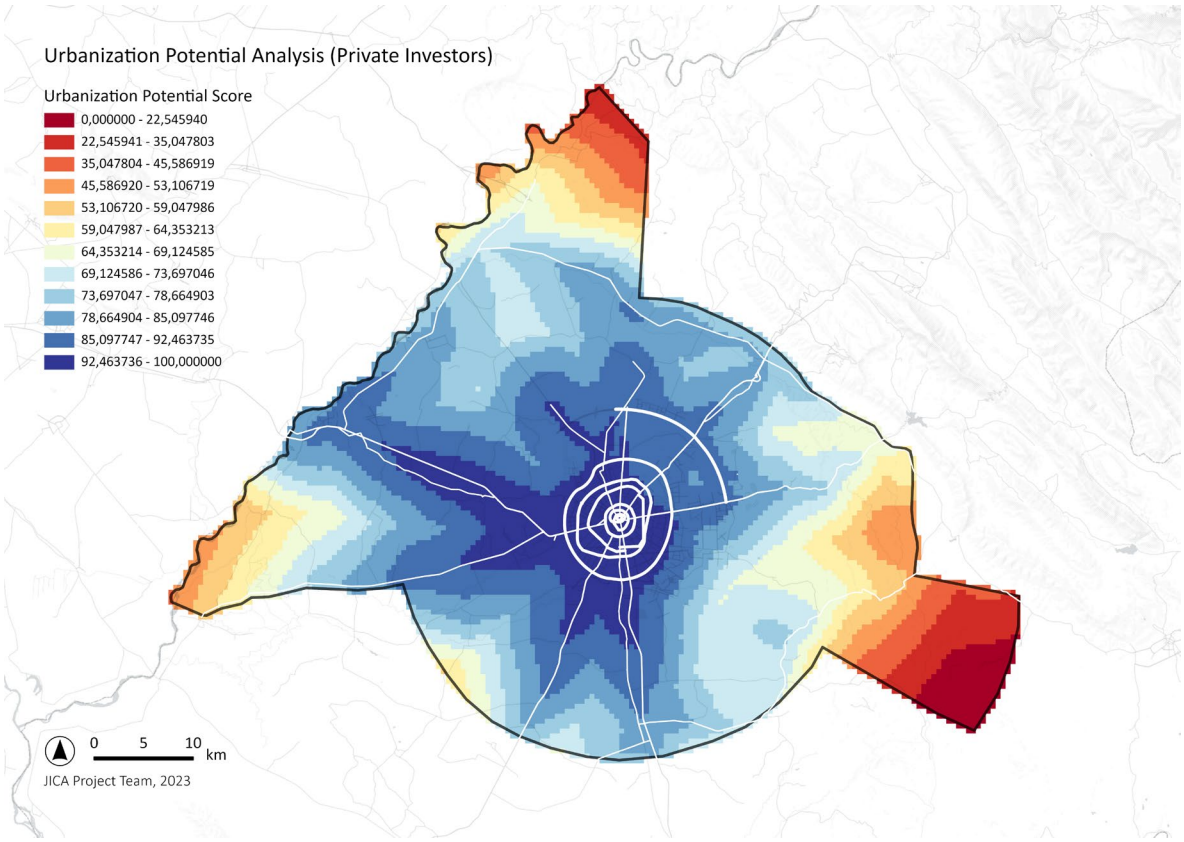
Based on the calculation of the 19 factors of attractiveness and repulsiveness of urbanization explained above, the results of the Urbanization Potential Analysis have been produced and are shown in Figure 2.4.7 and 2.4.8 for Public Authorities and Private Investors, respectively. On the maps, high urbanization potential score is displayed in blue and low urbanization potential score is displayed in red.

Interpretation of the results the Urbanization Potential Analysis serves as a basis for the spatial planning (see Section 5.1).



Source: JICA Project Team

Figure 2.4.7 Result of Urbanization Potential Analysis (Public Authorities)



Source: JICA Project Team

Figure 2.4.8 Result of Urbanization Potential Analysis (Private Investors)

2.5 Existing Upper-Level Policies and Plans

2.5.1 Existing Upper-Level Policy: Vision 2030

(1) Context & integration

The Ministry of Planning (MoP) led and oversaw the preparation of a new, long-term document, named KRG Vison 2030, under the chairmanship of the Deputy Minister of the MoP, as an update of KRG Vision 2020. The UNDP has supported the MoP in preparing this strategic document.

The draft of Vision 2030 has been outlined and was expected to obtain official approval before the end of 2022, but as of June 2024, KRG Vision 2030 has still not been approved. Due to its still unapproved nature, it was decided together with GDUP that the propositions of KRG Vision 2030 shall not be integrated as it is a basic foundation of the formulation of Erbil 2050 MP. However, the contents of the Vision are described below, and may be used for reference for a subsequent refining of future updates of Erbil Master Plan's Long-term Visions or development objectives.

Indeed, if KRG Vision 2030 gets approved and the necessity of considering its propositions as a basic foundation of the formulation of the future updates of Erbil Master Plan is agreed, then the planning contents of KRG Vision 2030 shown in Table 2.5.1 below shall be utilized qualitatively and quantitatively. Namely the pillars, regional priorities and development strategies of KRG Vision 2030 will be used qualitatively in the refining of the planning concepts, development strategies and land use plan of future updates of Erbil Master Plan, and the indicators and targets to attain the fixed regional priorities of KRG Vision 2030 shall be reflected in the socio-economic and the spatial frameworks, as well as in sectoral development plans of future updates of Erbil Master Plan. For example, the quantitative target of share of GDP for industrial sector in KRG Vision 2030 can be converted in terms of industrial zone spatial development effort in future updates of Erbil Master Plan.

Nevertheless, it should be noted that, in absence of a legal binding relation between KRG Vision and urban development masterplans, integration is not mandatory, yet recommended.

(2) Planning Contents of KRG Vision 2030

KRG Vision 2030 comprises four main pillars: 1) Citizens, Society and Regional Identity; 2) Public Sector and Governance System; 3) Economy and Productivity and 4) Environment. Twelve regional priorities including their development strategies and 93 goals have been set up to support the main pillars. The goals are aligned with the United Nations Sustainable Development Goals (SDGs), so that the Kurdistan region effectively contributes to the universal goals adopted by the United Nations. Table 2.5.1 shows the planning contents of KRG Vision 2030, namely the pillars, regional priorities and development strategies with indicators and targets to attain the fixed regional priorities.

Table 2.5.1 Planning Contents of KRG Vision 2030

Main Pillar	Regional Priority	Development Strategy	Indicators & Targets		
			Indicator	Baseline (2020)	Target (2030)
Citizens, Society and Regional Identity	Population growth	A resilient and inclusive society with high-quality life for all and a deeply-rooted regional identity	Proportion of population living below the national poverty line	5.5%	2.75%
	Education	High-quality education for all, focused on research and innovation, to equip our youth with adequate skills for the future	Net enrolment rate in pre-primary education	28%	81% (OECD average)
			Completion rate of lower-secondary education	65.9%	92.2% (OECD average)
	Healthcare	A healthy society and a medical tourism hub, home to an affordable state-of-the-art healthcare system on par with international standards	Infant mortality rate (per 1,000 births)	15	6.3% (OECD average)
			Number of doctors per 1,000 people	1.1 (In 2019)	2 (Average income of upper-

Main Pillar	Regional Priority	Development Strategy	Indicators & Targets		
			Indicator	Baseline (2020)	Target (2030)
					middle countries)
	Social protection	An equitable, sustainable and comprehensive social protection system that contributes to a more dynamic private sector	Establish a pension fund	N/A	A fully operational pension fund
Public Sector and Governance System	Size of the public sector	An agile and sustainable government that enables the private sector and civil society	Wage bill as a percentage of the total expenditure	50%	40% or less
	Institutional performance	Responsive and effective state institutions, capable of providing quality services that meet the public's needs and expectations	Ranking on the Government Effectiveness Index	176 (Out of 193)	Rank among top 50
	Governance system and rule of law	A robust governance system that strengthens oversight, builds public trust in state institutions and advances the rule of law	Ranking on the Control of Corruption Index	177 (Out of 193)	Rank among top 50
			Ranking on the Rule of Law Index	186 (Out of 193)	Rank among top 50
Economy and Productivity	Economic diversification and fiscal sustainability	A diversified, productive and competitive economy that creates added value for all and is resilient to external shocks	Agricultural sector share of GDP	3% (In 2015)	6%
			Industrial sector share of GDP	6% (In 2015)	12%
			Number of tourists arriving in KRI	3,057,000	6,114,000
			Ranking on the Economic Complexity Index	109 (Out of 133)	Rank among top 50
	Private sector and business environment	A dynamic private sector, leading the economy and creating sustainable jobs, empowered by a competitive business environment that attracts investments	Ranking on the Doing Business Indicator	172 (Out of 190)	Rank among top 50
			Domestic credit to private sector	2% (In 2015)	50% (MENA avg.)
	Labour force	A skilled and active labour force capable of competing in the 21st century and in the era of the 4th industrial revolution	Participation rate of the female labour force	14%	64% (OECD avg.)
			Participation rate of the overall labour force	39.6% (In 2017)	50.6% (MENA avg.)
			Youth unemployment rate	24%	13% (OECD avg.)
	Energy and Infrastructure	Quality and resilient infrastructure enabling sustainable economic development, with affordable, reliable, sustainable and modern energy for all	Average number of hours of electricity per day	17 Hours/day	24 Hours/day
Environment	Environmental sustainability	A well-preserved and sustainable environment paving the way for a circular economy	Database for climate change indicators	N/A	Fully operational database
			Size of areas contaminated by mining	216 km^2	108 km^2
			Provision of mine risk education to KRI's citizens regarding the danger of landmines and war residues	N/A	100%
			Reduction of the number of mines' victims per year	23 (In 2017)	Less than 5 cases per year

Source: Vision 2030, Ministry of Planning

(3) Analysis of relevancy of KRG Vision 2030 propositions to Urban Development Master Plan

Firstly, job creation should be the result of stimulating economic activity. In Kurdistan, annual population growth is estimated at 2.2%, which is higher than the Iraqi average and four times greater than the average for OECD countries. Moreover, 62.5% of the total population is below the age of 30 and the population is generally young in terms of age. Women's participation in the labour force is also expected to increase from the current level of 14% to the OECD average of 64% by 2030. Job creation

is a top priority in supporting these populations. The oil industry accounted for 85% of the revenue of the Kurdistan region in 2017, but the Kurdistan Regional Government has fallen into financial difficulties due to low oil prices. To resolve this situation, the government intends to grow the agriculture, tourism and industry sectors, so as to diversify economic activity. In this sense, Erbil must be a suitable place for economic growth for the following reasons: 1) the city has a large population and an abundant working population; 2) it has a considerable working population of young graduates from higher education institutions; 3) it is rich in tourism resources, including the Citadel and historical areas; 4) agriculture is practiced around the city and 5) Erbil has a relatively well-developed infrastructure. In the process of the revision of the urban master plan, recommendations for economic development with a focus on agriculture, tourism and manufacturing should be required.

Secondly, high-quality infrastructure is needed to achieve economic growth. Improvements are required across a wide range of infrastructures, including transportation, water supply, sewage treatment, solid waste management and electricity. In addition, from the perspective of environmental management, there is a need to reuse treated water in sewage treatment and to recycle solid waste. In the sphere of electricity, the introduction of renewable energy, such as solar power, is being touted as a means to introduce environmentally friendly power sources. When revising the urban master plan for Erbil city, a plan for a high-quality and environmentally friendly infrastructure should be proposed.

Thirdly, in order to promote economic vitalization and infrastructure development, emphasis is placed on the cultivation and participation of the private sector. Measures to realize the master plan should include recommendations for the enhancement of and participation in the private sector.

Fourthly, a goal has been specified to enhance the sustainability of cities by improving urban planning and balancing development initiatives between rural and urban areas. Urban planning is considered as one of the most important issues from the perspective of the balanced development of rural and urban areas.

2.5.2 Upper-Level Plans: Absence of Regional Plan in Kurdistan

As mentioned in the analysis of the position of Erbil in regional context (see Section 2.1.2), there is no existing regional plan that would include Erbil and the other cities of Kurdistan Region.

A physical regional plan based on the analysis of existing situation in terms of major urban functions, infrastructure networks, etc. of each city of Kurdistan, would help to narrow down spatially the general policies fixed in KRG Vision 2030 and to give orientations in terms of expected roles of Erbil, Sulaymaniyah and other major cities of Kurdistan and to what extend they should contribute to the realization of the development goals. Therefore, the formulation of a physical regional plan would help to translate the KRG Vision policies into further updates of Erbil Urban Development Master Plan.

Therefore, the creation of a legal and institutional framework of Regional Planning in KRG as well as the formulation of the Kurdistan Regional Plan at horizon 2050 has been proposed as a Short-Term and Priority Project (See UP-3 in Section 11.5).

CHAPTER 3
REVIEW OF ERBIL 2030 MASTER PLAN

Erbil City Master Plan (hereafter referred as Erbil 2030 MP) was formulated from 2006 to 2007 with the planning horizon of year 2030. The consultant company in charge of the study was Dar Al-Handashah Shair & Partners, based in Lebanon. Final report of Erbil 2030 MP was submitted to the then Ministry of Municipalities in January 2007, consisting in 11 chapters for a total of 224 pages. Erbil 2030 MP was officially approved by decree on October 27th, 2009.

To properly update Erbil 2030 MP to the revised target year of 2050 (see Section 1.5) and therefore formulate Erbil 2050 MP within the framework of this Project, this chapter provides an update and finalization of the comprehensive and in-depth review of all contents of Erbil 2030 MP. The methodology of reviewing is summarized in the Figure below and explained in the next paragraphs.

In general terms, assessing the implementation status of all Erbil 2030 MP Policies & Projects will allow to evaluate the relevancy of the proposed Policies & Projects and to understand whether or not they should be considered in Erbil 2050 MP in light of the changes in conditions and political intentions from 2006 to 2022. The review is also the occasion to improve the approach of Policies & Projects which implementation has failed. As shown in Figure above, the review will also be done on planning methodology: accuracy of the methodology used, gap analysis, changes in sector conditions, global situation. The template for review of all contents of Erbil 2030 MP is adopted as follows. A focus will also be done on assessing the validity of proposals regarding the practical leverages of the MP.

Policy in Erbil 2030 MP (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring Score*	Implementation Monitoring Comment	Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator Integration**	Recommendation for Erbil 2050 MP Strategy & Indicator Comment
	Implementation Review: What was implemented and what was not?				MP Update 2022-2024	

Note: (*) **+++** Excellent implementation, **++** Average/Good implementation, **+** Fair implementation, **-** No implementation.
(**) **Complete**: Full integration to Erbil 2050 MP is recommended, **Partial**: Partial integration, **discontinued**: No integration, **TBS**: Integration to be further studied.

3.1 Review of Planning Concepts

3.1.1 Review of Long-Term Vision

The Long-Term Vision in Erbil 2030 MP, which has been elaborated based on the opinions given by all related stakeholders through a questionnaire in September 2006, is composed of a total of 24 Vision Statements divided into the 4 Themes of City Role, City Character, International Business Center and Center of Tourism.

According to our discussions with GDUP, it was clear that KRG government still nowadays has a strong sense of ownership towards this comprehensive and strategic part of the Erbil 2030 MP. Therefore, it was decided to keep the same structure of a Long-term Vision divided into the 4 themes. In order to reflect the new development vision of GDUP in 2022, the review of Long-Term Vision has been carried out through various brainstorming workshops with GDUP between July 2022 and January 2023. The Table 3.1.1 below shows the results of collective assessment of Long-term Vision Statements.

In methodologic terms, it can be criticized that Erbil 2030 MP does not link Long-term Vision Statements to concrete measures proposed for implementation.

Table 3.1.1 Review of Long-term Vision in Erbil 2030 MP

(1) City Role

Long-Term Vision (2006)	*Evaluative question* (2022)	Implementation Monitoring Score*		Changes in conditions (2006-2022)	Recommendation for Erbil MP Update Strategy & Indicator Integration**	
1. Major Trading Centre Vision: A major trading center, similar to Dubai.	*Did Erbil become a major trading center, similar to Dubai? Shall this vision be continued?*	-	This Vision Statement has been implemented with limited success, due to instability factors in recent history and also to the facts that Erbil simply does not have the geographical potential to become like Dubai (which has a sea port, airport hub, etc.).	Iraq is currently working to change the international trading routes, with the construction of the Great Faw Sea Port, to become one of the largest ports in the world and the largest in Middle East by 2028.	**Partial**	- Erbil 2050 MP pursues the Vision of becoming a trading center but abandons the mention of Dubai; - In addition, rather than ambitioning to become a "center", the Vision can put the emphasis on "enabling Erbil as an active node inside a vast trading network"; - Before thinking about international competitiveness, the competition with neighboring cities shall (Tehran, Istanbul) comes first; - Erbil can be connected to the International Silk Road. Shall be discussed with stakeholders (MoP, MoCH, MoTC. MoMT).
2. Administrative Capital Vision: The administrative capital of Iraq Kurdistan Regional Government, Erbil Governorate, Erbil Municipality, and any future larger Kurdistan association.	*Did Erbil become the administrative capital of KRG, Erbil Governorate, Erbil Municipality etc.?*	++	This Vision Statement has been implemented with significant success, since Erbil has indeed become the administrative center of KRG and is hosting all the governmental facilities.	N/A	**Partial**	- Erbil 2050 MP pursues the Vision of further strengthening Erbil as an administrative Capital, by improving and rationalizing land use for governmental zones; - The question shall the dealt at the spatial level in terms of creating single core or multi core governmental functions (Ministry District already exists near Kasnazan but no implementation has been done).
3. International Quality Service Centre Vision: Meeting the higher-level needs (e.g. international quality universities, training centers, specialist hospitals, sports and other national facilities, and international business services) for all who live or work in KRI.	*Does Erbil meet higher-level needs (international quality universities, training centers, specialist hospitals, sports and other national facilities, and international business services) for all who live or work in KRI?*	+	This Vision Statement has been implemented with moderate success: some private universities and hospitals have decent quality, but need international marketing and quality, and there is no international stadium, training center or international business services.	N/A	**Complete**	- Erbil 2050 MP pursues the Vision, in line with KRG Vision 2030, of promoting international quality services and features, in order to be able to attract international investors and to compete symbolically with other cities of the region; - The important role of large-scale sports facilities (international stadium) in regional marketing, as underlined by KRG Vision 2030, shall be translated into Erbil 2050 MP.
4. Globally Significant Petrochemicals Industries Vision: Serving the needs of globally significant oil and gas industries within KRG, especially in conjunction with the World Bank proposed Arat "Industrial City".	*Does Erbil serve the needs of globally significant oil and gas industries within KRG? Was Arat Industrial City implemented?*	+	This Vision Statement has been implemented with moderate success: few oil industries were implemented, but Arat Industrial City was not implemented until now.	N/A	**Discontinued**	- Erbil 2050 MP discontinues the Vision of focusing on petrochemical industries for economic growth; - In line with KRG Vision 2030, diversification of the economy shall be pursued, rather than focusing only on one sector; - Possibility of moving heavy industries far from urban extend, taking into account wind direction and connection to transport has to be considered.

Long-Term Vision (2006)	*Evaluative question* (2022)	Implementation Monitoring Score*		Changes in conditions (2006-2022)	Recommendation for Erbil MP Update Strategy & Indicator Integration**	
5. Affordable Good Quality of Life Vision: Providing a good quality of life for people of all income levels who live or work in the expanded city. This includes choice of jobs, affordable housing, shops, services and access to social and recreational facilities; an attractive environment, and a low cost of living.	*Does Erbil provide a good quality of life (choice of jobs, affordable housing, shops, services and access to social and recreational facilities) for people of all income levels who live or work in the expanded city?*	+	This Vision Statement has been implemented with moderate success: most of socio-economic and urban indicators show that the city offers a variety of opportunities to its residents.	N/A	**Partial**	Erbil 2050 MP pursues the Vision of providing affordable and good quality of life to citizens, but prefers to put the emphasis on improving the accessibility of services.
6. Kurdish Homeland Vision: The city of Kurdish culture, that Kurds and others can be proud of, and a place of return for Kurds living or working in other countries.	*Did Erbil become the city of Kurdish culture, that Kurds and others can be proud of, and a place of return for Kurds living or working in other countries? Does MP really have leverages for this Vision?*	+	There are plans to preserve and improve the Kurdish culture, but not fully implemented. A lot of urban developments have been implemented with low quality and global image, without Kurdish identity. There is a diversity of people living in Erbil in co-existence. But Erbil is still not a city in which Kurds in other countries prefer to return due to economic fluctuations in the region. MP does not have the intended leverages for this vision.	Due to the recent stability in the region and the slightly better economy in Erbil, there are now more Kurds living in Erbil currently.	**Partial**	Because Erbil is preceding to become an international city, a way should be found to make a balance between serving multiculturalism and Kurdish identity.

(2) City Character

Long-Term Vision (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil MP Update Strategy & Indicator	
		Score*	Comment		Integration**	Comment
1. Unique Character Vision: A capital city worthy of the Kurdish people, with its own distinctive character. A pleasure to live in, work in and visit. Not an "anywhere city".	*Does Erbil have a unique character? Does MP really have leverages for this Vision?*	++	This Vision Statement has been implemented with significant success. Erbil has a lot of distinctive characters such as heritage, shape of development, better living and working conditions than the rest of the cities in KRI.	N/A	**Complete**	Erbil 2050 MP pursues the Vision of Unique Character of the urban features.

Long-Term Vision (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil MP Update Strategy & Indicator	
		Score*	Comment		Integration**	Comment
2. Spacious City Vision: A predominantly low-density city, that has space for all activities, extensive landscaping and open spaces, free-flow transport, housing that meets people's preferences, and room for future expansion of local facilities. Not a congested city.	*Did Erbil become a predominantly low-density city, that has space for all activities, extensive landscaping and open spaces, free-flow transport, housing that meets people's preferences, and room for future expansion of local facilities?*	++	This Vision Statement has been implemented with significant success.	Urban sprawl has happened widely in the city until recent days.	**Discontinued**	Low-density is not suitable for a capital city which wants to maximize economic activity. Low density also does not necessarily match with sustainability of urban development. Transportation must be considered.
3. Rivers and Water Features Vision: A city that is renowned for its relationship with water, a relationship that Kurdish settlements have had throughout history. The improvement of existing watercourses and the creation of new ones throughout the existing and expanded city. The inclusion of water storage lakes, ponds, fountains and other water features for recreation, sport and amenity.	*Were the improvement of existing watercourses and the creation of new ones throughout the existing and expanded city implemented? Were water storage lakes, ponds, fountains and other water features for recreation, sport and amenity implemented?*	-	This Vision Statement has been implemented with limited success: no improvement of watercourses or creation of new ones.	Climate change is affecting the city that led to frequent flooding and water scarcity.	**Partial (improvement)**	Erbil 2050 MP pursues the Vision of recreating the relation of the city to water, but adds the notion of resilience towards flooding and water scarcity.
4. Urban Greenways Vision: City-wide networks of landscaped parkland with picnic areas; pedestrian and cycle routes linking activity points such as public open spaces, sports fields, schools, shops, housing areas, work locations and countryside trails; including shade trees and other shade structures. A Green City, known for its water features, urban greenways, other landscaping, and generally for its cultured people-friendly character. A city not dominated by motor vehicles.	*Did Erbil become a Green City not dominated by motor vehicles? Were city-wide networks of landscaped parkland with picnic areas, pedestrian and cycle routes linking activity points such as public open spaces, sports fields, schools, shops, housing areas, work locations and countryside trails including shade trees and other shade structures implemented?*	-	This Vision Statement has been implemented with limited success: no major greening operations, and nothing for pedestrian and bicycle has been achieved.	N/A	**Partial (improvement)**	Erbil 2050 MP pursues the Vision of creating green spaces but adds the importance of green areas for carbon sequestration in the framework of climate change adaptation, as well as protection from dust storms and urban heat islands.
5. Congestion-Free Transport Vision: A genuine choice of affordable private or public transport, with an excellent public transport system that reduces	*Did Erbil become a congestion-free city offering a genuine choice of affordable private or public transport, with an excellent public transport system that*	-	This Vision Statement has been implemented with limited success: public transportation was not implemented and congestion has	There are increasing import of cars in recent years.	**Partial (improvement)**	Erbil 2050 MP pursues the Vision of creating a congestion-free city, but adds the notion of walkability: all commodities shall

Long-Term Vision (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil MP Update Strategy & Indicator	
		Score*	Comment		Integration**	Comment
the need to use cars. No significant traffic congestion, and pedestrian friendly local streets.	*reduces the need to use cars? Does Erbil propose pedestrian friendly local streets?*		worsened. Sidewalk has disappeared.			be reachable by walking 15 minutes.
6. City of Culture Vision: A city that stimulates the arts as well as being a thriving trading center. A city where public art is widespread and meaningful, especially that pertaining to Kurdish heritage and culture.	*Did Erbil become a City of Culture where public art is widespread and meaningful, especially that pertaining to Kurdish heritage and culture? Does MP really have leverages for this Vision?*	+	This Vision Statement has been implemented with moderated success: Citadel and buffer zone are being renovated to some extent. There are a few artworks here and there. But the city generally lacks public art.	N/A	**Partial**	Culture, public spaces, and public art has to be improved all over the city that stimulates cultural activities. Urban renewal of older neighborhoods close to the Citadel shall be added to the intentions of the MP.
7. Variety and Identity Vision: A city that has a rich variety of different areas with their own identifiable characters, including gateway features that mark their entries and exits. Distinguished landmark buildings and other structures that provide identity when moving around the city. All utility cables, wires and pipes underground. A city of surprises, with neighborhoods in which local people can identify and be proud of.	*Did Erbil become a city that has a rich variety of different areas with their own identifiable characters, including gateway features that mark their entries and exits, distinguished landmark buildings and other structures that provide identity when moving around the city?*	-	This Vision Statement has been implemented with limited success.	N/A	**Complete**	Erbil 2050 MP pursues the Vision of making distinguished urban identity. Urban design laws and regulations should be improved. Implementation should be monitored strongly. Also, this should be reflected in Zoning Schemes and Detail Plans.
8. Sustainability Vision: A city that seeks to be cost-effective over the short, medium and long terms, not sacrificing future economic, social or environmental (natural and built) well-being for short-term gains. A city that cares for people and the natural environment. A healthy city.	*Did Erbil become a city that seeks to be cost-effective over the short, medium and long terms, not sacrificing future economic, social or environmental (natural and built) well-being for short-term gains? A city that cares for people and the natural environment? A healthy city?*	-	This Vision Statement has been implemented with limited success: no Environmental Impact Assessment is done for big projects, and there is a lack of proper MP implementation.	Air quality has decreased from 2006, meaning we have to continue and strengthen this vision.	**Partial (improvement)**	Erbil 2050 MP pursues the Vision of sustainable development and healthy city, but adds the important notion of becoming a carbon-neutral city by 2050.

(3) International Business Center

Long-Term Vision (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil MP Update Strategy & Indicator	
		Score*			Integration**	
1. Hub City Vision: The premier regional trading center for goods and services being imported to	*Did Erbil become the premier regional trading center for goods and services being imported to*	-	This Vision Statement has been implemented with limited success: on the four business districts planned, none	N/A	**Partial**	Erbil 2050 MP pursues the Vision of Hub City, but there is a need for a clearer vision on

Long-Term Vision (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring Score*		Changes in conditions (2006-2022)	Recommendation for Erbil MP Update Strategy & Indicator Integration**	
and exported from Iraq and other nearby countries. An export-oriented, private-sector led business community.	*and exported from Iraq and other nearby countries? Did Erbil become an export-oriented, private-sector led business community?*		of them were invested due to change of land use.			making Erbil on the path of Silk Road to be a hub city for international trading (more discussion with council of ministers is necessary).
2. Competitive City Vision: Competitive with other trading centers, in terms of costs, efficiency and general ease of doing business. An enabling business environment. The absence of disabling obstacles to working and living.	*Did Erbil become an enabling business environment with absence of disabling obstacles to working and living, competing with other trading centers in terms of costs, efficiency and general ease of doing business?*	+	This Vision Statement has been implemented with moderated success.	N/A	**Complete**	Erbil 2050 MP pursues the Vision of Competitive City. The financial and economic policies should be well structured. The diversity of different trading activities should be pursued.
3. Hub Aviation Vision: The hub of aviation-related activities within the region, including services to airlines, international business center, and free trade zone.	*Did Erbil become a hub of aviation-related activities within the region, including services to airlines, international business center, and free trade zone?*	+	This Vision Statement has been implemented with moderated success.	N/A	**Complete**	Erbil 2050 MP pursues the Vision of aviation-related activities development, since there is need to expand activities. Consultation with Erbil International Airport is needed concerning the activities.
4. Long Distance Land Transport Vision: Excellent Road transport links with other cities and towns in KRG and beyond.	*Were excellent road transport links with other cities and towns in KRG and beyond implemented?*	++	This Vision Statement has been implemented with relative success: road development between cities have occurred and accessibility has improved.	N/A	**Partial**	Erbil 2050 MP pursues the Vision of road development, but further projects are required, and different transport modes are needed. Relocation of terminal sites is necessary.
5. Available Serviced Land and Buildings Vision: Always having a large supply of affordable serviced land and buildings available for local and inward investors, especially for exporting businesses.	*Does Erbil always provide a large supply of affordable serviced land and buildings available for local and inward investors, especially for exporting businesses?*	+	This Vision Statement has been implemented with moderated success.	N/A	**Complete**	Erbil 2050 MP pursues the Vision of serviced land availability. Strategic plan of agro-industrial projects to be discussed with related ministries.
6. Food Exports Vision: The center of a thriving agricultural subregion, with extensive food processing and major food export businesses.	*Did Erbil become a center of a thriving agricultural subregion, with extensive food processing and major food export businesses?*	-	This Vision Statement has been implemented with limited success: exporting agricultural produced was not achieved, and even Erbil has to import food and processed foods.	Farmers cannot obtain enough benefit from their activity and import products (from Iran Turkey) are cheaper than local ones. There is no study regarding implementation of new agriculture technologies, no irrigation	**Partial**	Erbil 2050 MP pursues the Vision of Food development, but before trying to export, maybe reaching sufficiency is a more realistic goal. Agricultural fertile lands should be kept for agriculture. Also, the relation between urban expansion and agriculture land

Long-Term Vision (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring Score*		Changes in conditions (2006-2022)	Recommendation for Erbil MP Update Strategy & Indicator Integration**	
				project. Land suitability for agriculture is not studied, lands for agriculture have been used to other land uses.		shrinkage should be balanced. Erbil expansion is not necessary to have a circular shape. Soil fertility should be well studied with ministries of agriculture and finance to support agriculture sector.
7. Cybercity Vision: Full Information and Communications Technology (ICT) coverage throughout the city, with quick, efficient and free Internet access to all Government and urban services.	*Was full Information and Communications Technology (ICT) coverage throughout the city, with quick, efficient and free Internet access to all Government and urban services implemented?*	+	This Vision Statement has been implemented with moderated success: attempts are undergoing to implement information and communication systems.	N/A	**Complete**	Erbil 2050 MP pursues the Vision of Cybercity improvement.

(4) Centre for Tourism

Long-Term Vision (2006)	*Evaluative question*	Implementation Monitoring Score*		Changes in conditions	Recommendation for Erbil 2050 MP Strategy & Indicator Integration**	
1. Multi-Product Tourism Vision: A wide variety of tourist attractions, and levels of affordability, within and outside the city, for both local and international tourists, at all times of the year. World-class product interpretation, niche tourism, tourism promotion, and customer services.	*Does Erbil propose a wide variety of tourist attractions, and levels of affordability, within and outside the city, for both local and international tourists, at all times of the year? Does Erbil propose a world-class product interpretation, niche tourism, tourism promotion, and customer services?*	+	This Vision Statement has been implemented with limited success: no concrete measures to develop international tourism are taken.	Instability of security and drop in inter-national visitors.	**Complete**	Erbil 2050 MP pursues the Vision of multi-product Tourism. Recommendations from Board of Tourism shall be considered.
2. Qalaa Citadel World Heritage Vision: The "jewel in the crown" of heritage tourism in KRG, to rival any other ancient citadel.	*Did Qalaa Citadel become one of the most visited ancient citadels in the world?*	+++	This Vision Statement has been implemented with success: Citadel has been recognized by UNESCO as World Heritage.	N/A	**Partial**	Erbil 2050 MP pursues the Vision of promoting cultural heritage tourism, but not only focused on Citadel. The latter needs to be revitalized to reach international renown, then it should be supported by other historical assets such as archeological sites, etc.
3. Mountain Tourism Vision: The development of national parks and visitor centers in suitable locations, with their own memorable identity. Enhancement of indigenous wildlife, vegetation and landscapes, with strong ecotourism.	*Does Erbil national parks and visitor centers in suitable locations, with their own memorable identity? Was the indigenous wildlife, vegetation and landscapes, with strong ecotourism enhanced?*	-	This Vision Statement has been implemented with limited success: There is no mountainous area in the MP target area, however hilly and valley areas to the east and north.	N/A	**Partial**	Erbil 2050 MP pursues the Vision of promoting nature-based tourism, but delete the mention of "mountain" which is inexistent in the Project Area. Erbil 2050 MP will have to be more precise on the definition of ecotourism.

Source: JICA Project Team

Note: (*) +++ Excellent implementation, ++ Average/Good implementation, + Fair implementation, - No implementation.

(**) **Complete**: Full integration to the MP Update is recommended, **Partial**: Partial integration, **Discontinued**: No integration, **TBS**: Integration to be further studied.

3.1.2 Review of Development Concepts

In addition to the 24 Long Term Vision Statements explained above, Erbil 2030 MP also states Development Concepts, which have been fixed at the stage of the selection of the Development Alternative, namely one sentence, that can be considered as the Main Spatial Development Concept, supported by 8 Key Features.

(1) Review of the Main Development Concept

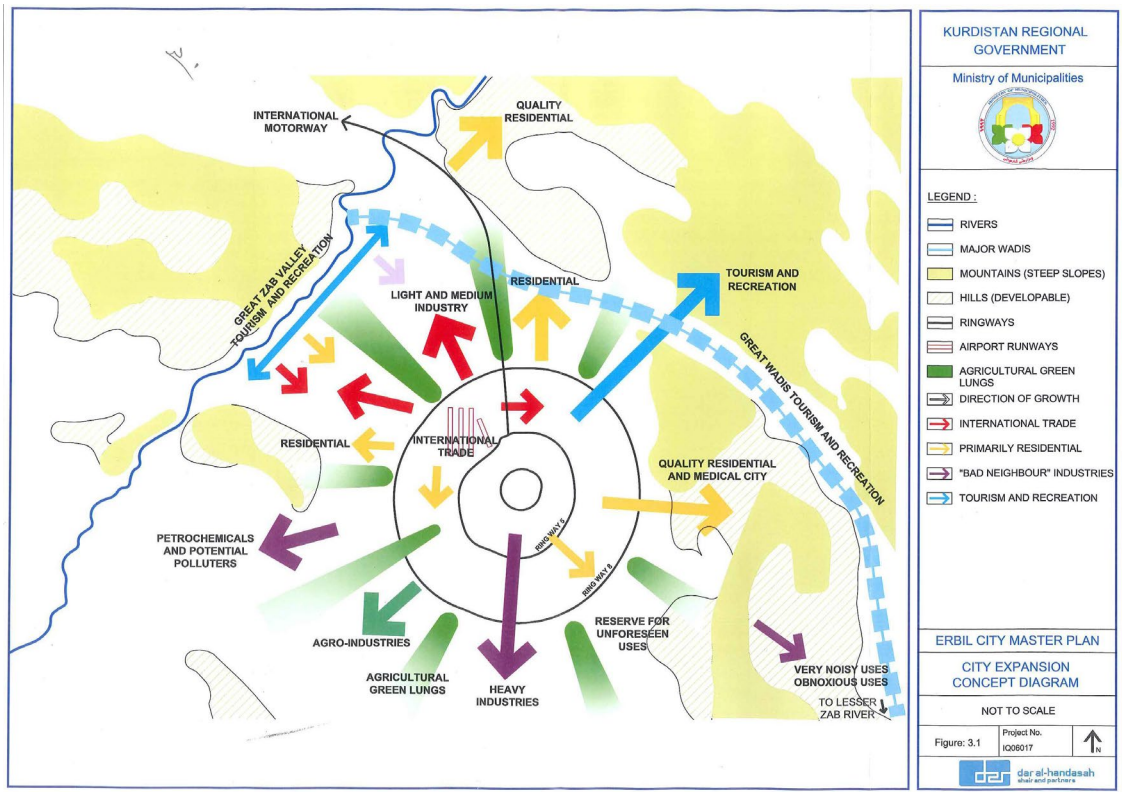
The Main Spatial Development Concept of Erbil 2030 MP is the following. The triple statement is break downed and its performance is assessed in the next paragraphs.

A DISPERSED, DUAL CENTER CITY WITH GREEN BELTS

1) **Dispersed city**: Even though the dispersed nature of Erbil's urban structure is mostly resulting from a lack of coordination in land use planning, the absence of zoning regulations, as well as rapid and uncoordinated urbanization history (see Section 2.4.3), it is likely that the dispersion of urban functions was also a political will which has been promoted through Erbil 2030 MP;
2) **Dual center city** makes reference to the existing city center and to the secondary urban core development which was planned on the Great Zab Valley, which was not implemented to date;
3) **A City with Green Belts**: Inner and outer Green Belts were planned in Erbil 2030 MP but were not implemented to date.

(2) Review of the 8 Key Features of the Chosen Alternative

The Main Spatial Development Concept is accompanied by 8 Key Features of the chosen spatial development alternative, which are supposed to be reflected City Expansion Concept Diagram, shown in Figure 3.1.1 below.



Source: Erbil 2030 MP

Figure 3.1.1 City Expansion Concept Diagram in Erbil 2030 MP

Table 3.1.2 Review of the 8 Key Features of the Chosen Alternative in Erbil 2030 MP

Key feature in Erbil 2030 MP (2006)	*Evaluative question* /comment (2022)	Implementation Monitoring Score		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator Integration	
Extendable road grid network that will serve the city for further expansion well beyond 2030, and permits all necessary transport and utility networks within their Rights-of-Way.	*Was the extendable road grid network key feature implemented?*	+	See Section 3.4.1 for detailed monitoring of this Key Feature.	N/A	**Discontinued**	The concept of Expendable Ring Roads & Radial Grid model has been partially abandoned in the proposed Urban Structure (See Section 5.3.1)
Airport City: The main economic generator, focusing on international trade, especially exports of goods and services.	*Was the Airport City key feature implemented?*	+	This Key Feature was implemented with moderated success.	N/A	**Continued**	Erbil 2050 MP pursues the Long-term Vision of Aviation Hub (see Section 3.1.1 International Business Center and 4.2)
Airport City Centre: The international business center, and a traffic countermagnet to the existing city center.	*Was the Airport City Center key feature implemented?*	-	This Key Feature was implemented with limited success.	N/A	**Discontinued**	The relevance of dual core urban structure supported by the airport city center has not been pursued, and was not even reflected in Erbil 2030 MP Land Use Layouts.
Permanent agricultural green corridors and necklaces: Reflecting the Kurdish agricultural tradition, and providing the city with extensive green lungs for all time.	*Was the Permanent agricultural green corridors and necklaces key feature implemented?*	-	The proposed Green Belts (for some reasons referred here as necklaces) has not been implemented to date.	Inner Green Belt has been planned in more details in 2010 (see Section 10.1.2) whereas no progress was done on Outer Green Belt.	**Partial**	Propositions included in Inner Green Belt MP are reviewed in Section 10.1.2. Boundaries and main contents of Outer Green Belt are abandoned and redefined within the scope of this Project.
Extensive development in nearby hills: Providing for about 350,000 population in the attractive eastern and northern hills	*Was the extensive development in nearby hills key feature implemented?*	-	This Key Feature was implemented with limited success.	N/A	**Discontinued**	The relevance of extensive development in the hills has not been pursued, and was not even reflected in Erbil 2030 MP Land Use Layouts.
Extensive development alongside Great Zab River: A further 250,000 population in Ararat technical city, in addition to the northern hills city.	*Was the extensive dvt. alongside Great Zab River key feature implemented?*	-	This Key Feature was implemented with limited success.	Ararat Industrial City, which was supposed to be the heart of this development, was not implemented (see Section 3.4.4).	**Partial**	The relevance of an urban structure supported by development alongside Great Zab River has been proved, but not in Ararat City (See Section 5.3.1).
Major tourism and recreation opportunities: In the Great Zab Valley National Water Park, and the Great Wadis National Park.	*Was the major tourism and recreation opportunities key feature implemented?*	-	This Key Feature was implemented with limited success (see Section 3.4.2).	N/A	**Partial**	Erbil 2050 MP considers in its Strategic Orientations to pursue Great Wadis National Park (SO-7-3-3 Section 5.4.7).
Bad neighbor uses in remote locations: Petrochemicals, heavy industry, fish farms and other obnoxious uses located well away from the main parts of the city.	*Were the bad neighbor uses in remote locations key feature implemented?*	-	This Key Feature was implemented with limited success.	Urbanization in southern part of Erbil has reached the vicinity of Tiemar industrial zone.	**Complete**	Erbil 2050 MP will pursue the Key Feature of developing bad neighbor uses in remote locations, far from the city center, and without harming precious natural environment.

Source: JICA Project Team

3.2 Review of Development Objectives

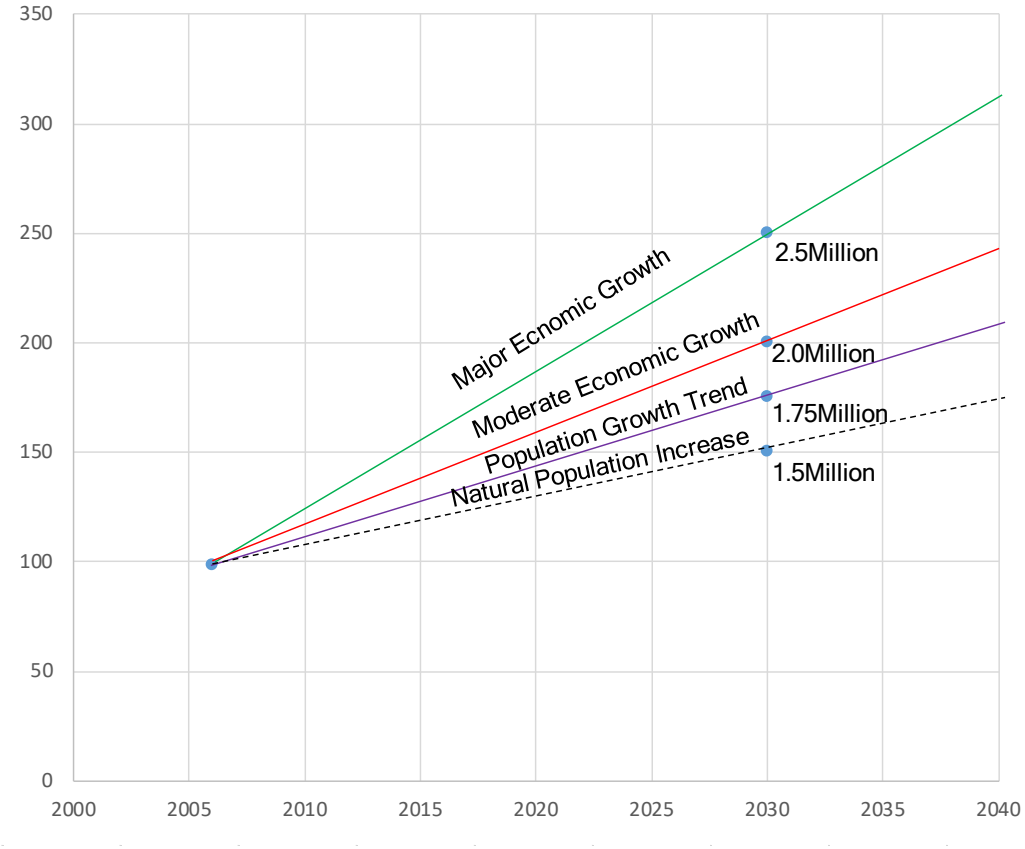
Erbil 2030 MP introduces the following quantitative development objectives:

- The population in the MP target area grows from 0.98 million in 2006 to 1.87 million in 2020 and 2.5 million in 2030 (in the high growth scenario). In addition, employment in 2030 is assumed to be 1.0 million.
- The growth rate of gross domestic product is assumed to be 9% per year.

The following is our current assessment of each indicator.

3.2.1 Review of Population Forecast

According to the Erbil 2030 MP, the population of the target area as of 2006 was 0.98 million and is assumed to grow to 2.5 million by 2030, or at an annual rate of 4.0%. Three other options are also considered: moderate growth, trend growth, and natural growth (see Figure 3.2.1 and Table 3.2.1). As discussed in Section 4.3, the study assumes a population of about 1.8 million in 2022, which is between to Erbil 2030 MP's Moderate Growth and Major Economic Growth projection. Considering that the population growth rate up to that point was about 2.4% per year, the MP assumes a fairly high growth rate in population. In other words, in reality, the population growth follows the trend, and the high population growth assumed in the MP was not realized.



Source: Erbil 2030 MP

Figure 3.2.1 Population Growth Scenario in Erbil 2030 MP

Table 3.2.1 Population Projections in Erbil 2030 MP

Population Projection Scenarios	Population (persons)		Average annual growth rate	As of 2020 Predicted Value	Remarks
	2006	2030			
Major Economic Growth	980,000	2,500,000	4.0%	1,867,000	
Moderate Economic Growth		2,000,000	3.0%	1,575,000	
Population Growth Trend		1,750,000	2.4%	1,429,000	
Natural Population Increase		1,500,000	1.8%	1,283,000	

Source: JICA Project Team

3.2.2 Review of Economic Growth Previsions

Gross Regional Product (GRP) in the Kurdistan Region is not continuously measured. The most recent statistics are the 2018 values published in August 2022 (see Section 2.3). Prior to that, values for 2007 and 2011 were published (see Table 3.2.2).

Table 3.2.2 Kurdistan Region GRPs[1]

Unit: Million Dinar

	Economic activity	2007	2011	2018
1	**Agriculture, Forestry and Hunting**	606,752.9	840,100	1,054,596.5
2	**Mining and Quarrying**	74,688.0	42,500	10,789,611.4
2.1	Crude Oil			10,640,225.3
2.2	Other Types of Mining	74,688.0	42,500	149,386.1
3	**Manufacturing Industry**	431,232.3	1,681,500	1,656,742.0
4	**Electricity and Water**	101,817.7	555,900	995,608.8
5	**Building and Construction**	1,056,466.0	5,130,800	2,477,709.8
6	**Transport, Communication and Storage**	1,391,524.5	3,597,200	5,568,239.1
7	**Wholesale and Retail Business, Hotels and the Like**	1,322,399.1	3,353,500	3,650,887.6
8	**Finance, Insurance and Real Estate Services**	2,408,485.9	4,659,900	2,272,330.7
8.1	Banking and Insurance	291,528.9	305,300	
8.2	Residence Ownership	2,116,957.0	4,354,600	2,272,330.7
9	**Social and Personal Development Services**	2,758,818.0	7,577,300	3,202,043.8
9.1	General Government	2,500,543.2	7,577,300	1,995,656.0
9.2	Personal Services	258,274.8		1,206,387.8
	Total	10,152,184.4	27,438,700.0	31,667,769.7
	Total (non-oil GRP, excluding Banking and Insurance)	9,860,655.5	27,133,400.0	21,027,544.4
	Average Annual Growth Rate since 2007 (%)		28.8	7.1%

Source: KRSO

At the time of the Erbil 2030 MP, the economy of Kurdistan Region was booming, thanks to its relative stability amidst the ongoing turmoil in Iraq, as well as its business-friendly environment; the average GRP growth rate from 2007 to 2011 was indeed 28.8%. However, the Islamic State of Iraq and the Levant (ISIL) militant group emerged around 2013 and entered into a state of war with the Kurdistan region in 2014. This had a negative impact on the economic outlook of the Kurdistan Region, including a decline in foreign investment and disruption of trade routes. In addition, over the past decade, the region has faced additional challenges, including the influx of Syrian refugees, budget disputes between the KRG and the Iraqi federal government, and falling oil prices. As a result, the GRP in 2018 was lower than that in 2011, and an average annual growth rate stayed only 7.1% since 2007, failing to achieve the 9% annual economic growth set forth in the MP.

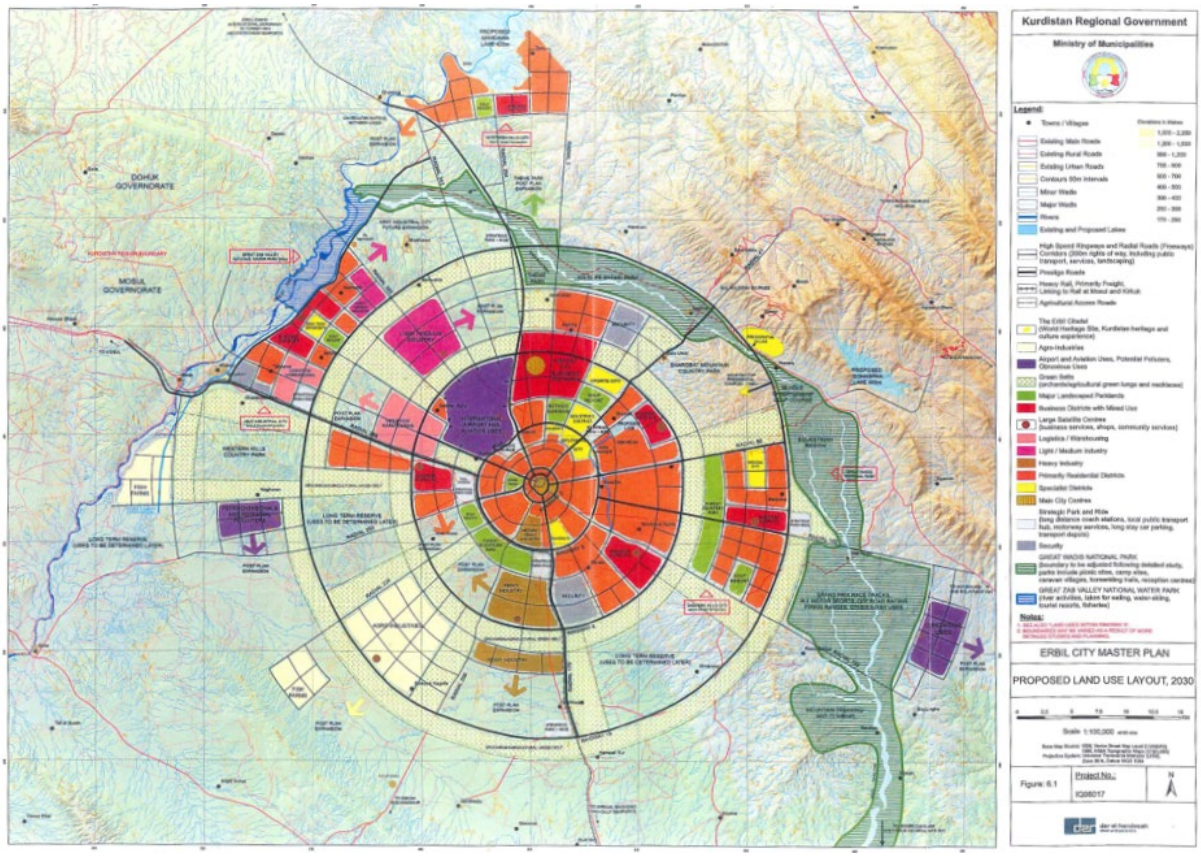
2 The items tabulated differ from year to year, with petroleum in 2007 and 2011, and finance and insurance in 2018 not being tabulated. Therefore, the average annual growth rate in the table is the growth rate for common items only.

3.3 Review of Master Plan & Sector Layouts

3.3.1 Review of Proposed Land Use Layouts

(1) Original Proposed Land Use Layout

Erbil 2030 MP provides the Proposed Land Use Layout, 2030 in A0 size format. It is accompanied by tables of numeric description in terms of population and employment in each of the 230 city districts in 2030. The original Proposed Land Use Layout of Erbil 2030 MP is shown in Figure 3.3.1 below.



Source: GDUP/MoMT

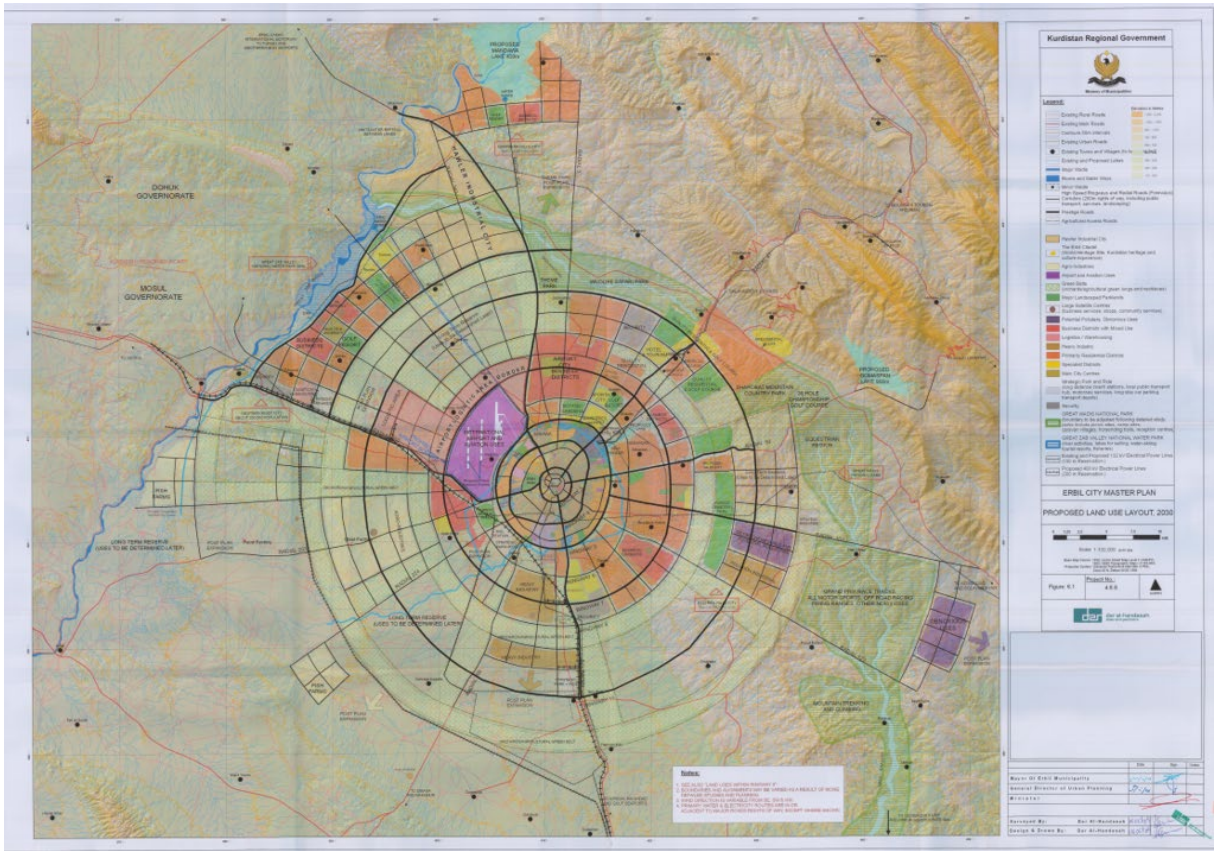
Figure 3.3.1 Proposed Land Use Layout of Erbil 2030 MP (Original)

(2) Subsequent Versions of Proposed Land Use Layout

After the official approval of Erbil 2030 MP in 2009, two rounds of modifications have been operated on the Land Use Layout, in 2010 and in 2012. Proposed Land Use Layout of Erbil 2030 MP, 2010 and 2012 Versions are respectively shown in Figure 3.3.2 and 3.3.3 in the next page. The latest officially approved version of the Proposed Land Use Layout, 2030, is the 2012 Version, and this is the one our Project is taking as a baseline for reviewing and updating.

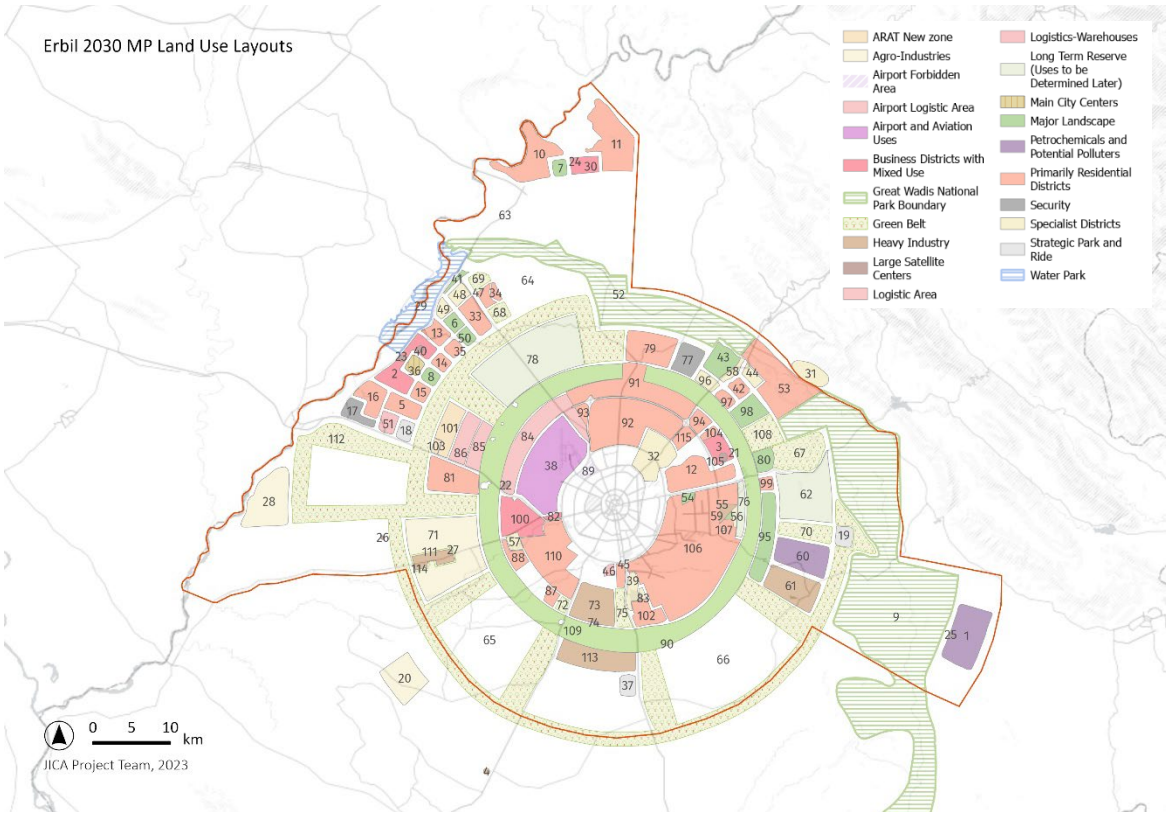
(3) Discrepancy between latest Land Use Layout (2012) and Final Report (2009)

Nevertheless, it is important to point out that both 2010 and 2012 modifications have been carried out only on the Land Use Layout at the horizon 2030, but that the final report of Erbil 2030 MP has remained unchanged from its approved version in 2009. This situation creates a discrepancy between the propositions of Erbil 2030 MP exposed in the final report of 2009 and shown in the Land Use Layout of 2012, as some policies and projects seem to have been abandoned or changed. The current Review will help to clarify this situation, but from now on, updates of MP shall be done on all contents (report, project list, Land Use Layout) simultaneously.



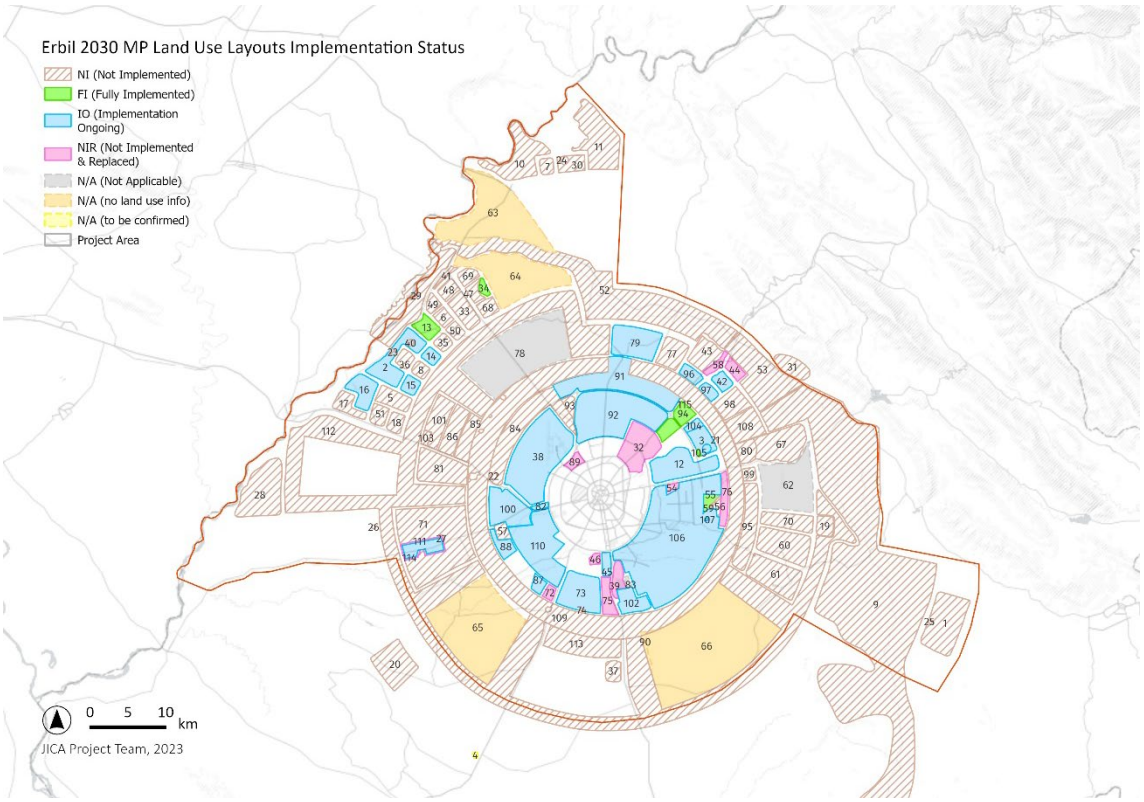
Source: GDUP/MoMT

Figure 3.3.2 Proposed Land Use Layout of Erbil 2030 MP (2010 Version)



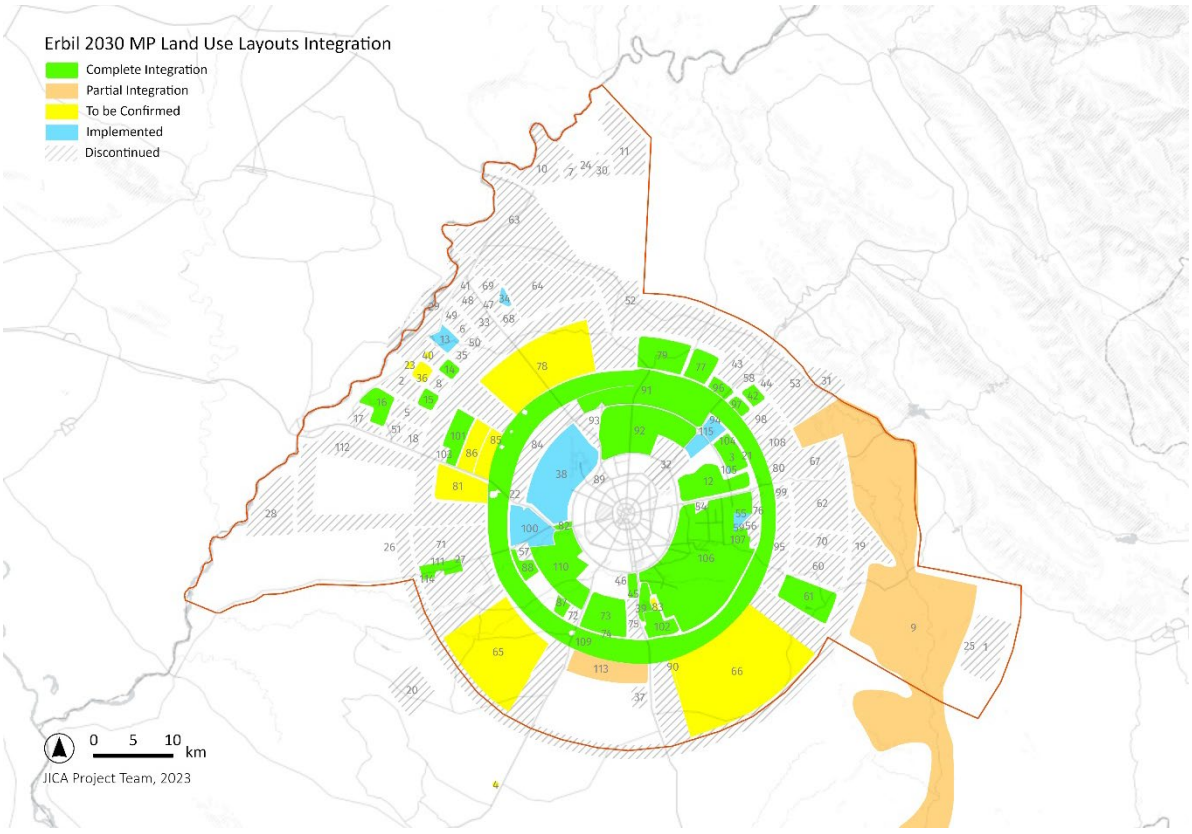
Source: GDUP/MoMT

Figure 3.3.3 Proposed Land Use Layout of Erbil 2030 MP (2012 Version)



Source: GDUP/MoMT

Figure 3.3.4 Erbil 2030 MP Land Use Layouts Implementation Status



Source: GDUP/MoMT

Figure 3.3.5 Erbil 2030 MP Land Use Layouts Integration Status

(4) Review of Erbil 2030 MP Land Use Layout Implementation Status

Figures 3.3.4 shows the implementation status, in 2023, of Land Use Layouts proposed in Erbil 2030 MP, while Figure 3.3.5 shows the integration status of those Land Use Layouts in Erbil 2050 MP. Table 3.3.1 summarizes implementation and integration status of Erbil 2030 MP Land Use Layouts.

As shown on Figure 3.3.4, most of the Land Use Layouts proposed in Erbil 2030 MP were not implemented to date.

There are several possible reasons why the Land Use Layout in proposed in Erbil 2030 MP has not been implemented properly after its approval. There are firstly circumstantial reasons, such as the economic slowdown, IS crisis, lack of finances from the federal government, etc. But it might also be due to the actual nature of Erbil 2030 MP, and especially the unrealistic and overscale scale of proposed developments in the Land Use Layout, which did not fit the reality of investment.

Table 3.3.1 Review of Erbil 2030 MP Land Use Layout Implementation Status

Land Use Layout in Erbil 2030 MP (2012)	Implementation Monitoring		Changes in conditions (2012-2022)	Recommendation for Erbil MP Update	
	Score*	Comment		Integration**	Comment
[1] Petrochemicals and Potential Polluters	**NI**	Not implemented	Other industrial zones have been promoted instead of this one.	**Discontinued**	This land is too far, in a hilly location and there will be enough space for industries in other industrial estates.
[2] Business Districts with Mixed Use	**IO**	Implementation of polluting oil-related industries	Development of many unregulated polluting industries.	**Discontinued**	The land use of this Great Zab Cluster area shall be carefully considered.
[3] Business Districts with Mixed Use	**NIR**	Business district is not implemented	Residential and mixed-use land uses are proposed in addition to stadium and vocational schools/complex.	**Decision Awaited**	Business district needs to be reconsidered elsewhere. A decision has to be made in regard to the proposed stadium and vocational schools/complex.
[4] Heavy Industry	**NI**	Not implemented	Outside master plan target area.	**Discontinued**	No need to follow up as it is outside target area.
[5] Primarily Residential Districts	**NI**	Not implemented	Topzawa subdistrict MP is approved. Small part of it is within this land use.	**Discontinued**	The land use of this Great Zab Cluster area shall be carefully considered.
[6] Major Landscape / Forest outdoor activities park	**NI**	Not implemented	Development of a small village and expansion of Kawrgosk MP.	**Discontinued**	The land use of this Great Zab Cluster area shall be carefully considered.
[7] Major Landscape / Golf resort	**NI**	Not implemented	None of the gulf resorts are developed, however, small golf area is developed within other investment projects.	**Discontinued**	The land use of Mandawa area will be fully reconsidered (See Section 5.4.4.(2))
[8] Major Landscape / Golf resort	**NI**	Not implemented	None of the gulf resorts are developed, however, small golf area is developed within an investment project.	**Discontinued**	The land use of this Great Zab Cluster area shall be carefully considered.
[9] Great Wadis National Park Boundary	**NI**	Not implemented	No action has been done nor plan has been elaborated.	**Partial**	Parts of it shall be kept as Nature Tourism (SO7-3-3), however, most of the land use is outside target area.
[10] Primarily Residential Districts	**NI**	Not implemented	No development has taken place in Mandawa area.	**Discontinued**	The land use of Mandawa area will be fully reconsidered (See Section 5.4.4.(2))
[11] Primarily Residential Districts	**NI**	Not implemented	No development has taken place in Mandawa area.	**Discontinued**	
[12] Primarily Residential Districts	**FI**	Fully implemented as it is.	Development of residential districts and gated communities.	**Complete**	The land use is kept as primarily residential.
[13] Primarily	**FI**	Fully implemented	-	**-**	-

Land Use Layout in Erbil 2030 MP (2012)	Implementation Monitoring		Changes in conditions (2012-2022)	Recommendation for Erbil MP Update	
	Score*	Comment		Integration**	Comment
Residential Districts					
[14] Primarily Residential Districts	**IO**	Village expansion	-	**Complete**	Shall be kept for village expansion but with changed shape.
[15] Primarily Residential Districts	**IO**	Village expansion	-	**Complete**	Shall be kept for village expansion but with changed shape (See Section 5.4.4.(2)).
[16] Primarily Residential Districts	**IO**	Topzawa master plan implementation	-	**Complete**	
[17] Security	**NI**	Not implemented	Khabat master plan and oil-related industries cover part of this land use.	**Discontinued**	To find another location for future security activities.
[18] Strategic Park and Ride	**NI**	Not implemented		**Discontinued**	Park and Ride Intermodal stations will be reconsidered based on the proposed public transportation network (SO4-5-2 Section 5.4.4).
[19] Strategic Park and Ride	**NI**	Not implemented		**Discontinued**	
[20] Agro-Industries	**NI**	Not implemented	Outside master plan target area.	**Discontinued**	No need to follow up as it is outside target area.
[21] Large Satellite Centers	**NIR**	Not implemented and replaced	There is an approved residential detail plan	**Discontinued**	New development cores will be proposed elsewhere.
[22] Large Satellite Centers	**NI**	Not implemented		**Discontinued**	New development cores will be proposed elsewhere.
[23] Large Satellite Centers	**NI**	Not implemented	Development of many unregulated polluting industries around this area.	**Discontinued**	New development cores will be proposed elsewhere.
[24] Large Satellite Centers	**NI**	Not implemented		**Discontinued**	The land use of Mandawa area will be fully reconsidered (See Section 5.4.4.(2))
[25] Large Satellite Centers	**NI**	Not implemented		**Discontinued**	New development cores will be proposed elsewhere.
[26] Large Satellite Centers	**NI**	Not implemented		**Discontinued**	New development cores will be proposed elsewhere.
[27] Large Satellite Centers	**NI**	Not implemented	Development of heavy industry activities.	**Discontinued**	New development cores will be proposed elsewhere.
[28] Agro-Industries	**NI**	Not implemented	Sufaya master plan is approved which covers part of this land use.	**Partial**	Sufaya master plan should be kept as well as promotion of irrigation project for agricultural uses.
[29] Water Park	**NI**	Not implemented		**Discontinued**	Similar activities shall be proposed nearby main roads axis on the river.
[30] Business Districts with Mixed Use	**NI**	Not implemented		**Discontinued**	The land use of Mandawa area will be fully reconsidered (See Section 5.4.4.(2))
[31] Specialist Districts / Presidential Villas	**NI**	Not implemented	Land use is specialist districts, then it was changed to presidential villas.	**Discontinued**	There is no plan to develop this area as intended.
[32] Specialist Districts	**NIR**	Not implemented and replaced	Land use is changed to Special and Residential District. There is also development of many residential and mixed-use projects.	**Discontinued**	New approved land use change should be considered.
[33] Primarily Residential Districts	**NI**	Not implemented		**Discontinued**	The land use of this Great Zab Cluster will be fully reconsidered (See Section 5.4.4.(2))
[34] Primarily	**FI**	Fully implemented	-	**-**	-

Land Use Layout in Erbil 2030 MP (2012)	Implementation Monitoring		Changes in conditions (2012-2022)	Recommendation for Erbil MP Update	
	Score*	Comment		Integration**	Comment
Residential Districts					
[35] Primarily Residential Districts	**NI**	Not implemented		**Discontinued**	The land use of this Great Zab Cluster will be fully reconsidered (See Section 5.4.4.(2))
[36] Main City Centers	**NI**	Not implemented	Development of many unregulated polluting industries.	**Discontinued**	
[37] Strategic Park and Ride	**NI**	Not implemented	Qushtapa master plan and village development.	**Discontinued**	Park and Ride Intermodal stations will be reconsidered based on the proposed public transportation network (SO4-5-2 Section 5.4.4).
[38] Airport and Aviation Uses	**IO**	Implementation ongoing		**Complete**	
[39] Specialist Districts	**NIR**	Not implemented and replaced	Development of public and private university and other uses such as dorms and cemetery.	**Discontinued**	
[40] Large Satellite Centers	**NI**	Not implemented	Development of many unregulated polluting industries.	**Discontinued**	The land use of this Great Zab Cluster will be fully reconsidered (See Section 5.4.4.(2))
[41] Major Landscape	**NI**	Not implemented		**Discontinued**	
[42] Primarily Residential Districts	**IO**	Implementation ongoing	Mala Omer residential expansion and Tarin Residential Project.	**Complete**	Shall be kept as residential.
[43] Major Landscape	**NI**	Not implemented	Village development.	**Discontinued**	??
[44] Specialist Districts	**NIR**	Not implemented and replaced	Development of gated communities.	**Discontinued**	New developments shall be considered.
[45] Primarily Residential Districts	**IO**	Implementation ongoing		**Complete**	
[46] Logistics-Warehouses	**NIR**	Not implemented and replaced	Residential development.	**Discontinued**	New locations for logistics-warehouses to be reconsidered.
[47] Primarily Residential Districts	**NI**	Not implemented		**Discontinued**	The land use of this Great Zab Cluster will be fully reconsidered (See Section 5.4.4.(2))
[48] Specialist Districts	**NI**	Not implemented		**Discontinued**	
[49] Specialist Districts	**NI**	Not implemented		**Discontinued**	
[50] Major Landscape / Forest Outdoor Activities Park	**NI**	Not implemented	Village development	**Discontinued**	
[51] Logistics-Warehouses	**NI**	Not implemented	Partly covered by Topzawa master plan	**Discontinued**	New locations for logistics-warehouses to be reconsidered.
[52] Great Wadis National Park Boundary	**NI**	Not implemented		**Partial**	This area has been considered as Agriculture preservation zone (See Section 5.4.1 and 6.1.3).
[53] Primarily Residential Districts	**NI**	Not implemented	Bastora dam under construction. Also, it is designated as Afforestation Area in Erbil GB MP.	**Discontinued**	This area is located in Groundwater recharge zone, there is Bastora dam and related tourism activity, therefore residential function is discontinued.
[54] Major Landscape	**NIR**	Not implemented and replaced	Land use in the process to be changed to residential.	**Discontinued**	To consider approved changes.
[55] Heavy	**FI**	Fully implemented	Kasnazan industrial area		

Land Use Layout in Erbil 2030 MP (2012)	Implementation Monitoring		Changes in conditions (2012-2022)	Recommendation for Erbil MP Update	
	Score*	Comment		Integration**	Comment
Industry			development.		
[56] Specialist Districts	**NI**	Not implemented	Encroachments.	**Discontinued**	No special use intended for this area.
[57] Specialist Districts	**NI**	Not implemented	Land use in the process to be changed to Stores and Warehouses	**Discontinued**	Approved changes shall be considered.
[58] Specialist Districts	**NIR**	Not implemented and replaced	Development of private school and village expansion.	**Discontinued**	
[59] Major Landscape	**NI**	Not implemented		**Discontinued**	
[60] Petrochemicals and Potential Polluters	**NI**	Not implemented		**Discontinued**	For the detailed reasons of discontinuation of heavy industry, refer to Section 6.2.4 (1) 2).
[61] Heavy Industry	**NI**	Not implemented	Pungina Bestana area is being studied for industrial development.	**Discontinued**	
[62] Long Term Reserve (Use to be determined later)	**N/A**	Erbil 2030 MP does not specify any land use	It is designated as Afforestation Area in Erbil GB MP	**Discontinued**	Area to be considered for afforestation.
[63] *No Land Use Specified*	**N/A**	Erbil 2030 MP does not specify any land use		**N/A**	
[64] *No Land Use Specified*	**N/A**	Erbil 2030 MP does not specify any land use		**N/A**	
[65] Long Term Reserve (Use to be determined later)	**N/A**	Erbil 2030 MP does not specify any land use		**Discontinued**	Recommended to be kept for agriculture.
[66] Long Term Reserve (Use to be determined later)	**N/A**	Erbil 2030 MP does not specify any land use		**N/A**	
[67] Green Belt	**NI**	Not implemented	It is designated as Afforestation Area in Erbil GB MP	**Discontinued**	Area to be considered for afforestation.
[68] Green Belt	**NI**	Not implemented		**Discontinued**	The land use of this Great Zab Cluster will be fully reconsidered (See Section 5.4.4.(2))
[69] Green Belt	**NI**	Not implemented		**Discontinued**	
[70] Green Belt	**NI**	Not implemented		**Discontinued**	
[71] Agro-Industries	**NI**	Not implemented	Development of oil-related industries.	**Discontinued**	Regular area of Gwer Road Industrial Zone is enough to accommodate industries.
[72] Green Belt	**NI**	Not implemented		**Complete**	Shall be kept as green to increase the area of green space.
[73] Heavy Industry	**IO**	Implementation ongoing	Industrial detail plans have been prepared for this area.	**Complete**	Approved industrial detail plans shall be considered.
[74] Large Satellite Centers	**NI**	Not implemented	Industrial detail plans are prepared for this area.	**Discontinued**	Approved industrial detail plans shall be considered.
[75] Green Belt	**NIR**	Not implemented and replaced	Encroached.	**Discontinued**	
[76] Long Term Reserve (Uses to be Determined Later)	**NIR**	Not implemented and replaced		**Discontinued**	
[77] Security	**IO**	Implementation ongoing	Plan for security-related development is intended.	**Complete**	Land use shall be kept as security.
[78] Long Term Reserve (Uses to be	**NI**	Not implemented	Village expansion.	-	

Land Use Layout in Erbil 2030 MP (2012)	Implementation Monitoring		Changes in conditions (2012-2022)	Recommendation for Erbil MP Update	
	Score*	Comment		Integration**	Comment
Determined Later)					
[79] Primarily Residential Districts	**IO**	Implementation ongoing	Part of Bahirka master plan.	**Complete**	Land use shall be kept. Land uses of Bahirka master plan to be considered.
[80] Major Landscape	**NI**	Not implemented	Part of green belt master plan	**Discontinued**	Green belt and Recharge Zone to be proposed.
[81] Primarily Residential Districts	**IO**	Implementation ongoing	Residential detail plans are approved.	**Complete**	Approved detail plans shall be considered.
[82] Business Districts with Mixed Use	**FI**	Fully implemented	-	-	-
[83] Specialist Districts	**NI**	Not implemented	Part of it is allocated for housing units for university.	-	
[84] Airport Logistic Area	**IO**	Implementation ongoing	Parts of it are developed as indented, also, Sebiran masterplan is approved.	**Partial**	Land use shall be separated between logistics and Sebiran master plan.
[85] Airport Logistic Area	**NI**	Not implemented		**Complete**	It's in Airport buffer zone, so keep it as "land reserve".
[86] Logistics Area	**NI**	Not implemented		**Complete**	This area is planned to be used in relation with the planned railroad for loading / unloading goods (SO3-2-3).
[87] Primarily Residential Districts	**IO**	Implementation ongoing	Residential detail plan is approved.	**Complete**	
[88] Primarily Residential Districts	**IO**	Implementation ongoing	Residential detail plan is approved.	**Complete**	Approved detail plans shall be considered.
[89] Airport Forbidden Area	**NIR**	Not implemented and replaced	Residential project under development	**Discontinued**	
[90]	**N/A**		Village development	**Discontinued**	
[91] Primarily Residential Districts	**IO**	Implementation ongoing	Residential detail plan is approved.	**Complete**	Approved detail plans shall be considered.
[92] Primarily Residential Districts	**IO**	Implementation ongoing	Residential detail plan is approved.	**Complete**	Approved detail plans shall be considered.
[93] Primarily Residential Districts	**IO**	Implementation ongoing	Residential detail plan is approved.	**Complete**	Approved detail plans shall be considered.
[94] Primarily Residential Districts	**NI**	Not implemented	Encroachments.	**Complete**	
[95] Major Landscape / Forest Cemetery Park	**NI**	Not implemented		**Discontinued**	See Section 9.3.8 (2)
[96] Specialist Districts	**NI**	Not implemented		**Discontinued**	
[97] Primarily Residential Districts	**IO**	Implementation ongoing	Subdistrict expansion	**Complete**	
[98] Major Landscape / Quality Residential and Golf Course	**NI**	Not implemented		**Discontinued**	Area to be considered for afforestation.
[99] Primarily Residential Districts	**NI**	Not implemented		**Discontinued**	Green belt and Recharge Zone to be proposed.
[100] Business	**IO**	Implementation ongoing	Approval of detail plans	**Complete**	Approved detail plans shall

Land Use Layout in Erbil 2030 MP (2012)	Implementation Monitoring		Changes in conditions (2012-2022)	Recommendation for Erbil MP Update	
	Score*	Comment		Integration**	Comment
Districts with Mixed Use			for warehouses and mixed-use land uses.		be considered.
[101] & [103] ARAT New zone	**NI**	Not implemented	Area is being studied for industrial development.	**Complete**	
[102] Primarily Residential Districts	**IO**	Implementation ongoing		**Complete**	
[104] Primarily Residential Districts	**IO**	Implementation ongoing		**Complete**	
[105] Primarily Residential Districts	**FI**	Fully implemented	-	**-**	-
[106] Primarily Residential Districts	**IO**	Implementation ongoing		**Complete**	
[107] Specialist Districts	**NIR**	Not implemented and replaced	Development of cemetery and health center.	**Discontinued**	
[108] Green Belt	**NI**	Not implemented	It is designated as Afforestation Area in Erbil GB MP	**Complete**	Area to be considered for afforestation.
[109] GreenBelt_1	**NI**	Not implemented	Small parts are encroached	**Complete**	Inner green belt shall be kept in the updated master plan including gateway parks.
[110] Primarily Residential Districts	**IO**	Implementation ongoing	Residential detail plan is approved.	**Complete**	Approved detail plans shall be considered.
[111] Green Belt	**NIR**	Not implemented and replaced	Development of oil-related industries.	**Discontinued**	There is a possibility to expand this area for oil-related industries. Green area around it to be reconsidered
[112] Green Belt	**NI**	Not implemented		**Partial**	Western and southern parts should be kept as outer green belt, if possible, to increase the green areas and forests that will help reduce dust storms usually coming from that direction. Other parts shall be kept for agriculture.
[113] Heavy Industry	**NI**	Not implemented	Development of industrial projects	**Complete**	Approved industrial projects shall be considered.
[114] Heavy Industry	**IO**	Implementation ongoing	There is an approved detail plan that includes oil refineries and related activities.	**Complete**	Approved detail plan shall be considered.
[115]	**IO**	Implementation ongoing	Shawes subdistrict development	**Complete**	Approved detail plan shall be considered.

Source: JICA Project Team

Note: (*) **FI**: Fully implemented, **IO**: Implementation ongoing, **NI**: Not implemented, **PI**: Partially implemented not ongoing, **AB**: Abandoned.

(**) **Complete**: Full integration to Erbil 2050 MP is recommended, **Partial**: Partial integration, **discontinued**: No integration, **TBS**: Integration to be further studied

3.3.2 Review of Proposed Community Facilities

(1) General Review of the Approach of Proposing Community Facilities

Erbil 2030 MP assumes that the city will grow within RW5 and assigns lands uses within this limit for a projected population of 2.5 million. It also keeps the option of a further expansion till RW13 with a population of 4 million and assigns broad land use categories. The large scale of these districts reflects a planning approach based on clustering similar and complementary activities, creating new destinations

with a clear identity. In the 10 sectors, public facilities are assigned either on vacant lands or by changing some current uses (especially closer to the center). This mainly includes health, education, religious and green facilities within the residential neighborhoods as well as specific mixed-use streets. A number of small-scale community services are injected within the urban tissue to provide security and socio-cultural services. City-scale public facilities such as universities, hospitals and parks are located further from the center in the yet to be urbanized zones.

In the update of the masterplan (Erbil 2050 MP), public facilities planning is addressed in chapter 9 of the report. Large-scale public facilities that serve the city and beyond, on national and international scales are proposed based on the general visions and the planning strategies. Their locations are assigned based on a series of planning criteria, within the currently urbanized areas or in the planned new cores.

The smaller scale public facilities within districts and neighborhoods follows a different approach. Availability, accessibility and affordability of these facilities among the main requirements. By following planning standards, in relation to projected populations, age groups and minimum areas, the needed number and distributions of facilities are calculated.

(2) Review of Community Facilities Projects & Standards in Erbil 2030 MP

- Proposed community facilities in Erbil 2030 MP are limited within RW5 while the city already expanded beyond this limit;
- Figures for proposed community facilities in the Erbil 2030 MP are not consistent between the maps and the tables;
- Proposed land use includes residential and very few "multi-story residential" without defining a range of floor numbers for the 2 categories. We assume that the towers that appeared in the city in the last years are not accounted in the proposed provision of community facilities;
- Large-scale proposed extensions of the sectors are assigned very broad land uses such as Residential/ Diplomatic Compounds/ Industrial without assigning community facilities within these zones. Many of these areas are now urbanized (mostly residential) without a guidance from the Erbil 2030 MP in terms of Community facilities implementation;
- Land area comparison between proposed Erbil 2030 MP and current condition shown in Table 3.3.2 below proves that some facilities are below target, while others reached targets and spilled out of RW5. However, they mostly do not follow allocated lots;
- Proposed planning standards and implementation are assessed in Table 3.3.3 below. Spatial distribution and population thresholds are not sufficient criteria in standards. Type and quality of services shall be included.

Table 3.3.2 Land Area Comparison & Implementation Status of Community Facilities

		Land Area Comparison for Public facilities (m2)			
	Existing 2006 within RW5	Planned in Erbil 2030 MP within RW5	Current condition (2022) within RW5	*Achievmt. of planned*	Current (2022) within RW9
Institutional- Health	395,446.20	1,133,172.30	722,214.96	*64%*	903,231.24
Inst.-Governmental	2,127,565.50	3,164,165.00	2,370,720.27	*75%*	3,208,711.40
Inst.- Education	2,592,294.50	4,402,499.60	4,373,333.07	*99%*	6,685,858.80
Religious	392,944.30	550,183.00	683,000.80	*124%*	1,408,452.64
Cemeteries	1,113,801.60	1,746,414	1,123,568.95	*64%*	1,897,026.15
Tourism	69,715.80	1,243,152	350,826.62	*28%*	350,826.62
Playgrounds & Parks	2,921,306	9,288,449	3,525,609.78	*38%*	8,183,419.35
Sports Areas	221,055.70	221,055.70	1,475,163.65	*667%*	2,069,960.65
Culture	23,427.70	23,427.7	221,745.61	*947%*	234,712.49
TOTAL	**9,857,557.3**	**21,772,518.3**	**14,846,183.7**	***68%***	**24,942,199.3**

Source: JICA Project Team

Table 3.3.3 Review of Community Facilities Projects & Standards in Erbil 2030 MP

Projects (2006)	Implementation Monitoring Score* & Standards		Changes in conditions (2006-2022)	Recommendation for Erbil MP Update Integration**	
Education (Primary/ Intermediate/ High Schools)	**NI**	**High Schools:** 1/25,000 population 1.1 ha for each **Intermediate Schools:** 1/25,000 population 0.9 ha for each **Primary Schools:** 1/5,000 population 0.55 ha for each	- Increase in population and vertical and horizontal expansion of the city; - Bad condition of some existing schools.	**Discontinued**	- Schools are needed and the implementation of new ones should take into account the allocated ones in approved detailed plans; - Proposing schools by type (education level, size, gender, public/private) is advised for better coverage; - The MoE follows defined school typologies based on 9/12/18 classrooms; which may be adopted in the MP update; - Currently, a 12-classroom school has 2 shifts and serve 350 students and an 18-classroom school has on 2 shifts and serve 500 students. The proposed schools should absorb the overload on the existing schools and respond to future needs based on the projected population increase.
Health (Clinic Centers/ Health Centers)	**PI**	**Clinic Centers:** 1/40,000 population 0.5 ha for each **Health Center:** 1/4,500 population 0.25 ha for each	- Increase in population and vertical and horizontal expansion of the city; - PHC are not reliable.	**Discontinued**	- Improving the service of the existing PHC is a prerequisite to implementing new ones; - PHC are indicated in approved DP and many are not implemented. These may be considered as part of the MP update; - Private clinics are implemented based on a request to the BOI. Approved projects may also be considered in the MP update; - The allocation of 8 or 9 health centers in (sector 1) may be reviewed in the presence of nearby doctors' street.
Security (Main Police Station/ District Police Station/ Fire Station)	**NI**	**Main Police Station:** 1/100,000 population 0.5 ha for each **District Police Station:** 1/50,000 population 0.3 ha for each **Fire station:** 1/80,000 population 0.5 ha for each	- Expansion of the city - Social and demographic changes	**Discontinued**	- These are mostly vital facilities that need to be integrated. However, the distribution may be reviewed taking into account the change in population, high-rise building and available lands; - Fire station sharing a corner plot with a cultural center and a library may be reviewed (sector 8); - District police station distribution may be reviewed for better coverage.
Community Services: (Telephone Exchange/ Youth Center/ Public Library/ Cultural Center/ Post office/ Cinema/ Social Center/ Multipurpose Hall)	**NI**	**Telephone Exchange:** 1/50,000 population 0.5 ha for each **Youth Center:** 1/45,000 population 0.65 ha for each **Public Library:** 1/45,000 population 0.11 ha for each **Cultural Center:** 1/45,000 population 0.6 ha for each **Post Office:** 1/50,000 population 0.2 ha for each **Cinema:** 1/45,000 population 0.27 ha for each **Social Center:** 1/20,000 population	Digitization and advanced technology should be reflected in how these services are provided.	**Discontinued**	- A number of social centers are proposed at relatively close proximity to each other. These may be defined more to understand their function, scale and validity in the context of Erbil; - The distribution of these services on the land use plans may be reviewed based on the characteristics of each urban block. They may either be clustered to create a focal point (piazza, square) or scattered to animate a street or an area; - Many of these services, especially the cultural ones, may be located adjacent or within the proposed [playgrounds& parks]. This would create an ideal indoor-outdoor relation and safe open space especially at night; - Most of these services can occupy existing buildings or part of them,

Projects (2006)	Implementation Monitoring Score* & Standards		Changes in conditions (2006-2022)	Recommendation for Erbil MP Update Integration**	
		0.22 ha for each **Multipurpose Hall:** 1/45,000 population 0.45 ha for each			especially in heritage areas or where their assigned plots are already replaced with residential developments; - On the other hand, they may be an opportunity to create a unique architectural character for these public services, that citizens and visitors can clearly identify.
Tourism	N/A	1/ 80,000 population 1 ha for each	N/A	**Discontinued**	- It is unclear what the program of "tourism" is. - The allocation strictly follows the population standard; while it may follow available tourist attraction and propose amenities to reinforce them. (more site specific)
Religious Buildings	**NI**	1/7,500 population 0.4 ha for each	A large number of mosques has been constructed by donors.	**Discontinued**	- To be reviewed as there might not be a need for new mosques. The need for other religious buildings (churches) may be reviewed. - The MoERA has its own urban regulations in terms of served population and needed area for each type of mosques. MP update may look at these official guidelines.
Cemeteries	**NI**	1/50,000 population 6 ha for each	The proposed ones are now in the center of the growing city.	**Complete**	Standard is adopted since there is no other official standard. The proposed cemeteries in sectors 3, 5 & 8 are not valid anymore, replaced by residential developments. Alternative location must be found even further from the city.
Major proposed projects (Cluster of community facilities)	**NI**		A cluster of community facilities in the location of the silos. The removal of the silos has not been confirmed yet.	**Complete**	The location is very strategic for a community-based project. MP2050 proposes projects with a strong identity in this location, focused on art and culture.
Major proposed projects (Large scale playgrounds & parks)	**NI**		50 & 60 ha parks in sectors 5 & 6 are both inapplicable now due to residential expansion.	**Discontinued**	An opportunity to propose the allocation of small & medium scale gardens and parks, that communicate with the community facilities and the streets.

Source: JICA Project Team

Note: (*) **FI**: Fully implemented, **IO**: Implementation ongoing, **NI**: Not implemented, **PI**: Partially implemented not ongoing, **AB**: Abandoned

(**) **Complete**: Full integration to Erbil 2050 MP is recommended, **Partial**: Partial integration, **discontinued**: No integration, **TBS**: Integration to be further studied

3.4 Review of Land Use Component Policies

3.4.1 Review of Transport Policies

(1) General review of the approach of transport in Erbil 2030 MP

- Transportation is addressed in Erbil 2030 MP as one of the five main elements that differentiate an attractive city from an unattractive city, namely the "Ability to get around easily";
- Road development projects are not clearly explained in Erbil 2030 MP, making the monitoring of implementation difficult;
- Approach of Public Transportation is weak.

(2) Review of Transport Policies

Table 3.4.1 Review of Transport Policies in Erbil 2030 MP

Policy in Erbil 2030 MP (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator	
		Score*	Comment		Integration**	Comment
[MP811-1] Extendable Road Grid Policy (Concentric Grid) with sufficient RoW that can accommodate all likely future requirements for traffic, including public transport, utility networks and landscape treatment.	*Between 2006 and 2022, has the Extendable Road Grid Policy (Concentric Grid) been implemented? Has a sufficient RoW that can accommodate all likely future requirements for traffic, including public transport, utility networks and landscape treatment been ensured?*	++	Between 2006 and 2022, Extendable Road Grid Policy has been implemented with success through 120m and 150m Ring Roads, even though the shape of those ring roads has been changed slightly.	Road network is developed up to the Ring Road 8 (150m Road). The current total daily traffic volume at all cordon line counting is about 236,000 for both directions, i.e. in and out of Erbil, therefore, 120m and 150m (when completed) together have enough capacity to accommodate this traffic volume. Ring Road 8 is a fully access controlled 4 lane expressway and differs from the concept of the Green Belt Master Plan.	**Partial**	Erbil 2050 MP will pursue the Extendable Road Grid Policy (Concentric Grid) as design criteria, but it is actually not necessary to realize the road network outside of 150m Road from the traffic volume unless new urban development and associated generated new traffic requires it. Setting an appropriate cross section (depending on category and function of the road) and securing the right-of-way is important.
[MP811-2] Freeways and District Roads Policy shows how the Ringways and Radial corridors can be used, and how they can be linked into district road networks and land uses in neighborhoods: urban greenways throughout the district, local employment areas and park & ride on the outside, government or commercial land uses on the corner of the district, etc.	*Between 2006 and 2022, has the Freeways and District Roads Policy been implemented?*	-	The policy of organizing typical land uses inside Districts between Ringways and Radial corridors has almost not been implemented in Erbil until now, due to, among other factors, the development of gated communities and the lack of initiative for implementing urban green corridors and amenity corridor taking into	Approved Detail Plan of Municipality 6 is integrating the main concepts of District Layout which has been elaborated in Erbil 2030 MP. Implementation of this Detail Plan shall be followed up.	**Complete**	Erbil 2050 MP pursues the policy of giving orientations in terms of typical land use distribution inside mixed-use districts. Those concepts shall be more developed in Zoning Plans.

Policy in Erbil 2030 MP (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator	
		Score*	Comment		Integration**	Comment
			account townscape formulation			
[MP812-1] Policy of improving Road Network Performance by **increasing the use of Public Transportation** during peak hours, with the goal of making Public Transportation account for 25% of journeys in morning peak period	*Between 2006 and 2022, has the Road Network Performance has been improved by introducing Public Transportation? Does Public Transportation accounts for 25% of journeys on morning peak period?*	-	This policy has been implemented with limited success. Based on the result of the Household Survey, 72% of the employed people use private car. Use of public transport including taxi is of 13%.	N/A	**Complete**	Erbil 2050 MP pursues the policy of increasing the use of Public Transportation during peak hours. In order to push the modal shift from private car to public transport, P+R facilities shall be planned along 120m and 150m road with convenient transit service to the Erbil center (examples like Washington DC can be useful).
[MP812-2] Policy of achieving a high Level of Service at road junctions through the construction of grade-separated junctions	*Between 2006 and 2022, has a high Level of Service at road junctions been achieved? Have grade-separated junctions been constructed?*	++	This policy has been implemented with important success. All intersections of 120m and 150m Road are grade separated. There are 13 grade-separated intersections on and inside 100m road are currently built-up and 3 are planned but not yet constructed (see Figure 7.1.6, Section 7.1.1).	The 3 planned grade-separated intersections are not yet implemented due to budgetary limitation.	**Complete**	Erbil 2050 MP will pursue the policy of achieving a high Level of Service at road junctions through the construction of grade-separated junctions, especially where public transport like BRT will be introduced.
[MP812-2] Policy of achieving an affordable public transport system, a combination of buses with reserved routes, bus-only lanes and bus-priority junctions, and taxis.	*Between 2006 and 2022, has an affordable public transport system, a combination of buses with reserved routes, bus-only lanes and bus-priority junctions, and taxis been implemented?*	-	This policy has not been implemented. There is no bus priority lane and signal. LRT and BRT was planned, but not implemented because of the large investment and long concession period that brings a big risk to the investor.	N/A	**Complete**	Erbil 2050 MP will pursue the policy of achieving an affordable public transport system, by setting a proper mechanism for financing and operation of BRT including dedicated bus lane and priority signal. Reorganization of the mini-bus as feeder service is also necessary.
[MP814-1] Policy of introducing Car Parking Standards for required number of car park spaces in any private or public sector development.	*Between 2006 and 2022, has the Car Parking Standards proposed by Erbil 2030 MP been implemented in law and in reality, for each type of private or public*	-	In 2022, Car Parking Standards specific to Erbil has not been introduced and it has not become regulations (requirement of building permit)	Iraqi Urban Housing Standards, promulgated in 2010, includes parking norms for key neighborhood facilities and housing development has	**Complete**	Erbil 2050 MP pursues the policy of introducing Car Parking Standards for the different land uses of Erbil MP, especially because those standards will be reflected in the

Policy in Erbil 2030 MP (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator	
		Score*	Comment		Integration**	Comment
	sector developments?		for all relevant public and private facilities.	been referred to urban planning.		Zoning Scheme regulations as this tool has the legitimacy for urban form control and management.
[MP814-2] Policy for car parking system should be comprehensively established by off-street (public and private facilities in their sites, and on-street car parking system within R.O.W of road in relation to road side land us in association with parking management and controls.	*Between 2006 and 2022, has policy for car parking management in Erbil been introduced?*	-	In 2022, comprehensive parking policy in Erbil has not been introduced yet in coordination with Traffic Police.	Until now, there are no comprehensive parking management instrument for on-street and off-street parking.	**Complete**	Erbil 2050 MP pursues the policy of the comprehensive parking management in consideration with land use and street/traffic conditions.
[MP814-2] Traffic Calming Policy through the redesigning of roads and residential streets to give more space to pedestrian and bicycle, by implementing reduced speed (30 kph), road humps, chicane etc.	*Between 2006 and 2022, has the Traffic Calming Policy through the redesigning of roads and residential streets been implemented?*	+	In 2022, this policy as a whole has been implemented with very limited success, but speed humps are implemented in some residential areas, as well as U turn point which helps reduces the traffic speed. Bicycle lane is very limited, and pedestrian crossing is not safe.	Speed limit of 120m Road is 110km/h, but the average speed may be lower because of the speed humps.	**Complete**	Erbil 2050 MP pursues the policy of the traffic calming in consideration with land use and traffic conditions. Standard cross section of the residential road and of some selected trunk road shall be introduced for the better amenity. Use of appropriate speed reducing measure shall be recommended.
[MP815] Policy of Petrol Filling Stations (PFS) site development location at design requirement such as their size, compatibility with surrounding land uses, location in each district, accessibility on major roads etc.	*Between 2006 and 2022, were PFS developed according to the policy proposed in Erbil 2030 MP?*	TBC	KRG may follow Iraqi regulations with certain facilities requirement of PFS practically (to be confirmed).	Relevant regulations to be confirmed. So far the queueing cars at PFS that is cheaper than the others are do not obstruct the passing traffic on the trunk roads. The number of PFS seems to be sufficient inside 100m road.	**Partial**	Erbil 2050 MP pursues the policy of introducing requirements for PFS implantation and design especially because those standards will be referred to the Zoning Scheme land use control regulations (see Part IV, Section 2.2.2).
[MP816] Policy of Aviation activities development through ensuring sufficient available space around the airport to create hub facilities for airlines, aircraft maintenance and engineering, air training schools, etc.	*In 2022, has sufficient available space around the airport to create hub facilities for airlines, aircraft maintenance and engineering, air training schools, etc. been ensured?*	+	Between 2006 and 2022, a minor part of the airport vicinity reserved for aviation activities development has been encroached by urbanization	Private initiatives in urban development are growing in recent years in the surrounding of the airport, threatening more the integrity of airport zone	**Complete**	Erbil 2050 MP pursue the policy of protecting the lands surrounding the airport and to reserve it for developing economic activities relating to aviation

Source: JICA Project Team

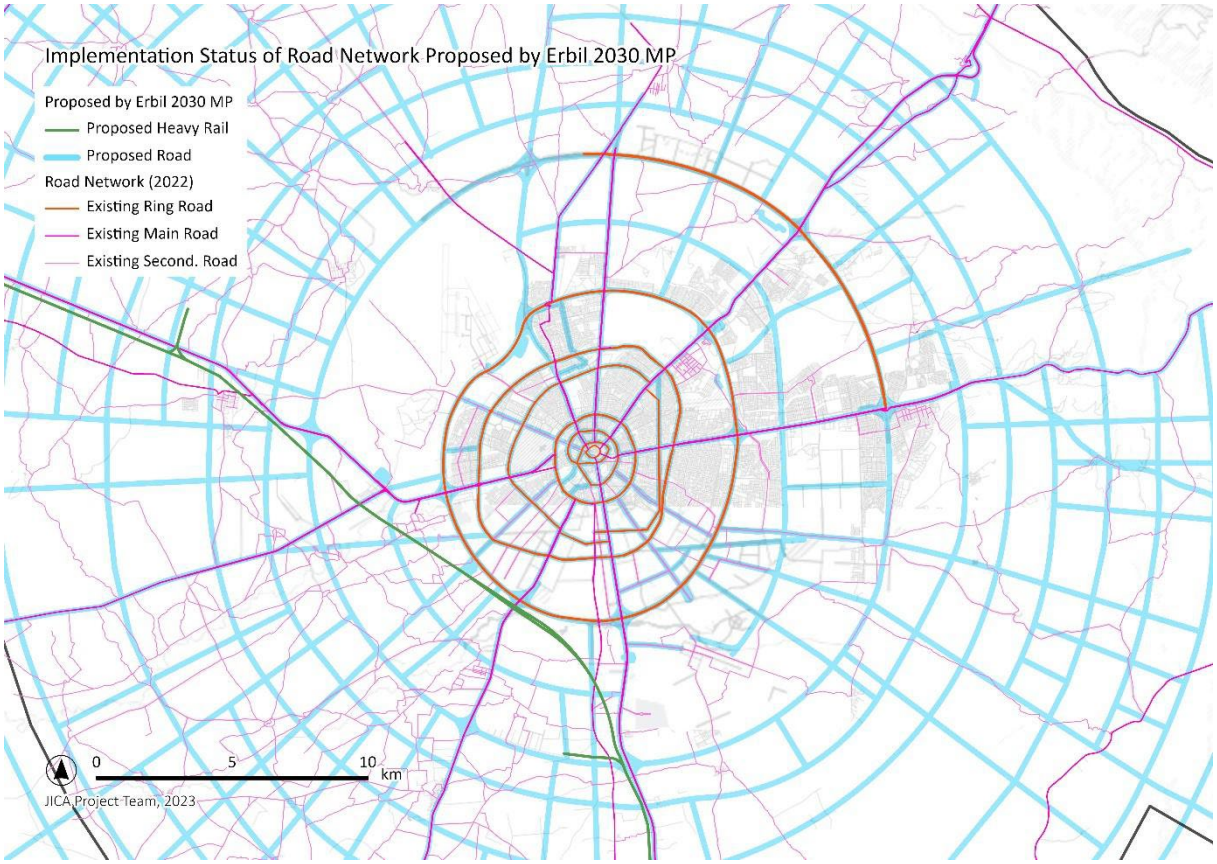
Note: (*) +++ Excellent implementation, ++ Average/Good implementation, + Fair implementation, - No implementation.

(**) **Complete**: Full integration to Erbil 2050 MP is recommended, **Partial**: Partial integration, **Discontinued**: No integration, **TBS**: Integration to be further studied.

(3) Review of Transport Projects Implementation

Road development projects (road names) are not clearly explained in Erbil 2030 MP, making the monitoring of implementation difficult.

The road network up to 150m Road is enough for the current traffic volume because the total traffic volume at all Cordon Lines is about 236,000 for both directions and 120m and 150m Road together have enough capacity to bear the traffic volume. From the traffic point ring roads beyond 150m road is not necessary unless there is considerable urban or industrial development. Setting an appropriate guideline for the cross section depending on the function of the road is necessary. If a new road outside of 150m Road becomes necessary from the urban development perspective, appropriate design considering both the local and through traffic is necessary to avoid excessive design (150m Road was planned as amenity road in the Greenbelt Plan but built as a freeway).



Source: JICA Project Team

Figure 3.4.1 Implementation Status of Road Network Proposed in Erbil 2030 MP

3.4.2 Review of Visual Environment & Urban Design Policies & Projects

Table 3.4.2 Review of Visual Environment & Urban Design Policies in Erbil 2030 MP

Policy in Erbil 2030 MP (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring Score*		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator Integration**	
[MP821: Visual Environment Policy] Development concepts, detailed designs and area improvements should maximize the use of good elements of visual environment, and minimize the use of poor elements, always harmonizing with the context within which the development is located.	*Between 2006 and 2022, have development concepts, detailed designs and area improvements maximized the use of good elements of visual environment, and minimized the use of poor elements, always harmonizing with the context within which the development is located?*	+	There is a moderate use of good quality elements regarding the visual environment in some specific areas such as in the Golden Zone and in some investment projects, but overall, in other parts of the city, the policy has not been implemented. MP does not have the necessary leverage to implement this policy.	From 2006 till 2013, due to the economic growth, implementation of private investment projects was the main factor of enhancing visual environmental elements. This trend has revived from 2020 with the development of many strategic projects of good landscaping quality.	**Partial**	Erbil 2050 MP will pursue some parts of the policy of Visual Environment promotion. In order to maintain and enhance both urban and natural landscapes, Landscape Quality Goals will be developed in the framework of Strategic Orientations. In order to foster the implementation of this policy, urban landscape component shall be integrated in subsequent based on the certain strategies and concept of urban landscape for Erbil context and urban environment (e.g. modern or traditional, soft or hard landscape with arid climate, dynamic or static) as essential frameworks of detailed regulatory or urban design scheme such as Zoning Scheme.
[MP822: Public Art Policy] Erbil city will be a unique city of bold colors and designs that delight the eye. It will avoid being an anywhere city of similar dun-colored buildings. Development concepts, detailed designs and area improvements should include public art. This should be a minimum of 1% of a project total.	*Between 2006 and 2022, have development concepts, detailed designs and area improvements included provision of public art, up to a minimum of 1% of a project total?*	+	Public art has been moderately implemented within public parks such as Shanadar park or Minara park but overall, it has not been spread everywhere in the city. Mixture of hard and soft landscaping, can be found in most Prestige route areas and in Golden Zone. Moreover, public art in Erbil city does not refer enough to Kurdish heritage and culture despite its potential. MP does not have the necessary leverages to implement this policy. (See Green Areas Diagnostic Sector Report for more details and photos)	N/A	**Partial**	Erbil 2050 MP will pursue some parts of the Public Art policy. In order to foster the implementation of this policy, public art should be incorporated and integrated as elements of urban landscape strategies represented as traditional and modern culture of Erbil City. The Public Art could be promoted and placed in a comprehensive urban design scheme or guidelines. In some specific areas designated by Zoning Plans, floor area bonus or other incentives could be allocated to private developers who agree to provide 1% of the project budget to Public Art.
[MP823-2: Urban Landscaping] The whole city of Erbil shall benefit from landscaping and	*In 2022, has the whole city of Erbil benefited from landscaping and beatification*	-	The landscaping and beautification of the city as a whole, especially in terms of greening, has known moderate	Some urban development projects including public parks and pocket parks have	**Complete**	Erbil 2050 MP will pursue the Urban Landscaping policy to support the effort of greening the city at

Policy in Erbil 2030 MP (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring Score*		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator Integration**	
beatification operations at each scale including inside urban districts (formal and informal parks, gardens and urban plazas, recreation and sports), roads (as ecological corridors) and major landscape parklands (urban forests, botanical gardens, parks and gold resorts).	*operations at each scale including inside urban districts, roads and major landscape parklands?*		implementation. The concept of an urban green system or urban green infrastructure planning and its policies at the scale of the whole city is not well known by the authorities and decision makers have not been exposed to yet. The important corridors of Northern and Southern greenways have not been designed well with a special treatment in terms of plantation and design. (See Green Areas Diagnostic Sector Report for more details and photos)	been implemented, but unfortunately, there is no improvement towards a global landscaping effort for the city as a whole.		various scales. The approach of major landscape parklands shall be reviewed in terms of accessibility of those areas to citizens. They shall not be too distant to residential areas. Moreover, in order to foster the implementation of this policy, urban landscape component shall be integrated in subsequent and more detailed regulatory framework such as Zoning Scheme or planning and design standards for recreational spaces and parks.
[MP823-3: Suitable Landscape Species] Tree species used for urban landscaping shall be suitable according to the usage of the area: deciduous species in pedestrian areas (to maximize sunlight in winter) and evergreen species for buffer, screening and forestry areas.	*In 2022, are the trees used for urban landscaping suitable according to the usage of the area: deciduous species in pedestrian areas and evergreen species for buffer, screening and forestry areas?*	+	Most of the species in Erbil are compatible with the harsh weather in Erbil city from evergreen to deciduous species such as Thuja occidentalis, Callistemon viminalis, Ceratonia siliqua, Lagerstroemia indica, Acer platanoides, Erythrostemon gilliesii, Eucalyptus, Magnolia grandiflora, Bougainvillea, Prunus laurocerasus L., Cupressus sempervirens, Cupressus sempervirens Swane's Golden, Melia azedarach, Ligustrum sinense, Albizia julibrissin, Washingtonia filifera, and many more. These species have mostly been used in median strip of the Prestige routes (see below). (See Green Areas Diagnostic Sector Report for more details and photos)	N/A	**Complete**	Erbil 2050 MP will pursue the policy of using suitable vegetation species for landscaping in the perspective of water irrigation efficiency and sustainable development. Moreover, in order to foster the implementation of this policy, urban landscape component shall be integrated in subsequent and more detailed environmental planning and design guidelines for planting trees and greenery allocation.
[MP823-4: Prestige Routes] Proposed roads in the city which are considered more important from a prestige viewpoint shall receive more particularly good quality landscape treatment in order to give identity to the different parts of the city.	*In 2022, are the roads designated as Prestige Routes of a particularly good quality landscape treatment and give identity to the different parts of the city?*	+	The policy of Prestige Routes has been moderately implemented in Erbil. Some of the proposed roads have received a special landscape design treatment with some evergreen and deciduous tree planting, but a majority of other roads did not (See Green Areas Management Sector	There are many changes in the Master Plan since 2010 land use and priority areas further study should be in consideration.	**Complete**	Erbil 2050 MP pursues the policy of Prestige Routes. In order to foster the implementation of this policy, urban landscape component shall be integrated in subsequent plans based on the certain strategies and concept of urban landscape for Erbil context and urban axis (e.g. urban

Policy in Erbil 2030 MP (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring Score*		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator Integration**	
			Report).			spines, pedestrian avenues, etc.) as essential frameworks of detailed regulatory or urban design scheme such as Zoning Scheme.

Source: JICA Project Team

Note: (*) +++ Excellent implementation, ++ Average/Good implementation, + Fair implementation, **-** No implementation.

(**) **Complete**: Full integration to Erbil 2050 MP is recommended, **Partial**: Partial integration, **Discontinued**: No integration, **TBS**: Integration to be further studied.

Table 3.4.3 Review of Visual Environment & Urban Design Projects in Erbil 2030 MP

Project in Erbil 2030 MP (2006)	Implementation Monitoring Score*		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator Integration**	
[MP823-1.1: National Parks] Great Zab Valley National Water Park including water-based recreation, centered on new man-made lakes especially designed for sailing, water skiing, power boat racing, rowing, fishing and other water-related leisure activities.	**NI**	No feasibility study or detail design has been carried out after the MP for Great Zab Valley National Water Park. Neither the Directorate in charge of tourism promotion (MoMT) / Board of Tourism (BoT) nor the Board of Investment (BoI) are promoting this project.	N/A	**Partial**	Erbil 2050 MP is considering to preserve farmlands in this area (See Section 6.1).
[MP823-1.2: National Parks] Great Wadis National Park including a variety of leisure facilities located to best suit the various natural landscapes, including nature and wildlife parks, an equestrian region, a large area for noisy activities including motor sports and firing ranges, an area of outstanding natural beauty for mountain trekking and rock climbing.	**NI**	No feasibility study or detail design has been carried out after the MP for Great Zab Valley National Water Park. Neither the Directorate in charge of tourism promotion (MoMT) / Board of Tourism (BoT) nor the Board of Investment (BoI) are promoting this project.	N/A	**Partial**	Erbil 2050 MP is considering to promote Nature Tourism on this area (See SO7-3-3 and Section 6.3). Nevertheless, the naming of "National Park" shall be abandoned since it does not reflect the purpose of nature-based tourism of the proposition.

Source: JICA Project Team

Note: (*) **FI**: Fully implemented, **IO**: Implementation ongoing, **NI**: Not implemented, **PI**: Partially implemented not ongoing, **AB**: Abandoned.

(**) **Complete**: Full integration to Erbil 2050 MP is recommended, **Partial**: Partial integration, **Discontinued**: No integration, **TBS**: Integration to be further studied.

3.4.3 Review of Carbon Neutral City Policies

(1) General Review of the Approach of Carbon Neutral City Policies in Erbil 2030 MP

In Erbil 2030 MP (2007), "carbon-neutral" is mentioned several times and it is also part of the long-term vision under City Character (2.1). In section 8.2.4 "A carbon neutral city", the basics of carbon-neutrality are covered and two general suggestions for policies are made. The first policy proposes to sequester carbon dioxide through tree planting in the proposed landscapes around Erbil. The other policy is to calculate Green House Gas (GHG) emissions in Erbil to monitor CO2 emissions and to plan emission reductions as part as the Monitoring process. In the Master Plan, "carbon-neutral policies" is mentioned as one of the subject plans in section 10.3 Urban planning function; page 10-8) without further details. In the Master Plan for Erbil (2007) the ambition to become a carbon neutral city is expressed, but little detail is provided on the pathway to become carbon neutral.

(2) Review of Carbon Neutral City Policies in Erbil 2030 MP

Table 3.4.4 Review of Carbon Neutral City Policies in Erbil 2030 MP

Policy in Erbil 2030 MP (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator	
		Score*	Comment		Integration**	Comment
[MP824-1] Sequester carbon dioxide through extensive tree planting in the proposed landscapes around Erbil	*Between 2006 and 2022, has carbon dioxide been sequestered through extensive tree planting in the proposed landscapes around Erbil?*	-	Between 2006 and 2022, only 16ha were planted with new trees between 2000 and 2020 and only at one site (Global Forest Watch). The current planting rate of 0.8 ha per year over the last 22 years does not constitute a sufficient increase of the carbon sink and sequestration potential of carbon dioxide.	A commitment to plant 100 million trees in the Kurdistan Region by 2030 has been made in 2022 under Hasar Organization program, but there is no plan in planting in Erbil Governorate. Due to ongoing climate change and extreme heat, tree planting will be increasingly challenging.	**Complete**	Erbil 2050 MP will pursue the policy to sequester carbon dioxide through extensive tree planting in the proposed landscapes around Erbil, as well as inside the urban extent through revegetation.
[MP824-2] Calculate GHG emissions in Erbil to monitor CO2 emissions and to plan emission reductions as part as the Monitoring process of the MP	*Between 2006 and 2022, have the GHG emissions in Erbil calculated for some sectors and actions for emission reductions suggested in the SEAP been implemented and monitored as part as the Monitoring process of the MP?*	-	Monitoring of Erbil 2030 MP has not been implemented; therefore, no GHG emission calculations or reductions has been carried out at the scale of the urban area of Erbil.	The federal government of Iraq has signed and ratified the Paris Agreement and committed themselves by becoming carbon neutral by 2050.	**Complete**	Erbil 2050 MP will pursue the policy of systematic GHG calculation as part of the revision of the urban development Master Plan (every 5 years). The performance of each KPI will be monitored and GHG emissions reduction measures shall be planned.

Source: JICA Project Team

3.4.4 Review of Industrial Development Policies

In the industrial field, Erbil 2030 MP proposes the development of Ararat Industrial City about 19 km northwest of Citadel on the left bank of the Great Zab River. Ararat Industrial City is described by Erbil 2030 MP as follows.

- The Ministry of Planning and Development Cooperation (MOPDC, then) received financing by Iraqi Reconstruction Trust Fund from International Development Association (World Bank Group);
- A committee was created under the Prime Minister. They identified an area of 100 km2 at the eastern side of the Great Zab River. A period of 5 to 10 years was assumed for the development;
- A population of about 250,000 is assumed;
- The land uses assumed are of 30% of warehouses and logistics, 20% of residential, 15% of light-medium industry, 10% of heavy industry, 10% of hospitals and universities, 10% of entertainment and 5% of commercial;
- The heavy industry was proposed to be located in other areas in consideration of possible adverse effects on the residential area and the natural environment of the Great Zab River with a high potential for tourism and recreation.

It shall be noted that the heavy industry area of Pungina Bestana, discussed in Section 6.2.4 (1) 2) was not proposed originally in Erbil 2030 MP. It was added in 2012 version of the Land Use Plan.

Table 3.4.5 Review of Industrial Development Project in Erbil 2030 MP

Policy in Erbil 2030 MP (2006)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator	
	Score*			Integration**	
[MP83-1] Ararat Industrial City	**NI**	In 2022, Ararat Industrial has not started development. A letter was issued on July 28, 2021, by BOI to the Ministry of Agriculture to convert the land use from agriculture to industry. A company called "AECOM" was selected as the investor. A committee has been in place since 2007 with 5 members. Satellite image shows that no development has taken place at this site as of January 2023.	- Board of Industrial Zone, the Ministry of Trade and Industry of KRG issued a request for proposals (RFP) for the Erbil Industrial Zone on August 5th 2014; - The purpose of this RFP is to encourage private investors to submit proposals as Master Developer for the Metropolitan Erbil Industrial Zone Project; - The project site is located 14.7km from the 1st circle and 6.8km from the checkpoint on the Mosul Highway. The land initially available was 561 hectares and additional land could be made available as land demands rise; - The assumed types of industries include food/beverages, construction/building materials and metals/ machinery and equipment; - The investment cost for on-site infrastructure is estimated to be US$184 million and that for off-site infrastructures to be US$160 million.	**Partial**	Ararat Industrial City is integrated partially into Erbil 2050 MP (see Section 6.2.3).
[MP83-2] Fish farms (close to Great Zab River and in proposed SW Agro-Industrial district)	**NI**	In 2022, fish farms have not been implemented.	- Increasing water scarcity and price of fresh water make fish farm projects hard to justify in terms of sustainability of development.	**Discontinued**	Erbil 2050 MP will discontinue the project of fish farm construction.

Source: JICA Project Team

3.4.5 Review of Commerce & Services Policies

Commerce & Services Policies in Erbil 2030 MP refer to a Vision Statement called Competitive City in the theme of International business center. Commerce & Services Policies section starts with mentioning the intention for the city to become competitive with other trading centers, in terms of costs, efficiency and general ease of doing business. Nevertheless, the section does not introduce proper policies but only showcases the lessons learned from Dubai and from Subic Bay in Philippines, as follows.

Table 3.4.6 Review of Commerce & Services Policies in Erbil 2030 MP

Policy in Erbil 2030 MP (2006)	Recommendation for Erbil 2050 MP Strategy & Indicator	
	Integration**	Comment
[MP84-1] Lessons learned from Dubai: There is an opportunity for Erbil to offer a better place than Dubai to do business, live, work, visit and to enjoy a good quality of life. It is the total package that a city has to offer, in relation to other cities, that makes it competitive, but congestion-free roads are a particularly important competitive advantage, as they affect all the city's activities.	**Discontinued**	Erbil 2050 MP will discontinue the reference to this lesson learned since it cannot be considered that congestion-free roads are a particularly important competitive advantage to compete with other trading centers such as Dubai.
[MP84-2] Lessons learned from Subic Bay: Investors need to be looked after once they have become established, and in particular their terms and conditions need to be maintained, or only changed by mutual agreement.	**Partial**	A real strategy to work in good understanding and collaboration with private investors shall be introduced.

Source: JICA Project Team

3.4.6 Review of Government & Institutions Policies

There are 3 major Government & Institutions Policies in Erbil 2030 MP, detailed in Table 3.4.7 below.

Table 3.4.7 Review of Government & Institutions Policies in Erbil 2030 MP

Policy in Erbil 2030 MP (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator	
		Score*	Comment		Integration**	Comment
[MP85-1] Presidential Complex located at the top of Sharobot Mountain to the north east of the city	*Between 2006 and 2022, has Presidential Complex policy been implemented?*	-	In 2022, Presidential Complex policy has still not been implemented.		**Complete**	Erbil 2050 MP will pursue the policy of Presidential Complex.
[MP85-2] Government District: chosen area for Ministries, including a new Parliament Building in the longer term, is on the outer side of prestige Ringway 5.	*Between 2006 and 2022, has Government District policy been implemented?*	-	In 2022, Government District policy has still not been implemented.		**Complete**	Erbil 2050 MP will pursue the policy of Government District.
[MP85-3] Diplomatic Quarters: highly secure compounds for foreign diplomatic representatives and their staff.	*Between 2006 and 2022, has Diplomatic Quarters policy been implemented?*	-	In 2022, Government District policy has still not been implemented. See Section 3-8 for situation of the planned land.	Security for foreign diplomats is even a higher priority nowadays.	**Complete**	Erbil 2050 MP will pursue the policy of Diplomatic Quarters.

Source: JICA Project Team

Note: (*) +++ Excellent implementation, ++ Average/Good implementation, + Fair implementation, - No implementation.

(**) **Complete**: Full integration to Erbil 2050 MP is recommended, **Partial**: Partial integration, **Discontinued**: No integration, **TBS**: Integration to be further studied.

3.4.7 Review of Housing Policies

There are 4 Housing Policies in Erbil 2030 MP, detailed in Table 3.4.8 below.

Table 3.4.8 Review of Housing Policies in Erbil 2030 MP

Policy in Erbil 2030 MP (2006)	***Evaluative question* / comment (2022)**	**Implementation Monitoring**		**Changes in conditions (2006-2022)**	**Recommendation for Erbil 2050 MP Strategy & Indicator**	
		Score*			**Integration****	
[MP86-1] Housing Supply & Demand Policy	*Between 2006 and 2022, has Housing Supply & Demand Policy been implemented?*	-	In 2022, Housing Supply & Demand Policy has not been implemented.	According to MoCH, Law (no.7) in 2008 on housing sector development has been promulgated, but further housing policies has not been developed yet until now. A new housing policy is currently under examination which may take times to be deliberated in the Council of Ministers.	**Complete**	Erbil 2050 MP will pursue Housing Supply & Demand Policy in Urban Management Improvement Measures & Policies as soon as it is approved.
[MP86-2] Infrastructure Provision Policy: involving private sector in financing necessary utility services	*Between 2006 and 2022, has Infrastructure Provision Policy been implemented?*	+	In 2022, Infrastructure Provision (by private sector) Policy has been implemented with relative success.	Shortage of government resources has worsened and thus the capacity of government to provide facilities and utilities for housing projects has decreased.	**Complete**	Erbil 2050 MP pursues Infrastructure Provision Policy in Urban Management Improvement Measures (see PART IV).

Policy in Erbil 2030 MP (2006)	***Evaluative question* / comment (2022)**	**Implementation Monitoring**		**Changes in conditions (2006-2022)**	**Recommendation for Erbil 2050 MP Strategy & Indicator**	
		Score*			**Integration****	
[MP86-3] Low Income Housing Policy	*Between 2006 and 2022, has Low Income Housing Policy been implemented?*	**-**	In 2022, Low Income Housing Policy (affordable housing) has not been implemented.	The MoCH had a program in 2012 for an affordable housing program in KRG of which 9,000 units are planned including 1,300 units for Erbil Governorate (396 units for Erbil). The budget is under deliberation to implement them at present. The economic crisis in the region halted the project.	**Complete**	Erbil 2050 MP pursues Low Income Housing Policy (see SO6-5: Ensure Affordability and Variety of Housing Options in Section 5.4.6).
[MP86-4] Plot Size Policy	*Between 2006 and 2022, has Plot Size Policy been implemented?*	++	In 2022, Plot Size Policy (variety of plot sizes) has been implemented with success.	Recently approved Detailed Plans feature land plot of varied sizes.	**Complete**	Erbil 2050 MP will pursue Plot Size Policy and will experience implementation in Pilot Zoning Scheme (PGR2).

Source: JICA Project Team

Note: (*) +++ Excellent implementation, ++ Average/Good implementation, + Fair implementation, **-** No implementation.

(**) **Complete**: Full integration to Erbil 2050 MP is recommended, **Partial**: Partial integration, **Discontinued**: No integration, **TBS**: Integration to be further studied.

3.4.8 Review of Tourism Policies

(1) Erbil Citadel

There are 4 Tourism Policies regarding Citadel in Erbil 2030 MP, detailed in Table 3.4.9 below.

Table 3.4.9 Review of Tourism Policies (Citadel) in Erbil 2030 MP

Policy in Erbil 2030 MP (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator	
		Score*	Comment		Integration**	Comment
[MP871-1] The preparation of an Erbil Citadel Master Plan in liaison with the UN World Heritage Centre, Paris. This includes a detailed management plan for the Citadel's conservation and interpretation.	*Has the Erbil Citadel Master Plan been formulated and approved?*	+++	Urban Design Guideline for the Buffer Zone of Erbil Citadel was formulated by Italian company ARS Progetti.	Erbil Citadel was listed as a UNESCO World Heritage in 2014.	**Already Completed**	Due to its completion, making a management plan for Erbil Citadel does not have to be suggested in Erbil 2050 MP.
[MP871-2] The role of the Citadel will be *The Kurdistan Experience*, portraying the history, heritage and cultures of Kurdistan in general and the Citadel in particular, and acting as the premier tourism experience and heritage research center within the region.	*Has the tourism experience and heritage research center The Kurdistan Experience been developed? What is the role of Erbil Citadel in regional tourism development?*	-	Tourism experience and heritage research center The Kurdistan Experience has not been implemented.	N/A	**Continued**	Integration of *The Kurdistan Experience* into Erbil 2050 MP is proposed in Tourism Sector (TOU-S1-2 See Section 6.3).
[MP871-3] The further investigation of the archaeological remains in the seven levels of citadel habitation.	*Has archeological investigations been carried out in the seven levels of Citadel habitation?*	+	Some archeological investigation has happened in 2023, but communication with Department of Antiquities is difficult.	N/A	**Continued**	Integration of Archeological Tourism has been integrated in Tourism Sector (TOU-S5 See Section 6.3).

Policy in Erbil 2030 MP (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator	
		Score*	Comment		Integration**	Comment
[MP871-4] The careful conservation of buildings of special architectural or historic interest, in accordance with the proposed Grading, both within the Citadel and within the nearby Conservation Areas.	*Have buildings of special architectural or historic interest being conserved according to the Grading inside Citadel and nearby conservation areas?* *Has the proposed Grading system been reflected in any other subsequent plan?*	N/A	No information.	N/A	**N/A in MP TBS for Zoning Scheme Toolkit**	MP does not have leverages on this. Nevertheless, integration or not of conservation of buildings of special architectural or historic interest, in accordance with the proposed Grading into Erbil 2050 MP shall be more studied for integration in Zoning Scheme scope and toolkit.

Source: JICA Project Team

Note: (*) +++ Excellent implementation, ++ Average/Good implementation, + Fair implementation, **-** No implementation.

(**) **Complete**: Full integration to Erbil 2050 MP is recommended, **Partial**: Partial integration, **Discontinued**: No integration, **TBS**: Integration to be further studied.

(2) Golf Courses

The Tourism Projects of golf course development in Erbil 2030 MP are detailed in Table 3.4.10 below.

Table 3.4.10 Review of Tourism Projects (Golf Courses) in Erbil 2030 MP

Projects in Erbil 2030 MP (2006)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP	
	Score*	Comment		Integration**	Comment
5 Golf Resorts (districts 5/224, 6/24, 11/113, 13/303, 19/351) 1 Championship Golf Course (district 13/62)	**PI**	Until now, out of the 5 proposed Golf Resorts, one has started its implementation over 151 ha. The Championship Golf Course has been implemented.	In 2006, during the formulation of Erbil City MP, there was still an important economic growth and lots of foreign visitors / investors that may explain the need to provide golf courses (for businessmen). Nevertheless, the IS crisis from 2010 has damaged the stability of the KRG leading to lower attractivity for businessmen visiting Erbil. Thus, the need of having 6 courses only in Erbil seems not relevant anymore. Water scarcity has been worsened by climate change.	**Discontinued**	In the perspective of sustainable development, proposing golf courses, which are a very water-intensive recreation equipment in a context of water scarcity, has been discontinued in Erbil 2050 MP.

Source: JICA Project Team

Note: (*) **FI**: Fully implemented, **IO**: Implementation ongoing, **NI**: Not implemented, **PI**: Partially implemented not ongoing, **AB**: Abandoned.

(**) **Complete**: Full integration to Erbil 2050 MP is recommended, **Partial**: Partial integration, **Discontinued**: No integration, **TBS**: Integration to be further studied.

3.5 Review of Utilities Component Policies

3.5.1 Review of Water Resources Policies

(1) Review of Water Resources Policies in Erbil 2030 MP

Review of Water Resources Policies in Erbil 2030 MP is shown in Table 3.5.1 below.

Table 3.5.1 Review of Water Resources Policies in Erbil 2030 MP

Policy in Erbil 2030 MP (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring Score*		Changes in conditions (2006-2022)	Recommendation for Erbil MP Update Strategy & Indicator Integration**	
[MP911-1] The two water resources of Great Zab River and the proposed Mandawa Lake and Dam have been selected over other sources such as Lesser Zab River, Shiwa Sur and Naher Mazuran perennial rivers, Gomaspan Lake and Dam or proposed Bekhme Lake and Dam.	*In 2022, are the two major water resources selected Great Zab River and the proposed Mandawa Lake and Dam? (1/2: Great Zab River)*	+	In 2022, water resources of Erbil depend on the Great Zab River but also groundwater.	Water availability has decreased globally in Iraq and especially in Tigris River. Numerous dam construction projects in Iraq reduce water availability downstream.	**Discontinued**	Erbil 2050 MP will discontinue the proposition of increasing the dependence on the water resources on the Great Zab River. As the sustainable use of groundwater resources, recharge ponds, rainwater infiltration facilities, and methods of saving water should be promoted in the Erbil 2050 MP.
	(2/2: Mandawa Lake and Dam)	-	In 2022, construction of the Mandawa Dam has not started due to budget and resettlement issues.	N/A	**Partial**	Erbil 2050 MP proposes downsizing and dam site modification of the Mandawa Dam because it helps to protect the existing water intake facility (IFRAZ SYSTEM).It is preferable to reduce the size and to change the location of the dam proposed in Erbil 2030 MP.
	In 2022, are other minor water sources such as Lesser Zab River, Shiwa Sur and Naher Mazuran perennial rivers, Gomaspan Lake and Dam or proposed Bekhme Lake and Dam being operated? (1/2: Gomaspan Lake and Dam)	+++	In 2022, construction of the Gomaspan Lake and Dam is ongoing.	N/A	**Complete**	Erbil 2050 MP will promote the continuation of the Gomaspan Lake and Dam construction. It is intended for agriculture and groundwater recharge. RCC Dam. Water storage capacity is 75 million cubic meters.
	(2/2: Other minor water sources such as Lesser Zab River, Shiwa Sur and Naher Mazuran perennial rivers)	+++	In 2022, construction of the Shawger Dam is ongoing.	Six dams have been planned on the Lesser Zab River and its tributaries, but none have been constructed except for Shawger Dam.	**Complete**	Erbil 2050 MP proposes the construction of minor dams for irrigation, groundwater recharge, and flood control.

Source: JICA Project Team

Note: (*) +++ Excellent implementation, ++ Average/Good implementation, + Fair implementation, - No implementation

(**) **Complete**: Full integration to Erbil 2050 MP is recommended, **Partial**: Partial integration, **Discontinued**: No integration, **TBS**: Integration to be further studied

(2) Review of Water Resources Projects in Erbil 2030 MP

Review of Water Resources Projects in Erbil 2030 MP is shown in Table 3.5.2 below.

Table 3.5.2 Review of Water Resources Projects in Erbil 2030 MP

Project in Erbil 2030 MP (2006)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil MP Update Strategy & Indicator	
	Score*	Comment		Integration**	Comment
Lake 1	**NI**	Construction works of Lake 1 have not been implemented so far.	N/A	**Discontinued**	Erbil 2050 MP will discontinue the proposition of construction of Bekhme Lake (Lake 1) and dam.
Lake 2	**IO**	Construction works of Lake 2 are currently ongoing.	N/A	**Complete**	Erbil 2050 MP will integrate the latest design and specificities of Lake 2 that has been used for civil works as prerequisite of planning.
Lake 4	**NI**	The system of Lakes 4, 6 and 7, together with the Proposed Inner River (see Stormwater Management Section 3.5.3), has not been implemented so far due to the rapid urbanization on the RoW of both Lakes and Inner River projects.	The land planned as public domain or the RoW of Lakes 4, 6 and 7 has been urbanized by private entities. Consequently, no budget has been allocated and no plan for implementation has been made so far.	**Partial**	Erbil 2050 MP will pursue the proposition of Lake 4 as it is effective against flooding, but discontinue Lakes 6 and 7 due to the unavailability of lands, which have been urbanized, on the planned RoW.
Lake 6					
Lake 7					

Source: JICA Project Team

Note: (*) **FI**: Fully implemented, **IO**: Implementation ongoing, **NI**: Not implemented, **PI**: Partially implemented not ongoing, **AB**: Abandoned.

(**) **Complete**: Full integration to Erbil 2050 MP is recommended, **Partial**: Partial integration, **Discontinued**: No integration, **TBS**: Integration to be further studied

3.5.2 Review of Water Supply Policies

(1) General Review of the Approach of Water Supply in Erbil 2030 MP

- **Water Supply Planning Subdivision Zoning**: Based on topography, the study area of Erbil 2030 MP (2007) was divided into 24 subdivisions for water supply sector, but same subdivision zoning was not used in the Kurdistan Water Sector MP (2012), which is based on only 5 main supply areas considering pressure level and pressure zones;
- **Water Demand Calculation:** The water demand estimated in the Kurdistan Water Sector MP is 518,735 m^3/day in average and 720,279 m^3/day in peak day in 2035. Water demand is calculated the population projection multiplied by per capita water consumption. The population projection of Erbil 2030 MP in 2030 is about 3,200,000, while that of Kurdistan Water Sector MP in 2035 is 1,946,740. Average per capita consumption of Erbil 2030 MP is 400 lpcd, while that of Kurdistan Water Sector MP is 270 lpcd. The peak day demand is calculated using a factor of between 1.36 and 1.75, depending on the size of the supply area. Therefore, it is recommended to review the population projection as well as the per capita water consumption in Erbil 2050 MP.

(2) Review of Water Supply Policies

Review of Water Supply Policies in Erbil 2030 MP is shown in Table 3.5.3 below.

Table 3.5.3 Review of Water Supply Policies in Erbil 2030 MP

Policy in Erbil 2030 MP (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring Score*		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator Integration**	
[MP912-1] Maintain average domestic per capita water consumption rate of about 400 l/person/day.	*In 2022, has the average per capita water consumption rate been maintained at about 400 l/person/day?*	-	The "Kurdistan Water Sector Master Plan (2012)" uses 270 lpcd for average per capita water consumption to forecast water demand, and the EWSD has adopted these figures.	The Kurdistan Water Sector MP was developed in 2012.	**Partial**	Per capita water consumption will continue to be defined in the Erbil 2050 MP, but the same figures shall be used as for the water sector.
[MP912-2] Maintain average water consumption rate for other water usages, including administrative, commercial and industrial of about 100 l/person/day.	*In 2022, has the average water consumption rate for other water usages, including administrative, commercial and industrial been maintained at about 100 l/person/day?*	-	In the Water Sector MP, Administrative, Commercial and Industrial water has water demand forecasts at 10% of domestic water and the EWSD has also adopted these figures.	Same as above.	**Partial**	Average water consumption for administrative, commercial and industrial will continue to be defined in the Erbil 2050 MP, but the same figures shall be used as for the water sector.
[MP912-3] Continuous supply of water, 24 hours a day, 7 days a week	*In 2022, is the water supply continuous 24 hours a day, 7 days a week in all seasons on the whole MP Target Area?*	+	Erbil city center is supplied with a 24/7 water supply service, while other districts have hourly intermittent water supply.	N/A	**Complete**	The policy of continuous water supply for 24/7 shall be pursued in Erbil 2050 MP. Also, the service performance shall be improved with zoning system for the entire city to avoid losses, maintain pressure, quantity and demand control of the consumers.
[MP912-4] Water quality in accordance with World Health Organization standards	*In 2022, is the quality of drinking water is in accordance with World Health Organization standards?*	++	Normally, water supply from WTPs complies with WHO drinking water guidelines. However, when raw water quality deteriorates significantly, such as during intense rainstorms, WTPs are overloaded and water quality standard cannot be adhered to.	N/A	**Complete**	The policy of drinking water quality complying the WHO guidelines shall be pursued in Erbil 2050 MP.
[MP912-5] The maximum day demand = 1.5 x average water demand	*In 2022, is the maximum day demand = 1.5 x average water demand?*	-	In the water sector MP, the daily maximum demand is calculated using a daily peak factor of 1.36-1.75, depending on the service area, and the EWSD has also adopted these figures.	The Kurdistan Water Sector MP was developed in 2012.	**Partial**	The maximum daily demand will continue to be defined in the Erbil 2050 MP, but the figures shall be used as for the water sector.

Source: JICA Project Team

Note: lpcd: Liter per capita per day, EWSD: Erbil Water and Sewerage Directorate, WTP: Water treatment plant

(3) Review of Water Supply Projects Implementation

Review of Water Supply Projects in Erbil 2030 MP is shown in Table 3.5.4 below.

Table 3.5.4 Review of Water Supply Projects in Erbil 2030 MP

Projects in Erbil 2030 MP (2006)	Implementation Monitoring Score		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Integration	
Construction of 2 water treatment plants at two potential sites on the Great Zab River. *(The proposed*	**PI**	One WTP, Ifraz 3, was constructed in 2007 by USAID grant aid, and expanded in 2015 by JICA loan project (IQ-P11). Another WTP, Ifraz 4, is planned to be	The Water Sector MP, developed in 2012, has different population and water	**Partial**	One of the two WTPs proposed in the Erbil 2030 MP is still in the planning stage and has not yet been implemented, therefore needs to be included in the Erbil 2050 MP, although the location will change.

Projects in Erbil 2030 MP (2006)	Implementation Monitoring Score		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Integration	
total capacity of the two plants shall be equivalent to the estimated total water demand within the city, which is about 1 Million Cubic Meters per Day for the ultimate plan for development of the city by 2030)		constructed in a different location from the proposed in the Erbil 2030 MP. The planned total capacity is 720,000 m3 which covered the projected demand in 2035 in the Water Sector MP.	demand projections than the Erbil 2030 MP.		
Construction of 2 strategic reservoirs at high points within the city *(These reservoirs along with the existing 20,000m3 reservoir near Ringway 5 will be used to supply the water supply system within the expanded city)*	**PI**	The existing core reservoir, Dawajin reservoir, with 24,000m3 was extended to 74,000m3 by constructing additional 50,000m3 reservoir under the JICA loan project (IQ-P11). Yet no other strategic reservoirs have been constructed.	Same as above.	**TBS (Partial or discontinued)**	The two strategic reservoirs proposed in the Erbil 2030 MP were not included in the subsequently developed Water Sector MP 2012. Therefore, the water sector is not planning to implement the second strategic reservoir.
Construction of storage reservoirs at different locations within the city with capacities varying between 25,000m3/day and 75,000m3/day.	**NI**	Until 2022, none of storage reservoirs has been implemented at the proposed locations in the Erbil 2030 MP.	Same as above.	**TBS**	In addition to Dawajin reservoir, four storage reservoirs with capacities ranging from 20,000 m3 to 70,000 m3 were proposed in the Water Sector MP 2012. However, there has been no move towards implementation yet, and the future direction of the water sector shall be confirmed.
Expansion the capacity of the existing reservoirs within the city of Erbil to a total of 425,000m3/day. The storage capacity within each zone shall be based on the total estimated daily demand within the zone, whereby storage of one day demand will be allowed for.	**NI**	Unlike the proposal in Erbil 2030 MP, Water Sector MP 2012 does not propose to expand the capacity of the existing reservoirs, but to build booster pumping stations. Therefore, no expansion of the existing reservoirs has been implemented.	Same as above.	**TBS**	Many existing reservoirs are no longer in use due to the introduction of systems that pump water using pressure boosting pumps. It is to be ascertained from the water sector whether there are any plans to utilize these reservoirs by rehabilitating or expanding them in the future.
Construction of water transmission mains to supply the strategic reservoirs composed of pipes with diameters of about 1,200, 1,400mm and 1,500mm.	**PI**	Along with the construction of one of the two WTP mentioned above, water transmission pipes were constructed from the WTP to the Dawajin reservoir. Two transmission mains are installed in parallel with the diameters of 600mm and 1,500 mm.	Same as above.	**Partial**	The project is on hold as the construction of the Ifaz 4 WTP, which is currently in the design phase, will also require the laying of water transmission pipes, but the diameter will need to be 1,800mm, according to the Water Sector MP 2012.
Construction of an integrated water supply network within the city, the primary network will be composed of pipes with diameters ranging between 300 and 1,000mm.	**IO**	The construction of new distribution pipeline networks and the rehabilitation of existing networks are being implemented under the JICA Loan project (IQ-P11, IQ-P28) and the Kurdish Government budget.	Same as above.	**TBS**	Before determining the scope to be included in Erbil 2050 MP, it is necessary to understand the extent to which the distribution network proposed in the Water Sector MP 2012 has been implemented and the extent to which areas have not yet been implemented. It should be noted that the Water Sector is currently in the process of compiling GIS data on existing water supply facilities in Erbil, and as such, organized and up-to-date pipe network data is not available at this time.

Source: JICA Project Team

3.5.3 Review of Stormwater Drainage Policies

(1) Review of Stormwater Drainage Policies

Review of Stormwater Drainage Policies in Erbil 2030 MP is shown in Table 3.5.5 below.

Table 3.5.5 Review of Stormwater Drainage Policies in Erbil 2030 MP

Policy in Erbil 2030 MP (2006)	*Evaluative question* (2022)	Implementation Monitoring Score		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator Integration	
[MP913-1] Construction of side-road ditches/gutters and channels or a pipe network with drainage gullies.	*Between 2007 and 2022, have side-road ditches/gutters and channels or pipe network with drainage gullies been constructed alongside roads?*	+	Construction is underway on a part of Barzany Namr Road. Other than this, it has not been completed.	Between 2006 and 2022, rainfall events have become more intense and unpredictable due to climate change, making stormwater drainage even more important.	**Complete**	Erbil 2050 MP will pursue the stormwater drainage policy of construction of side-road ditches/ gutters and channels or a pipe network with drainage gullies.
[MP913-2] Existing stormwater drainage system should be expanded to all primary and secondary roads in the city.	*Between 2007 and 2022, has the stormwater drainage system been expanded to all primary and secondary roads in the city?*	-	The storm drainage system has not been extended to all major and secondary roads in the city.		**Complete**	Erbil 2050 MP will pursue the policy of expansion of stormwater drainage system to all primary and secondary roads in the city.
[MP913-3] Expansion of the stormwater drainage system to the proposed new development areas within the city.	*Between 2007 and 2022, has the stormwater drainage system expanded to the proposed new development areas within the city?*	-	The storm drainage system has not been extended to the proposed new development areas. Plans appear to be underway.	More than half of newly developed residential area in this period are individual housing, which make stormwater drainage of urban plans important.	**Complete**	Erbil 2050 MP will pursue the policy of expansion of the stormwater drainage system to the proposed new development areas within the city.
[MP913-4] It is essential that Detailed Plans maintain and preserve the areas where natural wadis flow. Future plans of development should include the provision of training schemes for these wadis, and if for any reason construction is to be done within the flood plains of these wadis, the minimum width required for the natural flow of stormwater along the wadis should be safeguarded.	*Between 2007 and 2022, have urbanization and detailed urban development plans maintained the areas where natural wadis flow?*	-	Most of approved Detailed Plans from 2007 until 2022 did not study natural river beds and did not required the preservation of natural wadis flow.	In recent years, floods in Erbil have increased, especially due to the chaotic nature of urban development patterns in city outskirts, making the consideration of stormwater drainage absolutely necessary in all planning and design works.	**Complete**	The preservation of areas where natural wadis are flowing as well as flood plains of those wadis shall be considered primarily in Erbil 2050 MP but shall also receive a special attention through the improvement of Detailed Plans / Zoning Scheme approaches and tools to be detailed in the Pilot of the Project.

Source: JICA Project Team

(2) Review of Stormwater Drainage Projects Implementation

Review of Stormwater Drainage Projects in Erbil 2030 MP is shown in Table 3.5.6 below.

Table 3.5.6 Review of Stormwater Drainage Projects in Erbil 2030 MP

Projects in Erbil 2030 MP (2006)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP	
	Score			Integration	
Proposed External Flooding Channel	**NI**	Plans are existing but construction has not started.	Between 2006 and 2022, no specific design plans have been drafted for both External Flooding Channel and Inner Rivers. Multiple departments are working together to review the plans. However, the design and construction methods mentioned in the plans are not based on Erbil 2030 MP. The course to the problem is not only in the limited budget but also in the lack of scientific analysis of countermeasures.	**TBS**	Integration or not of proposed External Flooding Channel and Inner Rivers into Erbil 2050 MP shall be more studied. Citizens and public authorities have pointed out inadequacies in the government's flood control master plan. As a result of deepening discussions with the government, this project (EMP) is required to extract dangerous areas by simulation and propose economic countermeasures. JPT's proposal for flood control and the plan of the Kurdistan Government is almost the same, so the Kurdistan Government request to continue the discussion and support JPT.
Proposed Inner Rivers	**NI**	Plans are existing but construction has not started.		**TBS**	

Source: JICA Project Team

3.5.4 Review of Wastewater Policies

(1) General Review of the Approach of Wastewater in Erbil 2030 MP

- **Daily Wastewater Flow Estimation:** The average (maximum) daily wastewater flow estimated in the Sewerage MP for Erbil City is 840,000m3/day in 2035. The generated wastewater is calculated the population projection 2,400,000 in 2035 multiplied by per capita wastewater flow (daily maximum) of 350 lpcd. The calculation base of the Erbil 2030 MP is not defined;
- **General Wastewater Treatment Model:** The policy of developing the decentralized wastewater treatment schemes proposed by Erbil 2030 MP is not consistent with the policy of centralized wastewater treatment system proposed by Sewerage MP for Erbil City. Therefore, Wastewater Policies need to be reviewed in Erbil 2050 MP.

(2) Review of Wastewater Policies in Erbil 2030 MP

Review of Wastewater Policies in Erbil 2030 MP is shown in Table 3.5.7 below.

Table 3.5.7 Review of Wastewater Policies in Erbil 2030 MP

Policy in Erbil 2030 MP (2006)	*Evaluative question*	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator	
		Score			Integration	
[MP914-1] Collection of wastewater, combined grey and black water, from all residential and commercial developments by means of a wastewater collection network that discharges at a local wastewater treatment plant, i.e. a decentralized	*In 2022, to what extend wastewater, combined grey and black water, from all residential and commercial developments by means of a wastewater collection network that discharges at a local*	-	A wastewater treatment plant (WWTP) and sewerage pipes are designed and to be constructed under JICA Loan project (IQ-P23) covering the south-west area of Erbil suffering poorest sanitary condition in the city. In other areas of Erbil City, proper wastewater collection and treatment system is not implemented except inside the	Sewerage MP for Erbil City was formulated in 2007. JICA Sewerage project is ongoing at the tender stage.	**Partial**	The policy of development of decentralized wastewater treatment schemes proposed in the Erbil 2030 MP is not consistent with the policy of centralized wastewater treatment system outlined by the Sewerage MP for Erbil City. However, the policy of decentralized system will be partially included in the Erbil MP Update, as the centralized systems will cover the area of inside the Ring Road 8 (120m

Policy in Erbil 2030 MP (2006)	*Evaluative question*	Implementation Monitoring Score		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator Integration	
wastewater treatment scheme, whereby the effluent is treated to quality levels for re-use.	*wastewater treatment plant is collected and treated?*		investment residential areas. The investment residential areas are obliged to have separate sanitation and/or sewage treatment facilities attached to each of them, so that wastewater is properly collected within the area.			Ring Road), but the areas outside it will need to be covered by decentralized schemes.
[MP914-2] Collection of wastewater from the industrial areas separately, with pre-treatment utility for each industry or by connecting the industrial wastewater to the network with two centralized pre-treatment utilities on both sides of the city.	*In 2022, to what extend industrial wastewater is collected and treated?*	+	Pre-treatment of industrial effluent at the respective factories has become mandatory according to the regulations. Besides the construction of two centralized factory effluent pre-treatment facilities is not included in the plan proposed by the Sewerage MP for Erbil City.	Sewerage MP for Erbil City was formulated in 2007. Regulations have been enacted to make pre-treatment of industrial effluents mandatory.	**Partial**	Compliance with regulations and its monitoring shall be included in the MP Update to ensure that pre-treatment of industrial wastewater is carried out at each factory and that no industrial wastewater is discharged into the environment.
[MP914-3] Re-use of the treated sewage effluent for landscape irrigation in open areas and roads.	*Between 2006 and 2022, has the treated sewage effluent been re-used for landscape irrigation in open areas and roads?*	−	As of 2022, there are no wastewater treatment plant in Erbil city and treated sewage is not reused. In addition, the ongoing JICA project (IQ-P23) will not include any facilities that will enable the reuse of treated sewage effluent for irrigation, with only a proposal to add sand filtration facilities in the future to improve water quality to a reusable level.		**Complete**	Treated sewage is a valuable water resource in the Erbil where rainfall is very low, and is identified in the future plan as irrigation water for the Green Belt, as planned in the city's Green Belt MP. Therefore, this policy shall be included in the Erbil MP Update.

Source: JICA Project Team

(3) Review of Wastewater Projects in Erbil 2030 MP

Review of Wastewater Projects in Erbil 2030 MP is shown in Table 3.5.8 below.

Table 3.5.8 Review of Wastewater Projects in Erbil 2030 MP

Projects in Erbil 2030 MP	Implementation Monitoring Score		Changes in conditions	Recommendation for Erbil 2050 MP Integration	
Wastewater treatment plants 1 to 19	**NI**	The Sewerage MP for Erbil City developed by the sewerage sector does not plan for 19 decentralized sewage treatment plants, but proposes the construction of one centralized sewage treatment plant. In line with this, one centralized sewage treatment plant is currently under implementation under the JICA Sewerage project (IQ-P23).	Sewerage MP for Erbil City was formulated in 2007. JICA Sewerage project is ongoing at the tender stage.	**TBS**	As the centralized system will cover only inside the RW 8, it is desirable to implement decentralized wastewater treatment schemes outside the RW 8. Therefore, the appropriateness of the decentralized facilities proposed in the Erbil 2030 MP shall be studied before determining whether the plan would be included in the Erbil 2050 MP.
Wastewater collection system 200 mm to 1600 mm pipes	**NI**	As MPs with different philosophy were developed in the sewerage sector, the wastewater collection system as proposed in the Erbil 2030 MP has not been implemented.	Same as above	**TBS**	

Source: JICA Project Team

3.5.5 Review of Solid Waste Management Policies

(1) General Review of the Approach of Solid Waste Management in Erbil 2030 MP

Solid Waste Quantities and Generation Rates Estimate: The estimated domestic solid waste generation of Erbil 2030 MP is 3,250 tons/day in 2030, while the estimated domestic solid waste generation based on the waste characterization study conducted in 2020 by SWM sector is about 2,500 tons/day in 2030. Therefore, the estimated solid waste quantity and generation rate shall be revised for Erbil 2050 MP.

(2) Review of Solid Waste Management Policies in Erbil 2030 MP

Review of Solid Waste Management Policies in Erbil 2030 MP is shown in Table 3.5.9 below.

Table 3.5.9 Review of Solid Waste Management Policies in Erbil 2030 MP

Policy in Erbil 2030 MP (2006)	*Evaluative question*	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator	
		Score*	Comment		Integration**	Comment
[MP92-1] Conducting a city-wide waste characterization study.	*Between 2007 and 2022, has a city-wide waste characterization study been carried out?*	++	A waste characterization study was conducted in 2020 by the SWM sector (Directorate of Services and Environmental Protection under Erbil Municipality Presidency).	Erbil Waste Management MP was prepared with UNICEF support in 2011 but is not used in the waste sector.	**TBS**	Waste characterization study has been conducted, but does not capture industrial, medical, agricultural, hazardous waste or seasonal variations. Further studies are needed.
[MP92-2] Encouraging waste minimization and source separation through community awareness campaigns, as well as other socio-economic incentives.	*Between 2007 and 2022, has waste minimization and source separation been encouraged through community awareness campaigns, as well as other socio-economic incentives?*	-	Community awareness campaigns encouraging the waste minimization and segregation are not conducted by governmental organization.		**Complete**	This policy of promoting the waste minimization and source separation shall be pursued in the Erbil 2050 MP.
[MP92-3] Incorporating sorting and recycling activities.	*In 2022, is sorting and recycling of solid waste water implemented?*	-	No sorting and recycling of solid waste were implemented.		**Complete**	This policy of sorting and recycling of solid waste shall be pursued in the Erbil 2050 MP.
[MP92-4] Treatment of wastes by a combination of sanitary landfill, incineration and composting, for different waste types: industrial, medical and agricultural.	*In 2022, is the solid waste treated by a combination of sanitary landfill, incineration and composting for the different waste types: industrial, medical and agricultural?*	-	Treatment of solid waste is only landfill. There is not incineration nor composting for different waste. Neither no separation of industrial, medical and agricultural waste.		**Complete**	This policy of treatment of waste by combination of landfill, incineration and compositing shall be pursued in the Erbil 2050 MP. The lands for such facilities shall be secured.
[MP92-5] Disposal of remaining wastes in sanitary landfills.	*In 2022, are remaining wastes disposed in sanitary landfills?*	+	As there is no other treatment facilities in Erbil, all the solid waste collected from the city is disposed at landfill site.		**Complete**	This policy of disposal of remaining waste in sanitary landfills shall be pursued in the Erbil 2050 MP. The lands for such facilities shall be secured.

Source: JICA Project Team

(3) Review of Solid Waste Management Projects in Erbil 2030 MP

Review of Solid Waste Management Projects in Erbil 2030 MP is shown in Table 3.5.10 below.

Table 3.5.10 Review of Wastewater Projects in Erbil 2030 MP

Projects in Erbil 2030 MP (2006)	Implementation Monitoring Score		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Integration	
4 Solid waste transfer facilities (One transfer station of 1 ha will serve the Northern Hills City; another station of 3 ha will serve Arat Industrial City and two transfer stations of 6 ha each for the reminder of the city, one serving the northern part, the other serving the southern part.)	**NI**	Until 2022, none of the 4 solid waste transfer facilities has been implemented as proposed in the Erbil 2030 MP.	Since 2006, the amount of generated construction waste has rapidly increased, due to the development of real estate and other projects by foreign investment, while the construction industry has flourished. In addition, the uncontrolled distribution of real estate has led to the construction of residential complexes on vacant land in the suburbs, making it more difficult to secure solid waste management facilities, for which consideration for the surrounding residents is essential.	**TBS**	SWM sector doesn't have clear vision of implementation of the solid waste transfer facilities. Further study shall be carried out on the proposed and planned land availability, while plans for solid waste facilities will need to be considered by the SWM sector.
1 Metal Recovery Facility which accepts the entire non-hazardous mixed waste (about 4,740 Tonnes/day) and will process the waste into recyclables and organic material for composting. The area required for this facility is around 12 ha (based on a figure of 285 ft2/Tonnes/day2).	**NI**	A project of a recycling factory was planned and even tendered by the Kurdistan Government, but is now pending after two unsuccessful tenders.		**TBS**	Details of the proposed Metal Recovery Factory shall be obtained, the amount of waste that can be processed there and the adequacy of the land area required shall be studied and, if necessary, additional or alternative proposals should be included in the Erbil 2050 MP.
1 Composting Plant of 20 ha, calculated by taking 40% of the municipal waste stream (or 1,415 Tonnes/day) and a figure of 1 ha; per 100 Tonnes/day.	**NI**	It is reported that a composting plant is included in the above recycling factory project, but no designs have been obtained and no details are available.		**TBS**	Details of the plans for the composting plant shall also be obtained. Details of the plans for the composting plant should also be obtained. Also, as the dried sludge generated from the wastewater treatment plant will be brought in as solid waste, it is necessary to check whether the capacity and land area is sufficient to accommodate this.
1 Hazardous Waste Treatment Facility with an area of 3 ha.	**NI**	Hazardous waste treatment facilities are installed in large hospitals under the technical advice of the Ministry of Health. However, the hazardous waste generated small hospitals and clinics are collected with general solid waste, so no hazardous waste treatment has been implemented by the SWM sector.	Since 2020, the COVID-19 pandemic has led to a rapid increase in the amount of medical waste generated, with a large amount of hazardous waste such as vaccines, laboratory reagents and needles being used in the hospitals and clinics. However, due to the absence of hazardous waste treatment facilities, the current situation of hazardous waste being disposed of in landfills together with general waste raises concerns about the impact on the environment and the health of the population in the vicinity.	**TBS**	Medical waste is under the jurisdiction of the Ministry of Health and its handling will be considered the policy of the Ministry of Health. Other hazardous wastes are under the responsibility of the SWM sector, and the required land area and location should be studied to ensure that the proposal made in the Erbil 2030 MP is acceptable.
1 landfill area of 110 ha.	**NI**	A potential site for a new landfill site was proposed in the west side of Erbil and a survey carried out, but the plan was cancelled due to strong resistance from the neighboring community.		**TBS**	Proposing and securing a new landfill site is an urgent task for both urban planning sector and SWM sector. The adequacy and availability of the land area proposed in the Erbil 2030 MP needs to be studied. Alternative sites also shall be identified.

Source: JICA Project Team

3.5.6 Review of Electricity Policies

(1) General Review of the Approach of Electricity in Erbil 2030 MP

- The **Development/Update of the Transmission and Distribution Master Plan** for the KRG MOE was formulated in September, 2022. In this master plan, a transmission and distribution development plan has been formulated. The Erbil 2030 MP will need to be modified in accordance with the Transmission and Distribution Master Plan. The Transmission and Distribution Master Plan does not cover the 11kV distribution network, therefore the 11kV distribution development plan will need to be updated based on the current context and the development plan of Erbil City. Erbil 2050 MP will be developed considering that the scope is limited to the 400 and 132 kV transmission networks and the 33kV sub-transmission/distribution networks to the level of the 33kV and 11kV busbars in the respective substations;
- **Maximum demand** was roughly estimated by population and Watt per capita of neighboring countries such as Iran and Lebanon in the Erbil 2030 MP. In the Transmission and Distribution Master Plan, the maximum demand is calculated using a multiple linear regression model with temporal variability. According to this method, electricity demand growth is related to certain specific economic variables such as GDP, income per capita and population growth, among others. The maximum demand forecast is more accurate than the one for the Erbil 2030 MP. For the Erbil 2050 MP, the maximum demand forecast is updated by using the value of the Transmission and Distribution Master Plan. According to the Transmission and Distribution Master Plan, the supplied power demand is 1,073 MW in 2022, but the potential peak demand (real peak demand) including suppressed demand, is 1,534 MW. The supplied power demand will meet real peak demand in 2027. Therefore, to obtain the supplied demand at the supply point, a gradual reduction of load shedding is applied during the 5 years until 2027. The estimated maximum demand in 2020 of Erbil 2030 MP was 1,270 MW which is lower than the real peak demand of 1,534 MW in 2022. Hence, the power demand needs to be revised. The demand of each district in Erbil city will be further examined in the future study considering the development plan.

(2) Review of Electricity Policies in Erbil 2030 MP

Review of Electricity Policies in Erbil 2030 MP is shown in Table 3.5.11 below.

Table 3.5.11 Review of Electricity Policies in Erbil 2030 MP

Policy in Erbil 2030 MP (2006)	*Evaluative question*	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator	
		Score			Integration	
[MP932-1] The development of Erbil necessitates the initiation of major electricity generation and distribution projects both at the regional Kurdistan level and the local Erbil City level.	*Between 2007 and 2022, have major electricity generation and distribution projects both at the regional Kurdistan level and the local Erbil City level been sufficiently implemented?*	+	Capacity is increased but does not meet potential peak demand.	The power demand grew higher than estimated.	**Partial**	Development plan needs to be revised.
[MP932-2] The projects related to the generation sector are of critical importance and they are interlinked with the national strategies of Iraq as a whole.	*How Iraqi national strategies of power generation has influenced electricity sector in KRG and Erbil?*	++	From 2017, no power has been imported from Iraq and import is not expected in future.	KRG does not plan to import electricity as a policy.	**Discontinued**	KRG does not plan to import electricity as a policy.

Policy in Erbil 2030 MP (2006)	*Evaluative question*	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator	
		Score			Integration	
[MP932-3] The expansion of the 400 kV network will not only improve reliability of supply to Kurdistan, but it will also facilitate transfer of energy in the opposite direction, and allow other regions to benefit from Kurdistan's surplus power when available.	*Between 2007 and 2022, has the reliability of power supply of KRG improved? Is the strategy of exporting power to other regions realistic and on which basis?*	+	Construction of the 400kV network connected with the three regions of the KRG has not been completed.	The power demand grew higher than estimated.	**Partial**	Exporting power to other regions will be considered in the long-term plan.
[MP932-4] The development of Erbil City necessitates the expansion of the 132, 33, 11, and 0.4 kV networks. Exact locations for new routes should be within Ringway and Radial Road Rights of Ways, and put underground for visual and security of supply reasons.	*Between 2007 and 2022, have the necessary expansion of the 132, 33, 11, and 0.4 kV networks been developed?*	+	The expansion of the 132, 33, 11, and 0.4 kV networks is ongoing. The detail will be studied.	The power demand grew higher than estimated.	**Partial**	The development plan will be updated to meet the updated demand.
[MP932-5] All electricity cables should eventually be underground within the city, within the proposed national parks, where they have or would have a major visual impact on the national parks, and alongside prestige routes.	*Between 2007 and 2022, have electricity cables been buried underground in key areas?*		The newly installed 33kV lines in the center of Erbil are mainly underground cables.	Strengthening of the power supply system is more important than undergroundi ng cables.	**Partial**	Undergrounding the cables will be implemented, but the improvement of capacity of power supply is high priority than undergrounding the cables.
[MP932-6] All existing overhead distribution cables should, over time, be put underground. Priority should be given to the City Centre.	*Between 2007 and 2022, have all existing overhead distribution cables been put underground in the City Centre?*		The newly installed 33kV lines in the center of Erbil are mainly underground cables.	Strengthening of the power supply system is more important than undergroundi ng cables.	**Partial**	Undergrounding the cables will be implemented, but the improvement of capacity of power supply is high priority than undergrounding the cables.
[MP932-7] The existing 100-meter reserve corridors below overhead 132 kV transmission lines can be used for agricultural purposes, and should not be left as vacant land. Once these overhead lines are underground, local plans should be reviewed to determine the most appropriate use of land for the former reserve corridors.	*Have the existing 100-meter reserve corridors overhead 132 kV transmission lines been used for agricultural purposes?*		Some part has used for agricultural purposes.	According to the new regulations, the 100-meter distance has been reduced to 30 meters, with 15 meters extending from the center to each side.	**Partial**	The target area needs to adjust to the urban development plan.

Source: JICA Project Team

(3) Review of Electricity Projects in Erbil 2030 MP

Review of Electricity Projects in Erbil 2030 MP is shown in Table 3.5.12 below.

Table 3.5.12 Review of Electricity Projects in Erbil 2030 MP

Projects in Erbil 2030 MP (2006)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP	
	Score			Integration	
Construction of Pir Dawood 450 MW & Qaretagh 200 MW gas fired power plants (MoE)	**AB**	Implementation is aborded.	Not included in the Transmission and Distribution Master Plan.	**Discontinued**	-
Expansion of the 400 kV backbone transmission system (MoE)	**IO**	Erbil and Sulaymaniyah are connected.	N/A	**Partial**	Need to complete the 400 kV network
Construction of 400/132 kV substations in Duhok, Erbil and Sulaymaniyah	**IO**	The 400 kV substations in Erbil Center and Sulaymaniyah have been	N/A	**Partial**	Need to complete the 400 kV network

Projects in Erbil 2030 MP (2006)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP	
	Score			Integration	
		installed, but they are not yet connected.			
Expansion of the 132 kV transmission system (MoE)	**IO**	Koya and Soran substations have been constructed.	In the Transmission and Distribution Master Plan, construction of the 230 kV network is recommended.	**Partial**	Development plan needs to be revised.
Construction of 132/33 kV substations in Koya, Soran, Sirin and Sumeh	**IO**	Koya and Soran substation has been constructed.	In the Transmission and Distribution Master Plan, construction of the 230 kV network is recommended.	**Partial**	The development plan needs to be revised.
Expansion of the distribution system	**IO**	33kV and 11kV network is expanded.	N/A	**Partial**	The development plan needs to be revised.
Construction of 132/33 kV substations in Northern Hills, Eastern Hills and Industrial Cities (Erbil MP)	**IO**	Baharka substation for Northern Hills and Kaznasan substation for Eastern Hills have been constructed. Detail will be checked.	To be studied In the Transmission and Distribution Master Plan, construction of the 230 kV network is recommended.	**Partial**	The development plan needs to be revised.
Construction of 132/33 kV GIS (Gas Insulated Switchgear) substation for the City Centre (Erbil MP)	**FI**	Nishtiman substation has been constructed.	N/A	**Compete**	-
Construction of 132 kV line around Ringway 13 (Erbil MP)	**IO**	132 kV lines has been constructed.	Existing 132kV network is a little different which was planned.	**Partial**	The development plan needs to be revised.

Source: JICA Project Team

3.5.7 Review of Telecommunications Policies

(1) General review of the approach of Telecommunications in Erbil 2030 MP

The previous MP (Erbil 2030 MP), prepared in 2007, mentioned the plan for updates and renovations to the Exchange Buildings, Switching Network, Transmission Network, Broadband and Internet Connectivity, and Distribution Network. JICA Project Team has confirmed the following conditions regarding the telecommunications sector as of 2023, which differ from the assumptions made when the above goals were developed in the Erbil 2030 MP.

(a) Copper lines for telecommunications are not being used.

(b) With the increase in the number of cell phone users, Internet access using this network is becoming more common.

(c) The KRG government has already installed its own fiber-optic backbone network.

Erbil 2030 MP is planned based on the assumption of copper wire communications, and this assumption needs to be changed to fiber optic lines in Erbil 2050 MP. In addition, as of 2023, voice communications that have been carried out on the land line have been replaced mainly by calls using cell phones. The situation is similar for access to Internet services, which have shifted from the previously PC-based to the mobile phone based. Based on the current situation described above, it is necessary to consider “optical fiber network” and “mobile phone network” when setting design criteria.

Although it would not be appropriate for the MP to make the realization of telecommunications technology or the completion of telecommunications facilities a major goal, the telecommunications sector part of the Erbil 2030 MP is mainly concerned with the description of telecommunications facilities and capacity. Therefore, the Team is considering including in the telecommunications sector part of the Erbil 2050 MP more plans related to telecommunications facilities and telecommunications technology that are necessary to realize the goals and projects set in other sectors.

(2) Review of Telecommunications Policies in Erbil 2030 MP

Review of Telecommunications Policies in Erbil 2030 MP is shown in Table 3.5.13 below.

Table 3.5.13 Review of Telecommunications Policies in Erbil 2030 MP

Policy in Erbil 2030 MP (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator	
		Score			Integration	
[MP94-1] The rehabilitation of old exchange buildings, and the construction of new and larger exchange buildings, to house modern state-of-the-art telecommunications facilities that would solve existing network problems.	*Between 2007 and 2022, have old exchange building been rehabilitated and new and larger exchange buildings been constructed?*	-	The information was not disclosed due to an agreement signed between the central government and telecommunications companies.	N/A	**Partial**	It should be included in MP, however there is no information.
[MP94-2] Upgrading or replacing existing switches, and installation of new switches in the new exchange buildings. The upgrade/ replacement/new installations shall include all support equipment and material such as transmission facilities, fiber optic cable network, distribution frames, backup power, and air conditioning.	*Between 2007 and 2022, have existing switches been upgraded or replaced, and new switches in the new exchange buildings been installed?*	++	Ditto	Backbone fiber optic network is almost completed.	**Partial**	Reinforcing and upgrading of the network may be necessary.
[MP94-3] Replacing the existing old OSP distribution network with a new network, and implementing a new OSP network in the new planned development areas, that are able to provide the required telephone line capacity, and which should cater for future expansion. This necessitates the provision of reservations of underground utility corridors for this network, and requires close co-ordination with the various infrastructure services (roads, power, water, sewage).	*Between 2007 and 2022, has existing old OSP distribution network been replaced with a new network, and has a new OSP network been implemented in the new planned development areas?*	++	Ditto	Backbone fiber optic network is almost completed.	**Partial**	There is a need to introduce shared infrastructure such as public trench and common power supply that can be used by public institutions and telecommunication providers.
[MP94-4] Engage in the implementation and delivery of international call connectivity and high-speed broadband services to existing and future subscribers.	*Between 2007 and 2022, has international call connectivity and high-speed broadband services been delivered to existing and future subscribers?*	++	Ditto	Internet services have made overseas communications possible, and international calls have become less important.	**Discontinued**	High-speed broadband services are installed and provided by the existing infrastructure as of 2023.
[MP94-5] Establish a	*In 2022, has a spare*	-	-	Not suitable for	**Discontinued**	Not suitable for

Policy in Erbil 2030 MP (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil 2050 MP Strategy & Indicator	
		Score			Integration	
spare parts pool necessary for the operation and maintenance of the telecommunications networks.	*parts pool necessary for the operation and maintenance of the telecommunications networks been established?*			the content of MP.		the content of MP.
[MP94-6] Implementation of a comprehensive qualification and training programme for engineers and technicians within the Directorate of Post and Telecommunications of Erbil, and the engagement of new properly skilled and competent trained engineers and technicians.	*Between 2007 and 2022, has a comprehensive qualification and training programme for engineers and technicians within the Directorate of Post and Telecommunications of Erbil, and the engagement of new properly skilled and competent trained engineers and technicians been implemented?*	-	No information was disclosed.	N/A	**Partial**	The operation and maintenance of the fiber optic network is outsourced to the private sector and may not require training for the Ministry's technicians.
[MP94-7] Equip the operation and maintenance teams with advanced equipment, tools, accessories, and transport which would allow them to efficiently address the requirements of the telecommunications networks and subscriber demands.	*In 2022, have operation and maintenance teams been equipped with advanced equipment, tools, accessories, and transport?*	-	No information was disclosed.	N/A	**Partial**	The operation and maintenance of the fiber optic network is outsourced to a private company, which may not need to own equipment at the MOTAC.
[MP94-8] A total of 21 new exchanges and 7 remote exchange units are required, in addition to the existing 6 exchanges, in order to provide telecommunications services for the future city population of 2.5 million.	*In 2022, has a total of 21 new exchanges and 7 remote exchange units been constructed?*	-	The information was not disclosed due to an agreement signed between the central government and telecommunications companies.	N/A	**Partial**	It is considered necessary to make changes to the indicators related to capacity of fiber optic networks and mobile phone networks.

Source: JICA Project Team

3.6 Review of Implementation Strategy

Erbil 2030 MP provides an Implementation Strategy, which describes roughly (1) government investment phasing, (2) efforts towards competitiveness, (3) further urban plans to be formulated and (4) necessity for MP monitoring, which are explained below.

1) **Government investment phasing**: in this section, general recommendations are made regarding the ownership (public & private) and phasing of implementation of MP propositions, but no implementation phasing schedule (short, medium, long terms) is proposed;
2) **Competitiveness**: in this section, general recommendations are made to ensure attractivity of private investments in urban development sector in KRI;
3) **Urban Planning Functions**: this section suggests, in order to foster the implementation of the MP by more detailed type of planning documents, the formulation of 47 Local Plans and more than 50 Subject Plans. None of those documents have been formulated to time;
4) **Monitoring**: this section suggests the importance of monitoring the implementation of the MP through the establishment of a GIS-based system (see Section 3.8.2, Table 3.8.4).

3.7 Review of Regulatory Framework

The regulatory framework as general guidance to implement Erbil 2030 MP was described including the strategic zoning, land use classes, development density, and an example of the zoning plan in the City Center of Erbil case. Following Iraqi legislation, the building regulations were introduced as an interim planning regulation for the KRI as an upper framework for the regulatory framework described the urban planning function by "Development Control" and "Development Promotion" to be promoted. The lack of Local Plans as a binding plan with development control was pointed out, and certain Subject Plans for sectoral project implementation were defined and proposed as development promotion tools.

3.7.1 Review of Strategic Zoning & Land Use Classes

In Erbil 2030 MP, there are two frameworks for land use classes: strategic zoning and land use classes. The classes of Strategic Zoning are mostly aligned with Proposed Land Use Layout, 2030 and specified for the area outside of municipalities. On the other hand, there is no information identifying locations of land use classes. It is also different from the classes of the proposed land use (2030) by sector that covers the proposed land use classes for area within 120m ring road.

(1) Strategic zoning

Strategic zoning shows 12 major land use categories, and seven of which are for logistics and industries usage (international trade complex/global transport, light industry, medium industry, agro-industry, petrochemicals and the potential polluters, heavy industries, very noisy uses). This suggests that this classification reflects the long-term vision statement of Erbil 2030 MP, which emphasizes economic growth.

(2) Land use classes

Erbil 2030 MP establishes 20 land use categories for regulatory framework, which are different from proposed land use (2030) by sector. To integrate land use classes on map with regulatory framework for Erbil 2050 MP, a comparative discussion of the two is presented in the following bullet points.

- Land use classes for regulatory framework are merged among several proposed land use classes. For example, residential institution is a combined class of Institutional – Health, Social, Governmental, Education and residential.

- Some classes of regulatory framework are described in more detail while others are less well described. For example, one of the proposed land use classes is Commercial, but there are three relevant classes in regulatory framework: shops and financial, professional and other services, sale of food and drink, business.

(3) Proposition on reorganization of land use classes and strategic zoning

Erbil 2030 MP has two different land use classes at two scales and two regulatory frameworks. It is unclear that the background on how strategic zoning and land use classes were classified into two different classes at different scales. To promote and monitor implementation of master plan, land use classes in regulatory framework needs a clear consistency with land use classes, and the locations also needs clearly indicated.

In addition, master plan is a conceptual spatial plan and has no regulatory framework. Detailed plan has a regulatory framework called zoning including Floor Area Ratio (FAR) and Parcel Coverage (PC) etc. Based on land use classes of master plan, zoning code of detailed plan needs to be defined and keep consistent with master plan at upper spatial level. Zoning ordinance differs from country to country and generally defined based on size and land use classes. Regulatory framework may need reconsideration for reclassification based on the direction of development control.

3.7.2 Review on Density, Zoning Plans & Planning Applications

(1) The instrument for density development

Section 11. 3 describes the framework development density introducing the basic tools for density control by “floor area ratio”, “parcel coverage ratio”, “building height”, “building line” and “setback”. These tools were just described as principles without actual quantitative measures. Some of these tools have been stipulated not only in the Iraqi legislations from the 1980s to 2010s but also in the KRI legislations such as laws, resolutions, and instructions of the 2010s, of which the concept and method are defined as common tools internationally.

Table 3.7.1 Introductory Instrument for Controlling Development Density

Regulatory Instrument Category	Tools for Density	Description (explanatory note without quantitative indications)
Development Density	Floor Area Ratio (FAR)	Ratio by the total floor areas of buildings and structures on a given land parcel (lot)
	Parcel Coverage (PC)	This is relevant to Building Cover Ratio (BCR) by the total floor areas only on the ground level on a given land parcel
	Building Height	The height was defined by its measurement in the situation of the building, although the actual height is not shown.
	Building Line	In conjunction with the setback, the way of measurement for the building line was defined.
	Setback	The way of the setback by 60% of the building length (horizontal) was guided as a mandatory tool of urban forms.
	General provision	Apart from the above tools, other regulations for the utility network, mechanical equipment of the building, etc were defined.

Source: JICA Project Team

(2) An example of a zoning plan in the case of the City Center Zoning

Section 11.4 describes an example of a zoning plan applied to the City Center involving the Erbil Citadel as a world heritage in Erbil City. There is no section describing the details of zoning, although one drawing of the City Center Zoning Plan was drafted, where eight (8) zoning classifications in association with the instrument above-mentioned and parking were defined. This zoning covers the area similar to the Buffer Zone A proposed by an UNESCO study carried out by the Italian company A.R.S Progetti three years after (2011) the approval of Erbil 2030 MP. Table 3.7.2 shows the comparison of building

height between this zoning plan and the UNESCO plan[2]. Although this zoning is an example, the proposed heights of buildings in each zone seem to have been set without strong consideration of historical environment harmonization.

Table 3.7.2 Comparison of Building Height stipulated in Zoning Plan and UNESCO Buffer Zone

Proposed Zone		Building Height (maximum)	
Category	Classification	City Center Zone	UNESCO Buffer Zone
Residential	R1	7 m	8 m / 12 m (partially)
	R2	15 m	12 m / 15 m
Mixed Use	CR1	15 m	Not developed area / 8 m / 12 m / 15 m
Commercial	C1	22 m	8 m / 12 m
	C2	30 m	8 m / 12 m / 15 m
	C3	60 m	Not developed area /12 m / 15 m

Source: JICA Project Team

(3) The proposed application process for planning approval

This section describes the proposed contents for planning approval by two types of plans as "outline plan" and "detailed plan" under the master plan, although the definition (roles, functions) is not clearly defined whether they are a statutory plan to be done by the administration or private sector plan not. Table 3.7.3 illustrates the proposed contents for the planning application. The report did not describe the planning regulation in which type of planning should define.

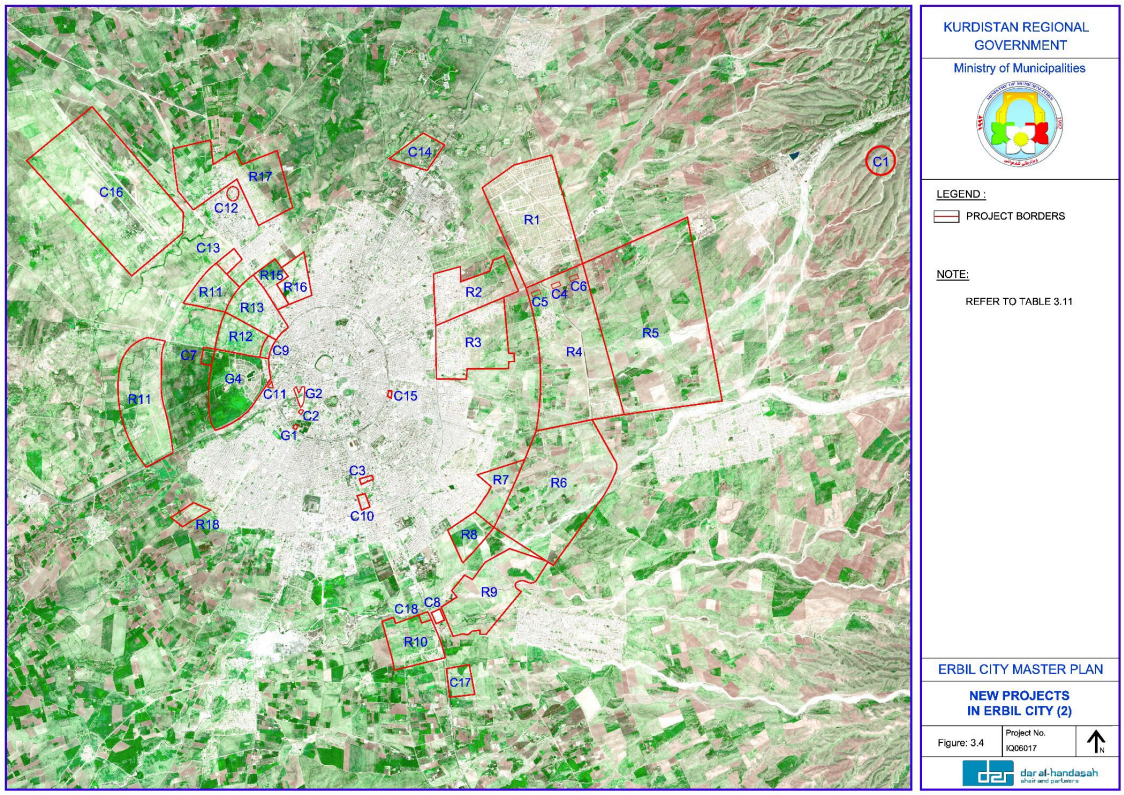
Table 3.7.3 Proposed Application Process for Outline Plan and Detailed Plan

Type of Plan	Key Requirements or Tasks in the Plan															
	Basic Information			Analyses, Planning, and Reporting							Regulation Plan				Facility Design	
	Applicant Information	Site Information (area, boundary, etc.)	Developer's Information (ownership, funding, etc)	Situation analysis	Development Concept	Development Framework (population, employment, etc)	Land Use Plan	Infrastructure (utilities) Scheme or Plan	Public Facilities Scheme or Plan	Environmental Assessments	Land ownership registration	Zoning Plan	Land Allocation Plan (lot/parcel)	Planning Regulations (FAR, BCR, etc)	Building Design and Drawings	Utilities and Equipment Design
Outline Plan	●	●	●	●	●	●	●	●	●	●	●	●	●	--	--	--
Detailed Plan	●	●	●	●	--	--	--	--	--	--	--	--	--	●	●	●

Source: JICA Project Team

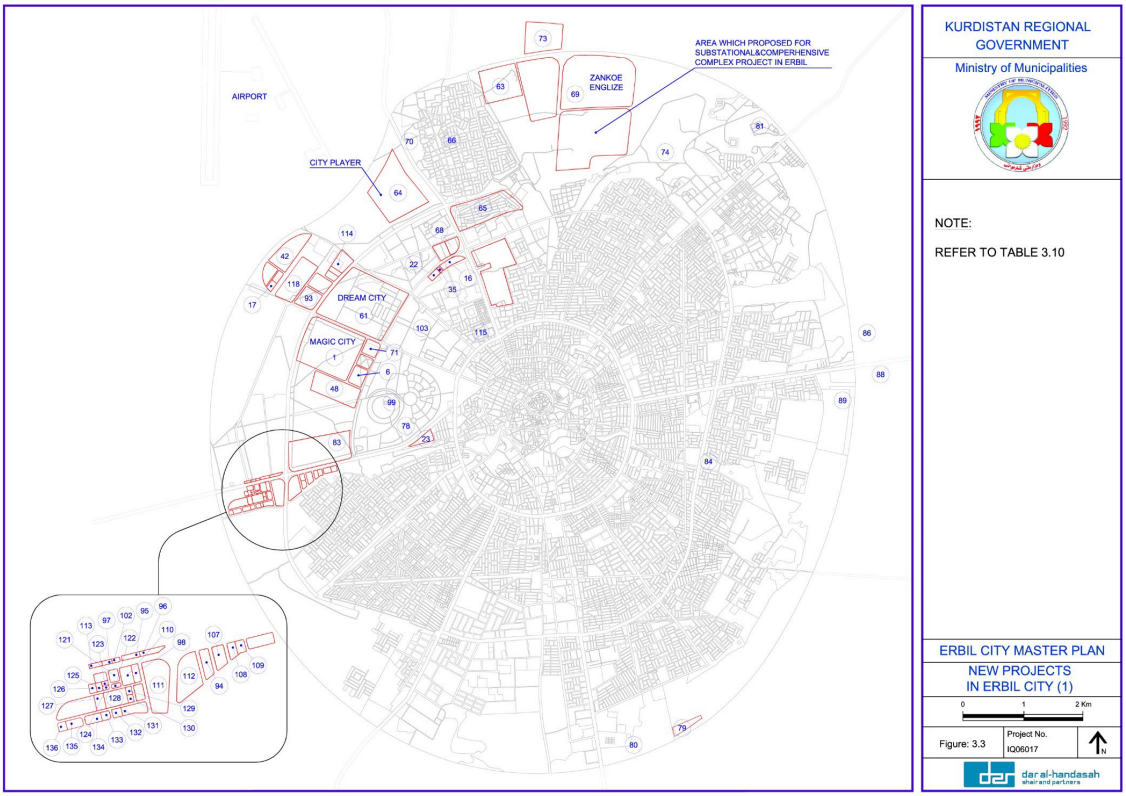
[2] Urban Design Guidelines for the Buffer Zone of Erbil Citadel, UNESCO 2011

3.8 Review of New Projects proposed in Erbil 2030 MP



Source: Erbil 2030 MP

Figure 3.8.1 Map of New Projects proposed in Erbil 2030 MP (Large-Scale)



Source: Erbil 2030 MP

Figure 3.8.2 Map of New Projects proposed in Erbil 2030 MP (Small-Scale)

3.8.1 Review of Government Projects Implementation

Table 3.8.1 Review of Government Projects Implementation

Project in Erbil 2030 MP (2006) **[No. on map]**	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil MP Update Strategy & Indicator	
	Score*	Comment		Integration**	Comment
[C1] Al Anfal Memorial	**FI**	Implemented as planned.	-	**-**	-
[C8] Section of The Martyr Shawkat Sheikh Izz Al Din Interior	**FI**	University students' dormitory	-	**-**	-
[C12] Akad Sporting Club	**FI**	Implemented as planned.	-	**-**	-
[C14] Erbil Media Center	**PI**		Khabat gazette and broadcasting complex has been built on the plot. However, KRG DIT (Department of Information Technology) is built in another location near UN Compound.	**Partial**	Parts of the project are already built and operating. It's a good idea to keep such activities in the same complex for future development.
[C16] Erbil International Airport	**FI**	Implemented as planned.	-	**-**	-
[70] Diplomatic area	**NI**	Plot is till partially vacant, but an oil station is built on it or nearby.		**Discontinued**	Area might not be suitable. An alternative location might be proposed. Another location might be allocated for this project (GDUP to confirm)
[71] Mr. Saad Conference Hall	**FI**	Implemented as planned.	-	**-**	-
[83] Erbil International Exhibition	**NI**		Erbil International Fairground (~1 ha) is implemented in another area (within Sami Abdulrahman Park)	**Complete**	The plot is ideal for the project. We are also proposing to share the parcel with a national museum (frontage on Gulan street)
[84] Public Retirement Building	**FI**	General Directorate of Retirement	-	**-**	-
[86] Radio and Television Herem	**NI**		A residential project is currently built on this plot (Ashti city)	**Discontinued**	-
[94] Ministry of Human Rights	**NI**		No Human Rights ministry in current KRG cabinet, however there is Independent Board of Human Rights.	**Discontinued**	Shape is changed based on detail plan (to be confirmed by GDUP)
[98] Ministry of Agriculture	**NI**		This plot is now allocated for Ministry of Higher Education and Scientific Research	**Complete**	Site is exchanged with MoAWR. Both may be implemented.
[127] Ministry of Justice	**NI**		Currently MoJ is located on 60m street [956] on this list.	**TBS**	Might be allocated for a facility for the MoJ (not the ministry itself).
[121] Ministry of Communications	**NI**		In current KRG Cabinet, Ministry of Communications is merged with Ministry of Transport [122].	**Complete**	This plot is allocated for Ministry of Transportation and Communication.
[107] Ministry of Health	**PI**	Structure is built.		**Complete**	The plot subdivisions are changed partially. but one plot is allocated for Ministry of Health.
[108] Erbil Directorate of Water and Sewerage	**FI**	Implemented as planned.	**-**	**-**	-
[109] General Directorate of Real	**IO**	Structure is completed		**Complete**	The plot subdivisions are changed partially. but one

Project in Erbil 2030 MP (2006) **[No. on map]**	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil MP Update Strategy & Indicator	
	Score*	Comment		Integration**	Comment
Estate					plot is allocated for Erbil Directorate of Land Registration
[110] Ministry of Higher Education	**NI**		This plot is now allocated for Ministry of Agriculture	**Complete**	*Site is exchanged with MoRHE. Both may be implemented.
[111] Ministry of Education	**NI**			**Complete**	This plot is still allocated for Ministry of Education.
[112] Ministry of Municipalities	**NI**			**Complete**	This plot is still allocated for MoMT; but a part of it will be sold to private sector.
[114] United Nations Building	**FI**	Implemented as planned.	-	-	-
[122] Ministry of Transport	**NI**		In current KRG Cabinet, Ministry of Communications is merged with Ministry of Transport [121].	**Complete**	This plot is now allocated for parking area for ministry of transportation and communication
[128] Genera Directorate of Passports and Nationality	**IO**	Structure is completed		**Complete**	This plot is now divided into two. General directorate of Passports and Nationality, and Ministry of Culture and Youth.
[131] General Directorate of Social Development	**NI**		Directorate of Natural Resources is built on part of the plot.	**Complete**	This plot is divided into five plots. one of them is General Directorate of Social Development. others are, directorate of geological survey, ministry of trade.
[133] Building Materials Laboratory	**NI**			**Complete**	The plot is allocated for the project.
[125] Ministry of Agriculture print shop	**NI**			**Complete**	The plot is allocated for the project.
[123] Women Rights Protection Center	**IO**	Only part of structure is built	GD of combating violence against women is built in another location.	**Complete**	The plot is allocated for the project.
[129] Task 1	**NI**		Allocated for GD of Martyr Affairs	**Complete**	The plot is allocated for the project.
[130] Task 2	**NI**	Structure is built.	Allocated for GD of Endowment and Religious Affairs.	**Complete**	The plot is allocated for the project.
[81] Central Office of Information	**NI**	Same location as [C14] Erbil Media Center		**Complete**	The plot is allocated for the project.
[74] The Guesthouse Limits	**FI**	Implemented as planned.	-	-	-
[10] Chamber of Commerce and Industry, Erbil	**FI**	Implemented as planned.	-	-	-
[20] Kawa Cultural Center	**FI**	Implemented as planned (Lease project by municipality)			
[116] University Conference Hall	**FI**	Implemented as planned.	-	-	-
[58] Holding Financial Group	**NI**	Directorate of Sami Abdulrahman park is built on this plot		**Discontinued**	
[956] Ministry of Justice	**FI**	Implemented as planned.	-	-	-

Source: JICA Project Team

Note: (*) **FI**: Fully implemented, **IO**: Implementation ongoing, **NI**: Not implemented, **PI**: Partially implemented not ongoing, **AB**: Abandoned

(**) **Complete**: Full integration to Erbil 2050 MP is recommended, **Partial**: Partial integration, **Discontinued**: No integration, **TBS**: Integration to be further studied

3.8.2 Review of Education & Health Projects Implementation

Table 3.8.2 Review of Education & Health Projects Implementation

Project in Erbil 2030 MP (2006)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil MP Update Strategy & Indicator	
[No. on map]	Score*	Comment		Integration**	Comment
[69] English University	**NI**	In 2022, English University (of London) in being built on Koya road	Moved to a new location. New projects in progress in the previous location	**Complete -** *in new location*	- Probably the location next to Anfal Memorial is allocated and will be built. (GDUP to confirm) - On the actual location of 69, there will be Erbil Hills project and University of Kurdistan Hewler UKH
[79] Technical College for technological education	**FI**	Implemented as planned.	-	**-**	-
[80] University compound / Saladdin University	**NI**	[80] is the extension of the existing campus [116].	[80] is replaced by residential developments	**Complete –** *in new location*	- The university extension is replaced by residential development. A new location for Salahaddin university is allocated further south (Facing PUK building) and the implementation in on-going.
[132] Bones and fractures Hospital	**NI**	The complex of new buildings including the ministry complexes is not implemented.		**Complete**	Allocated for the same purpose. Some changes were applied in the plot subdivisions.
[6] Hospital	**FI**	Implemented as planned, as Balsam Private Hospital	-	**-**	-
[7] KIPA Hospital	**NI**	In 2022, KIPA Hospital has not been built-up.	Replaced by a mixed-use building	**Discontinued**	Reserved lands for the 3 hospitals have been encroached. Other lands shall be found if necessity of building hospitals in those areas is confirmed.
[8] Hospital	**NI**	In 2022, Hospital has not been built-up.	Replaced by "Bright" Residential tower.	**Discontinued**	
[27] Hospital	**NI**	In 2022, Hospital has not been built-up.	Replaced by Stratford university.	**Discontinued**	
[901] Hospital	**NI**	In 2022, Hospital has not been built-up.	N/A	**Complete**	The northern area has many new urban developments thus hospital is needed.
[902] Hospital	**NI**	In 2022, Hospital has not been built-up.	Replaced by Cihan private University and Martyr Fakhir Mergasori Education complex.	**Discontinued**	-
[957] Hospital	**FI**	Implemented as planned, as Emergency management Center (EMC).	-	**-**	-
[106] Hospital	**FI**	Implemented as planned, as Welfare Hospital.	-	**-**	-
[105] Hospital	**FI**	Implemented as planned, as Lease project (clinics complex).	-	**-**	-
[960] Dentist Clinic	**IO**	Under implementation in 20222 as Dr. Piraz Dentist.	-	**-**	-
[126] The Center for Medical and Psychological Treatment	**NI**	In 2022, the complex of new buildings including the ministry complexes is still not implemented.	N/A	**Complete**	Plot allocated for the same purpose.

Project in Erbil 2030 MP (2006) **[No. on map]**	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil MP Update Strategy & Indicator	
	Score*	Comment		Integration**	Comment
[5] Beautification and Treatment Centers Natural	**NI**	Beautification and Treatment Centers Natural has not been implemented.	Florence Tower, a mixed-use building is being built in its location.	**Discontinued**	Since there is a demand for such services, new lands may be found.

Source: JICA Project Team

Note: (*) **FI**: Fully implemented, **IO**: Implementation ongoing, **NI**: Not implemented, **PI**: Partially implemented not ongoing, **AB**: Abandoned

(**) **Complete**: Full integration to Erbil 2050 MP is recommended, **Partial**: Partial integration, **Discontinued**: No integration, **TBS**: Integration to be further studied

3.8.3 Review of Sports Areas and Parks Projects Implementation

Table 3.8.3 Review of Sports Areas and Parks Projects Implementation

Project in Erbil 2030 MP (2006) **[No. on map]**	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil MP Update Strategy & Indicator	
	Score*	Comment		Integration**	Comment
[63] Ankawa park	**NI**	Still a vacant land. A minor part of the designated area (less than 30% of the land) has been urbanized, but it does not threaten the general integrity of the land and its capacity of becoming a green area.	Greenbelt Masterplan has been planned after to give more detail to the green areas planned within Erbil 2030 MP. Erbil 2050 MP should take Greenbelt Masterplan propositions into account. With climate change and increase of temperatures, the necessity of public parks is even more important. Urban development from 2006 to 2022 in the eastern and south-eastern directions has been done without providing green areas and Erbil 2030 MP focused on north west area only.	**Complete**	Erbil 2050 MP will pursue the proposition. Considering the current needs in terms of green areas, it is essential to build Ankawa Park to enhance publicly accessible green areas.
[64] Games City	**PI** **AB**	The land planned for Games City (59 ha) has been transferred to private sector for residential development but a small part of the land located in south-east corner (12 ha) is currently hosting Erbil Sports Center, which has been obviously developed based on Games City proposition.		**Discontinued**	Due to the transfer of the land to private residential development, it seems impossible to extend the public facility of Games City originally planned in Erbil 2030 MP.
[73] New Ankawa park	**NI**	Still vacant land, but some parts around it have been built on. It seems that there is an overlap with surrounding residential areas.		**Complete**	Erbil 2050 MP will pursue the proposition of New Ankawa Park, but its specific area shall be precisely re-designated.
[99] Erbil Park	**FI**	Implemented as planned.		-	-
[124] Sports Center	**FI**	Implemented as planned as integrated within Erbil Park. Built-up area, according to the standards, should not exceed 30% of the public park.		-	-

Source: JICA Project Team

Note: (*) **FI**: Fully implemented, **IO**: Implementation ongoing, **NI**: Not implemented, **PI**: Partially implemented not ongoing, **AB**: Abandoned

(**) **Complete**: Full integration to Erbil 2050 MP is recommended, **Partial**: Partial integration, **Discontinued**: No integration, **TBS**: Integration to be further studied

3.8.4 Review of Project Implementation Monitoring Policy

Erbil 2030 MP mentions that in 2006, there was no central record of projects, and it was often unclear as to the status of projects: whether (1) a project is fully approved, (2) it is approved in principle with details yet to be determined or (3) it is only a current proposal that could be completely superseded by a different project. Erbil 2030 MP then concludes that the comprehensive monitoring of projects, using

Geographic Information System (GIS), was a top priority. Table 3.8.3 shows the review of this policy.

Table 3.8.4 Review of Project Implementation Monitoring Policy

Policy in Erbil 2030 MP (2006)	*Evaluative question* / comment (2022)	Implementation Monitoring		Changes in conditions (2006-2022)	Recommendation for Erbil MP Update Strategy & Indicator	
		Score*	Comment		Integration**	Comment
[MP56] Policy of introducing comprehensive GIS platform for monitoring of urban development projects.	*In 2022, has a comprehensive GIS platform for monitoring of urban development projects been introduced?*	-	In 2022, no comprehensive GIS platform for monitoring of urban development projects has been introduced in GDUP/MoMT.	Situation seems unchanged from 2006: GIS data is maintained individually in servers and/or PCs of each responsible authority and shared with other organizations by DVD, and information about urban development projects is paper-based and stored exclusively at each entity. A quotation of procurement to launch GIS center is currently under review at Ministry of Finance, but it is unclear if it can be used for monitoring status of urban development projects.	**Complete**	Erbil 2050 MP pursues the policy of introducing comprehensive GIS platform through (1) the proposition of introducing newer technology of systematic and secure database as part of Spatial Data Infrastructure (SDI) equipped with dashboard for intuitive monitoring of urban development projects and (2) to reform the legal system of urban development projects approval and information sharing among stakeholders.

Source: JICA Project Team

Note: (*) +++ Excellent implementation, ++ Average/Good implementation, + Fair implementation, **-** No implementation

(**) **Complete**: Full integration to Erbil 2050 MP is recommended, **Partial**: Partial integration, **Discontinued**: No integration, **TBS**: Integration to be further studied

CHAPTER 4
PLANNING CONCEPTS

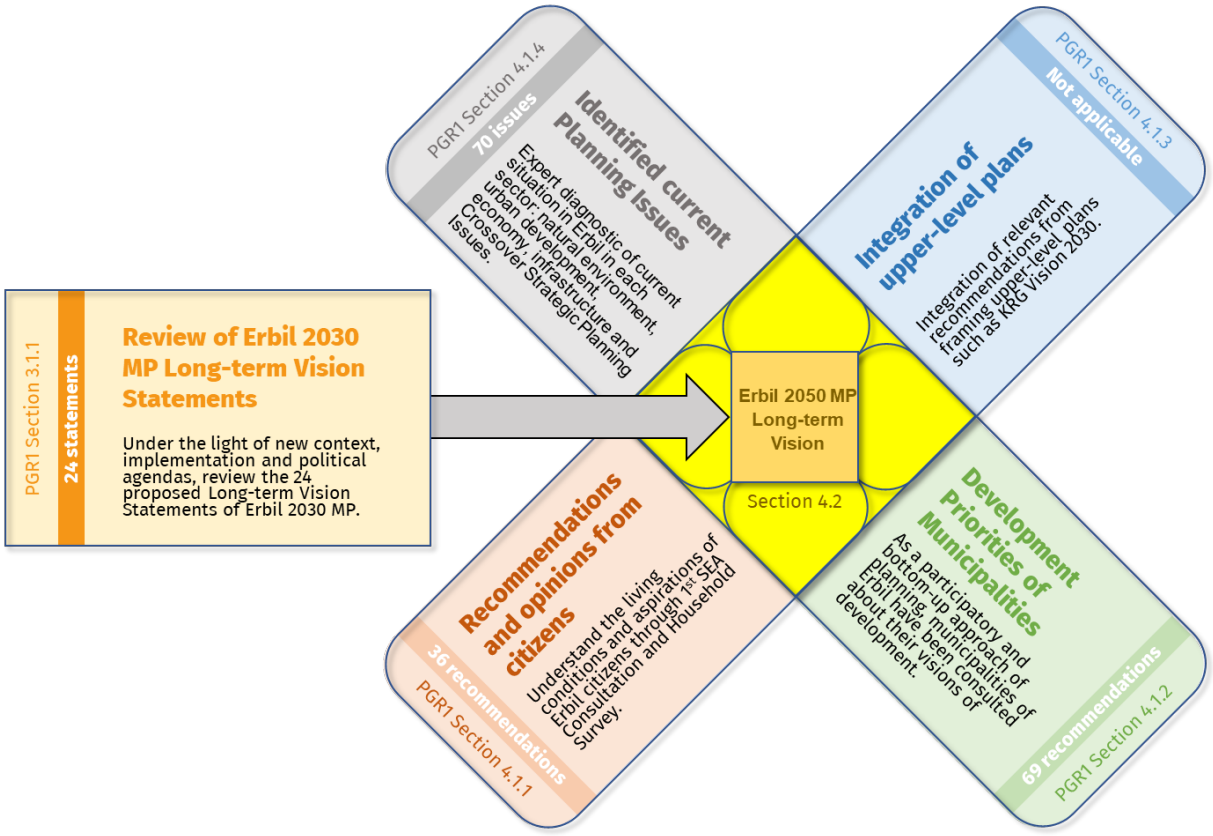
Based on the analysis of existing situation of Erbil in Chapter 2 and on the review of the contents and implementation status of Erbil 2030 MP in Chapter 3, the current Chapter 4 intends to set-up the basic planning concepts and frameworks that will become the conceptual foundations of the formulation of Erbil 2050 MP.

4.1 Analysis of Planning Issues & Recommendations

The formulation of Long-term Vision of Erbil 2050 MP is priorly based on the review of the existing Long-term Vision Statements of Erbil 2030 MP (see Section 3.1.1), then, on the cross-analysis of four different planning components which all state about the existing situation of Erbil city:

- Recommendations and opinions from citizens (see Section 4.1.1);
- Development Priorities of Erbil Municipalities (see Section 4.1.2);
- Integration of Upper-Level Plans (see Section 4.1.3);
- Identified current Planning Issues (see Section 4.1.4).

In order to accurately grasp the reality of the city and to propose a relevant Vision for a coherent future urban development, the emphasis was put not only on expert knowledge and judgement but also on the understanding of living conditions and opinions of the citizens of Erbil and of the development priorities of the local administration. Figure 4.1.1 show the concepts of formulation of Erbil City Long-term Vision through the integration of review results and of the 4 planning components.



Source: JICA Project Team

Figure 4.1.1 Concept of Formulation of Erbil City Long-term Vision

4.1.1 Recommendations from Erbil Citizens

Asking for the opinions of citizens regarding their living conditions and their vision of the future city is a crucial aspect of urban planning. A bottom-up participatory approach allows citizens to actively participate in the planning process, by providing valuable insights and ideas that can help to shape the development of their city. This approach empowers citizens, helps to ensure that their needs and desires are taken into account, and creates a sense of ownership and pride in the resulting developments. Additionally, incorporating the perspectives of citizens can lead to more innovative and effective solutions, as well as a greater likelihood of success in implementing and sustaining urban planning initiatives.

(1) Recommendations from Citizens on Living Conditions during Public Consultation (PC)

During the 1st SEA Public Consultation (see Part III, Chapter 2.3), the citizens of all Erbil municipalities were invited to give their opinions about the living environment in their neighbourhood in terms of current problems and assets, and future hopes and fears. A total of 1,548 opinions were gathered, that give a clear image about the living conditions of Erbil residents of all backgrounds and all social classes. Within the important variety of received opinions, the 25 top categories that received more than 1% of the total of opinions (which corresponds to only 14 opinions) have been considered as important recommendations from citizens to formulate the Long-term Vision of Erbil, as shown in Table 4.1.1. Each recommendation receives an ID beginning by PC to allow cross-analysis in Section 4.1.4.

Table 4.1.1 Recommendations from Citizen on Living Conditions during Public Consultation

ID	Recommendation on Living Conditions	Nbr. Opinions	Share	Rank
PC-01	Lack of educational facilities	148	11.08%	1
PC-02	Lack of green areas	127	9.51%	2
PC-03	Deterioration and bad state of roads	123	9.21%	3
PC-04	Water shortages	121	9.06%	4
PC-05	Lack of public facilities in general	57	4.27%	5
PC-06	Lack of health facilities	56	4.19%	6
PC-07	Unsafety due to wandering of stray dogs	52	3.89%	7
PC-08	Unemployment	35	2.62%	8
PC-09	Devastating flooding phenomenon	29	2.17%	9
PC-10	Frequent power cuts	28	2.10%	10
PC-11	Insufficient electrical capacity	26	1.95%	11
PC-12	Insufficient coverage of the power grid	24	1.80%	12
PC-13	Lack of maintenance of drainage infrastructure	22	1.65%	13
PC-14	Lack of sports facilities	22	1.65%	13
PC-15	Inadequate sewerage system	19	1.42%	14
PC-16	Insufficient sewerage capacity	19	1.42%	14
PC-17	Complex land tenure system	17	1.27%	15
PC-18	Lack of urban control regulation	17	1.27%	15
PC-19	Insufficient water capacity	17	1.27%	15
PC-20	Lack of roads	15	1.12%	16
PC-21	Unsafety due to substance addiction	15	1.12%	16
PC-22	Financial burden of energy expenses	14	1.05%	17
PC-23	Unguaranteed public safety	14	1.05%	17
PC-24	Lack of security infrastructure	14	1.05%	17
PC-25	Deterioration of urban fabrics in need of renewal	14	1.05%	17

Source: JICA Project Team

(2) Recommendations from Citizens on Future Vision during Household Survey (HS)

During the Household Survey, carried out on a sample of 1,009 households throughout Erbil city, some questions relating to the vision of the city were asked to the citizens. Table 4.1.2 summarizes their answers, and those which gathered more than 20% of all answers, are considered as important recommendations from citizens to formulate the Long-term Vision of Erbil. Each recommendation receives an ID beginning by HS to allow cross-analysis in Section 4.1.4.

Table 4.1.2 Recommendations from Citizen on Future Vision during Household Survey

Question in HS	ID	Recommendation on Vision	Nbr. HH	Share	Rank
Things that make you proud living in Erbil	HS-01	Safety for family	387	56.58%	1
	HS-02	Modern new roads such as 120m and 150m roads	357	52.19%	2
	HS-03	Public parks	352	51.46%	3
	HS-04	Pace of development compared to other cities of KRI or Iraq	333	48.68%	4
	HS-05	The Citadel and the History	324	47.37%	5
	HS-06	The choice of entertainment such as cafes, restaurants, malls	159	23.25%	6
Things that Erbil should improve to become an ideal city	HS-07	Electricity provision	339	49.56%	1
	HS-08	Water provision	291	42.54%	2
	HS-09	Quality of roads	289	42.25%	3
	HS-10	Cleanliness / depollution	245	35.82%	4
	HS-11	Vibrant economy and job creation	171	25.00%	5

Source: JICA Project Team

4.1.2 Development Priorities of each Municipality (PM)

In the perspective of creating the most complete and commonly-agreed urban development master plan, it's important to consider not only the central government policies but also the development priorities and visions at the scale of the local administration, namely the Municipalities in the case of Erbil. By incorporating both central and local perspectives, a comprehensive and inclusive plan can be created that addresses the needs and desires of the wider community. Including local perspectives ensures that the plan is tailored to the specific context of the area, taking into account local infrastructure, resources, and specific culture. Additionally, incorporating local priorities and visions helps to increase community engagement, leading to better implementation and sustainability.

In November 2022, the JICA Project Team conducted visits to all of the Municipalities of Erbil and asked each Municipality Director to gather information on their development priorities. The following paragraphs summarize the contents of the letters that were provided by Municipality Directors. Each Priority of Municipality receives an ID composed by: PM-Number of Municipality-Number of Priority to allow cross-analysis in Section 4.1.4.

(1) Municipality 1

1) Promote Infrastructure Development

- Increase the amount of greenery in the city center in areas where land ownership belongs to the municipality (PM1-1);
- Solve the problem of water shortage through:
  - Water treatment plant (PM1-2);
  - Use of porous pavement in the city streets that has the ability to absorb rainwater to supply groundwater as well as help eliminate floods (PM1-3).
- Redesign and construction of water supply network inside the sixty-meter street and the city center (PM1-4);
- Reorganize electricity network and internet transmission lines to be buried under the sidewalks (PM1-5).

2) Renovation and Construction

- Construction of schools and hospitals according to the needs of citizens and renovation of existing ones and providing staff, furniture and advanced equipment (PM1-6).
- Renovation and widening of main streets and renovation of secondary streets (PM1-7).
- Construction of modern parking, ie several buildings have a common parking and underground parking to utilize plot area (PM1-8).

- Emphasize public facilities by constructing new buildings in suitable location and renovating old facilities with the provision of human resources and equipment necessary to operate properly (PM1-9).
- Renovation of the cemetery located in the West part of the Municipality, by organizing traffic paths, greening and repairing fences and main gates (PM1-10).
- Relocation of motorcycle and bicycle market and poultry market outside 120m ring road (PM1-11).
- Relocation of factories and industrial works outside the city (PM1-12).
- Establishment of a public library in the city center where old and new books in all fields can be available in several different languages so that readers can benefit from it (PM1-13).
- Renovation of Sheikhalla market in such a way that it has a cultural and civilized characteristics that can be matched with the citadel and the Qaisary market (PM1-14).
- Reorganization of Tayrawa and Ziraryan markets and establishment of an orderly national market for the current market known as the old women's market (PM1-15).
- Organizing Iskan Street by building a public roof for the street from 60 m road to 30 m road, and removing the shades of shops and buildings, and decorating the public roof with colorful umbrellas with providing lighting and ventilation (PM1-16).

3) Emphasize the public facilities providing services

Recruitment of new employees according to the needs of the directorate and opening the necessary courses continuously. with providing all the equipment and materials necessary to carry out the affairs of the directorate and maintenance works within our boundaries (N/A).

4) Emphasizing the spreading of environmental awareness through schools, media, social media, etc (N/A).

(2) Municipality 2

- We recommend increasing green spaces in all neighborhoods. In addition to that, we recommend that population density and planning standards should be considered for service areas (schools, hospitals, businesses) in all neighborhoods (PM2-1).
- Since our border is not far from Erbil Citadel, which is a very important monument, we recommend that the height of buildings should be gradual from 60 meters road, 100 meters and 120 meters roads in a way that most buildings can have a view on the Citadel (PM2-2).
- Provision of parking spaces (PM2-3).
- Provide rapid transportation services in the master plan such as (highway, tram, train) to solve transportation problems to reduce congestion in the city (PM2-4).
- As some of the daily problems we face are mixing residential and commercial, we recommend that the commercial zone be separated from the residential so that it does not affect the residential areas (PM2-5).
- Considering the height of the buildings according to the airport guidelines (PM2-6).
- As the outer boundary of the master plan is close to the resort of Pirmam and mountainous areas, we recommend that the building in this area should be built in a way suitable with the nature of the area and should not affect or ruin the nature of the mountains (PM2-7).

(3) Municipality 3

- Construction of box and pipe sewerage within our directorate boundaries, especially in Hawleri Nwe neighborhood and Sarbakhoy neighborhood (PM3-1).
- Delivery of water, electricity and sewerage services in Sarbakhoy neighborhood (PM3-2).
- Increasing the amount of greenery within our boundaries, especially in Hawleri Nwe and Sarbakhoy neighborhoods, building parks and renovating old parks (PM3-3).

- Increase the amount of greenery in the two cemeteries located in our boundaries (PM3-4).
- Installation of traffic design in Hawleri Nwe neighborhood at the intersection of (30m) streets (PM3-5).
- Cornish Canal should be turned into an open channel and developed as a tourist destination (PM3-6).
- The industrial zone (north of our border) is in the city that has caused environmental pollution and a lot of congestion, we recommend moving it to the outskirts of the city, the current location to become a large park for tourism (PM3-7).

(4) Municipality 4

- Propose the construction of (schools, hospitals, parks and businesses) in each neighborhood according to the population density and planning (PM4-1).
- Propose the establishment of water treatment plant in Cornish Creek and 8 Hasarok for reuse for irrigation of parks and washing (PM4-2).
- Construction of a 100m street bridge in order to reduce congestion in the area (PM4-3).
- Provision of modern public transportation (PM4-4).
- Construction of a commercial city in order to reduce congestion in some mixed-use streets within our municipality boundaries (PM4-5).
- Construction of 100m street starting from Koya Street to Zaiton Street to reduce congestion on Koya Street (PM4-6).

(5) Municipality 5

- Treatment of Cornish Canal in our municipality (by concreting the foundation and its sides and greening its sides) (PM5-1).
- Construction of a 40-meter road in the industrial area of Timar, which is important for the area that has no road services (PM5-2).
- Increasing the green area in general within municipality boundaries (PM5-3).
- Delivery of water, electricity, sewerage and street services in Timari Hazari (PM5-4).
- Construction of two sides of the old Kirkuk street after the 120m tunnel to Tobzawa road and also adding a loop of 120m to the old Kirkuk street towards the Erbil Water and Sewerage Directorate (PM5-5).
- Construction of a bridge on one side of the old Kirkuk Street and renovation of a bridge on the other side (PM5-6).
- Construction of a health center in Zhyan neighborhood (compensation of Tobzawa) so that Tobzawa village benefits from it (PM5-7).
- Emphasizing public transport within municipality boundaries (PM5-8).

(6) Municipality 6

- Solving the problem of water delivery to the new neighborhoods such as Baghlu Minara and Hashti Turaq (PM6-1).
- Reviewing the sewerage system and designing and installing modern and advanced sewerage systems for the streets of the Municipality 6, as the boundary of Mun 6 lies in a location that the sewerage of all other parts of Erbil passes through it. With taking necessary measures and implementing projects to combat sudden floods (PM6-2).
- Solving the problem of sewerage corridors of Qatawi and Turaq, and carrying out a project along the corridor in such a way as to suit the appearance of the city (PM6-3).
- Relocation of unregistered cars market and oil vendors to suitable locations (PM6-4).
- Increase and emphasize green space (PM6-5).
- Installation of trenches in the pavement for electricity cables, internet, cameras, etc. (PM6-6)

- Installation of rainwater recycle systems and construction of tanks for commercial and residential units (PM6-7).
- Provide parking spaces near public places (PM6-8).

(7) Ankawa Municipality

- If possible, we would like to dedicate more resources to the public parks and gardens of Ankawa town for improving in accordance with international environmental requirements and guidelines (PMA-1).
- Implementation of new projects to reduce environmental pollution such as cycling areas next to public streets in Ankawa, and dedicated running areas (PMA-2).
- Expand the boundaries of Ankawa municipality in a way that is appropriate to provide land for the future generation because the boundaries of Ankawa municipality are closed on three sides and there is no place left to expand the boundaries (PMA-3).

(8) Bnaslawa Municipality

- Identifying and designating a place for waste disposal, cleaning, maintenance and recycling (PMB-1).
- There are a lot of gaps between the neighborhoods of Bnaslawa that are actually green areas on the maps. However, it has remained empty until now and has become a place of garbage and waste. We recommend that these areas should be implemented as green areas to improve aesthetically as well as removing the garbage (PMB-2).
- Due to the lack of water, there is no proper water system for both households and greening (PMB-3).
- All the median strips in the main streets need water and greening (PMB-4).
- Bnaslawa Canal flows a lot of sewerage water that collects from (Dlopa and Kasnazan), all flows through Kasnazan. It needs recycling so that it can be used for drinking or irrigation for green areas (PMB-5).
- Increasing garbage collection equipment because Bnaslawa district is very large which consists of 27 blocks and 4 towns and Garasor village (PMB-6).
- Increase the number of workers for improvement works in the area (PMB-7).
- Adding shovels, large chain excavators, bulldozers and dump trucks (PMB-8).
- Construction of ponds to collect water and increase groundwater and create tourist attractions in the area (PMB-9).
- Lack of necessary construction equipment that belongs directly to our municipality. This have created many problems for the municipality because of the increased area within our boundaries (PMB-10).
- Lack of lighting poles for the center of Bnaslawa district. The streets should have lighting poles (PMB-11).
- Give special authority to the municipality of Bnaslawa, which is currently not administratively and financially as needed. In addition to increasing monthly advance (PMB-12).
- Lack of skilled personnel and employee services in the field of engineering and accounting and administration (PMB-13).
- Completion of 150m ring road located in the center of Bnaslawa district which will facilitate the movement of citizens and give a better appearance to the district (PMB-14).

4.1.3 Integration of Upper-level Plans

Due to the still unapproved nature of KRG Vision 2030, it was decided together with GDUP that the propositions of this upper-level plan shall not be integrated as it is a basic foundation of the formulation of Erbil 2050 MP Long-term Vision. Nevertheless, the contents of KRG Vision 2030 are described in this report (see Section 2.5.1), and may be used for reference, if it gets approved, for a subsequent refining of Erbil 2050 MP Long-term Vision or development objectives. Table 4.1.3 below shows the different assessments that will be necessary in case of future integration of KRG Vision 2030 as a foundation for Erbil 2050 MP Long-term Vision and other components.

Table 4.1.3 Necessary Assessments in case of Integration of KRG Vision 2030

Theme	KRG Vision 2030	Erbil 2050 MP	Necessary Assessment
Scope of propositions	All sectors	Urban planning related sectors	Assessment of the relevancy of all Vision 2030 propositions to the scope / leverages of Erbil MP.
Spatial coverage	Whole KRG	Erbil only (Project Area)	Assessment of the expected contribution of Erbil to the Vision (in absence of regional spatial plan).
Technical accuracy	Qualitative measures and quantitative KPIs	-	Assessment of the technical & financial feasibility of the integration and modification.
Time horizon	2030	2050	Assessment of the horizon of implementation and proposition of adjustments (2030, 2040 or 2050).

Source: JICA Project Team

4.1.4 Identification of Planning Issues

Planning Issues are problems that are especially challenging for the future of the development of the city and that should be considered from the early stage of concept planning, to the end of the process of formulation of the Master Plan. Planning Issues summarized in Table 4.1.4 below are extracted from the analysis of existing conditions of Erbil (Chapter 2), of economic sectors (Chapter 6) and various infrastructures and urban services (Chapters 7 to 9), as well as from SEA (Part III) and climate change adaptation (Part V).

The Planning Issues that necessitate a special attention due to their strategic or transdisciplinary nature are considered as Crossover Strategic Planning Issues to Discuss in further paragraphs.

(1) Summary of Identified Planning Issues

A total of 70 Planning Issues, classified in 22 different themes, have been identified. The justification of the importance of each Planning Issue is given based on the reference to recommendations and other Planning Issues ID. Potential consequences of each Planning Issue on the daily life of Erbil residents and implications for urban planning formulation process has been clarified. Additionally, the solutions given by Erbil 2050 MP to tackle each Planning Issue have been mentioned, through the reference of the Strategic Orientations (see Section 5.2) or other parts of the MP.

Table 4.1.4 Summary of Identified Planning Issues

Category	ID	Identified Planning Issue	Justification	Consequences for Residents & Implication for Urban Planning	References and [Solutions in Erbil 2050 MP]
Climate (CLI)	CLI-01	Intense rainfall causing flooding	PC-09 PM1-3 PM3-6 PM5-1 PMB-9 *Section 2.2.1* *Section 8.7.1*	<u>For citizens:</u> Property damage (homes, businesses, and infrastructure) Evacuation and resettlement of people who lost home Health hazards (floodwaters can contain contaminants) Economic losses (disrupt local economies, causing temporary or long-term	*Section 8.7.2* Visualization of areas vulnerable to flood (hazard map) Hard countermeasures such as stormwater harvesting ponds (PMB-9) and diversion channels (Cornish canal PM3-6 & PM5-1), porous pavement (PM1-3) Improving rainwater drainage systems in urban areas

Category	ID	Identified Planning Issue	Justification	Consequences for Residents & Implication for Urban Planning	References and [Solutions in Erbil 2050 MP]
				business closures) For urban planning: Managing and mitigating the impact of natural disasters, including evacuation of residents and providing temporary shelter, ensuring that public facilities such as hospitals and fire stations remain operational. Long-term implication includes rebuilding damaged infrastructure and homes, delineating flood-prone area.	Green Infrastructure which can absorb rainfall and reduce runoff Soft countermeasures as manual for evacuation plan, early warning system, etc. Delineating development control flood-prone area in the city and enforcing the prohibition to build and to issue building permits in this area.
	CLI-02	Hot arid climate and heat wave causing Urban Heat Island effect	*Section 2.2.1*	For citizens: Heat stress & heat stroke particularly among vulnerable populations such as the elderly, young children, etc. Poor air quality: Urban heat islands can contribute to poor air quality, with higher levels of pollutants and particulate matter in the air Increased energy consumption (usage of air conditioning) Decreased quality of life Increased risk of wildfire in rural areas Mental health consequences For urban planning: Urban Heat Island effect is fostered by the urban form of recent low-density developments (URB-02) Obstacle to the adoption of walking and bicycling as transportation options (TRA-03)	[SO6-1-2] Increasing green spaces, such as parks, gardens, and green roofs, into urban areas to provide shade and reduce heat buildup Inside residential parcels, increasing the share of non-impervious area Adopting sustainable building techniques such as reflective surfaces on roofing (cool roof), pavements, and walls, to reduce the amount of heat absorbed by buildings and surfaces Vegetated buffers. Heat warning systems to diffuse information to the population.
	CLI-03	Dust storms which occur more and more frequently	*Section 2.2.1*	For citizens: Aggravating air quality and human health problems (asthma, bronchitis). Negative impacts on visibility, transportation, and agriculture. Economic losses (disrupt local economies, causing temporary or long-term business closures). For urban planning: Dust storms can be an obstacle for implementing policies promoting walking and cycling as modes of transportation (TRA-03).	Improving green infrastructure: incorporating green spaces like parks, gardens, and green roofs into the urban landscape can help reduce dust levels. Trees and plants can help trap dust particles, and also increase humidity levels, which can reduce the formation of dust storms. Regulating construction activities: implementing regulations to minimize dust generation during construction and demolition. Controlling traffic dust. Improving air quality monitoring. Raising public awareness on the danger of dust storms.
	CLI-04	Drought caused by reduction of rainfall amount & mismanagement of water resources	*Section 2.2.1* *Section 8.7.1*	For citizens: Drought aggravates water scarcity (HYD-01) and competition and conflicts over water resources Crop failures which can	Water conservation by promoting water-efficient technologies such as low-flow toilets, showers, and faucets, and xeriscape landscaping Rainwater harvesting for non-

Category	ID	Identified Planning Issue	Justification	Consequences for Residents & Implication for Urban Planning	References and [Solutions in Erbil 2050 MP]
				have an impact on food security and livelihood of farmers and rural communities	potable uses such as irrigation, flushing toilets in business etc. Water recycling and reuse for irrigation
Pollution (POL)	POL-01	Air pollution caused by car traffic and usage of private generators	*Part III Section 2.4.1*	Adverse health effects, including lung cancer, respiratory problems, heart disease, and stroke. Increased greenhouse gas emissions and climate change. Damaged ecosystems and wildlife (BIO-01). Negative impacts on tourism and recreation.	Improve access to power grid (ELC-01) will make decrease the necessity of using private generators. Promote sustainable transportation options, such as public transportation, cycling, and walking (TRA). Encourage the use of electric and low-emission vehicles. Encourage compact and sustainable urban development patterns. Invest in green space and parks to mitigate the impacts of air pollution (GAM)
	POL-02	Hot spots of air pollution in the vicinity of heavy industries	PM3-7 *Part III Section 2.4.1*	Adverse health effects, including respiratory problems, heart disease, and stroke. Decreased quality of life for local residents. Negative impacts on property values and economic development. Damaged ecosystems and wildlife (BIO-01).	Propose relocation of industrial zone to the outskirts of city and conversion of land into green area (PM3-7) in MP. Promote sustainable land use planning and development patterns that separate residential areas from heavy industries in Zoning Schemes. Encourage the development of green buffers around the industrial zones to mitigate the impacts of air pollution (GAM). Implement air quality monitoring and reporting systems.
	POL-03	Solid waste disposal & uncleanliness of streets	HS-10 PMB-1 PMB-6	Visual pollution and aesthetic degradation of the area. Foul odors, attracting pests, disease-carrying and organisms. Organic waste attracting wandering stay dogs which causes safety issues (SOC-08). Soil and water pollution, negatively affecting the environment. Health hazards for residents and visitors.	Provide adequate and accessible waste receptacles in public spaces. Design public spaces to facilitate waste management, such as pedestrian-friendly streets and parks with adequate waste receptacles. Increase public green spaces and natural areas, which can improve the overall appearance of the area and reduce the amount of waste generated. Work with local businesses and residents to establish recycling programs and increase awareness of the environmental benefits of recycling.
	POL-04	Surface water pollution	PMB-5 (Bnaslawa Canal)	Adverse health effects, including increased risk of water-borne diseases. Reduced water quality for drinking, agriculture, and other uses. Degradation and loss of aquatic ecosystems and wildlife (BIO-02) Decreased economic benefits from agriculture (AGR-01), freshwater	Implement comprehensive stormwater management systems, including green infrastructure. Regulate and enforce water quality standards and discharge permits. Invest in water treatment and monitoring technologies. Increase access to water conservation and management tools.

Category	ID	Identified Planning Issue	Justification	Consequences for Residents & Implication for Urban Planning	References and [Solutions in Erbil 2050 MP]
				fishing and other water-dependent industries.	Encourage the development of green spaces and parks to mitigate the impacts of stormwater runoff.
Hydrology and Water Resources (HYD)	HYD-01	Water scarcity caused by decrease of rainfall and of groundwater recharge	PC-04 PMB-3 *Section 8.1.1*	Crop failures, food shortages, and decreased agricultural productivity. Increased frequency and severity of wildfires. Decreased availability of drinking water, leading to public health issues. Economic losses due to reduced water supply for industrial and commercial activities. Increased conflict over water resources, particularly in regions where water is already a scarce resource. Damage to aquatic ecosystems and loss of biodiversity due to reduced water availability and quality (BIO-02).	*Section 8.1.2 (2)* Protection of groundwater recharge zone (URB-12). Adopting rainwater harvesting and storage techniques to capture and store rainfall for later use, and develop rainwater recycling systems & tanks (PM6-7). Promoting water conservation measures, such as fixing leaks, using water-efficient appliances, and encouraging behavioral changes to reduce water usage. Developing and implementing sustainable agriculture practices that use water more efficiently and rely on drought-resistant crops.
	HYD-02	Groundwater depletion caused by excessive pumping or extraction of groundwater	*Section 8.1.1*	Increased pumping costs: As groundwater levels decline, it can become more expensive to pump water from deeper aquifers, increasing costs for water users and reducing access to water for some communities.	*Section 8.1.2 (2)* Groundwater operation management based on groundwater monitoring, legal framework formulation o notification system for well construction. Agriculture and domestic water collective management system.
Physical Conditions (PHY)	PHY-01	Majority of flat lands around the city prone to urban sprawl	*Section 2.2.2*	Urban sprawl without obstacles leads to loss of farmlands (URB-07) and fragmentation of ecosystems (BIO-01). Increased risk of natural disasters such as flooding and wildfires.	Encourage compact, mixed-use development and higher-density housing in existing urban areas to reduce pressure on flat lands around the city. Establish urban growth boundaries in MP or Zoning Scheme or similar policies to limit urban sprawl into surrounding areas.
	PHY-02	Majority of clay soils of low load-bearing capacity	*Section 2.2.2*	Reduced stability and increased risk of soil settlement and subsidence, which can cause structural damage to buildings and infrastructure. Increased difficulty and cost of construction, as additional measures such as deep foundations may be required to support buildings and infrastructure.	Conduct comprehensive geotechnical investigations and soil testing to assess the load-bearing capacity of soil before planning and designing construction projects. Establish land use and development policies and regulations that consider soil characteristics and limit the height of buildings in areas with low load-bearing capacity. Encourage the use of light-weight construction materials and designs that are suitable for areas with low load-bearing capacity.
Biodiversity (BIO)	BIO-01	Presence of endangered bird species on shrinking natural terrestrial ecosystems	*Section 2.2.2* Erbil is on migration route of Sociable Lapwing (CR) among	<u>For biodiversity & humans:</u> Disappearance of bird species from the region would have negative consequence such as: insect population increase leading to ecosystem unbalance, loss	In order to provide resting areas for Sociable Lapwing (CR) and other endangered bird species, the protection of all natural terrestrial ecosystems such as arid grasslands and shrub areas from intensive

Category	ID	Identified Planning Issue	Justification	Consequences for Residents & Implication for Urban Planning	References and [Solutions in Erbil 2050 MP]
			others	of genetic diversity of plant populations due to lack of seed dispersal.	urban development, as well maintenance of cultivated areas (URB-07), if possible, far away from intense sources of light pollution, are major priorities.
	BIO-02	Presence of endangered fish, reptile and bird species in reducing riparian and freshwater habitats	*Section 2.2.2* Erbil region's freshwater ecosystems are hosting Euphrates Softshell Turtle (EN) among others	For biodiversity & humans: Euphrates Softshell Turtle (EN) plays a major role in controlling the populations of aquatic plants and small invertebrates especially frogs. Its disappearance from Erbil region's wetlands would have negative consequence such as ecosystem unbalance, increase of algae and frogs, etc.	In order to provide food, shelter, and reproduction habitats for Euphrates Softshell Turtle (EN) as well as other endangered aquatic species, the protection of the integrity (URB-11) and the depollution (POL-04) of all wetlands and freshwater ecosystems including ponds and rivers are major priorities. Restoration of degraded habitats or creation of new water-related ecosystems such as stormwater harvesting pond or channels are efficient.
Regional Position (REG)	REG-01	Landlocked region with difficult access to trading routes from seaports	*Section 2.1.1*	Limited access to international markets via seaport, which can reduce its economic opportunities and competitiveness. Higher transportation costs making it more difficult for businesses to compete in the global market. Reduced tourism potential (TOU-01) which can limit the region's economic growth and development. Difficulty in attracting foreign investment.	Improving regional transportation infrastructure, such as roads, railways, and airports, can help to reduce the high transportation costs faced by landlocked regions and increase their competitiveness. Promoting alternative forms of trade such as air freight of high value-added products. Developing alternative economic activities such as agriculture, tourism, and technology-based industries, which can help to diversify their economies and reduce their dependence on a single economic sector (ECO-01).
	REG-02	Influence of Mosul, Sulaymaniyah and Kirkuk	*Section 2.1.2*	Mosul, Sulaymaniyah, and Kirkuk have the potential to play important roles of supporting regional integration and economic development of Erbil, but recent history of instability and conflict (in Mosul) has had a negative impact on their ability to fully realize this potential. In recent years though, the reconstruction efforts of Mosul, especially through the development of large-scale infrastructures such as Mosul International Airport, are expected to enhance Mosul's attractiveness. Consequently, this could lead to increased competition with Erbil and potentially reduce Erbil's economic appeal.	Erbil has the potential to be competitive with Mosul, Sulaymaniyah, and Kirkuk, and to benefit from their presence, especially by positioning itself as a haven of peace in the region. To maximize its competitiveness and realize its full potential, it will be important for Erbil to continue to invest in its infrastructure, support economic development and investment, and maintain a stable security situation.
Social Issues (SOC)	SOC-01	Rapid urban population growth (higher population growth rate compared with the Iraqi national average)	*Section 2.3.1* HS-04	Housing shortages and affordability issues (HOU-02) Increased congestion and traffic (TRA-06) Overcrowding and degradation of public	Implement affordable housing policies for low- and middle-income residents to have access to safe, decent, and affordable dwellings, both rental and ownership. Efficient public transportation

Category	ID	Identified Planning Issue	Justification	Consequences for Residents & Implication for Urban Planning	References and [Solutions in Erbil 2050 MP]
				infrastructure (TRA-05) Strain leading to deficit of public facilities, services and infrastructure (PBF-01)	coupled with walkable/bike-friendly neighborhoods. Address social & economic inequalities regarding access to public facilities.
	SOC-02	High rate of in-migration from rural areas, IDPs and refugees, triggered by Erbil's attractive economic opportunities	*Section 2.3.1*	*Same as above SOC-01* Possible displacement of residents. Social and economic disparities due to lowering of labor costs. Possible increased of safety concerns in case of failed integration to society. Social and cultural challenges linked to identity.	*Same as above SOC-01* Promote economic opportunities in rural areas and peripherical cities. Improve rural living conditions by improving access to public facilities. Support and integrate IDPs/refugees through involvement of private sector. Manage migrations through various policies and incentives.
	SOC-03	Unbalanced employment structure (high unemployment rate of women)	*Section 2.3.1* PC-08 HS-11	Increased poverty of the households and gender inequality. Reduced economic growth and productivity as long as it only relies on male workforce. Increased dependence on social welfare programs.	Promote economic diversification (ECO-01) and especially jobs which are attractive for women, in tertiary sector. Encourage women-led businesses and entrepreneurship. Provide public transportation options to access employment opportunities. Increase access to affordable and quality childcare (PBF-01).
	SOC-04	Relative homogeneousness of the society in terms of household size	*Section 2.3.1*	Consistent demand for housing and related services, but at the same time lack of diversity in housing options. Reduced affordability for large families and single-person households. Strong sense of community and social cohesion. Possible inadequate consideration for elderly residents.	Encourage diverse housing options, including multi-generational and shared housing. Promote affordable and accessible housing for all household sizes. Encourage intergenerational and multicultural exchange through community programs and events.
	SOC-05	Relative homogeneousness of the society in terms of income	*Section 2.3.1*	Increased sense of community and social cohesion. Predictable and stable demand for housing and other goods and services. More efficient and effective allocation of public services and infrastructure. Improved economic stability and sustainability.	Foster inclusive and equitable development that prioritizes the needs of marginalized communities. Encourage the development of mixed-income communities and affordable housing options. Increase access to basic needs, such as healthcare and transportation, for low-income populations.
	SOC-06	Relatively aging population compared to Erbil Governorate	*Section 2.3.1*	Increased demand for healthcare and support services. Needs in terms of mobility options which are not either private car nor walking and bicycling. Increased pressure on public services and infrastructure. Decreased workforce and economic productivity.	Promote the development of mixed-use communities that provide access to jobs, housing, and services without the need for car ownership. Invest in public transportation systems and services that are accessible, reliable, and affordable for older adults. Invest in community-based support services and programs that provide care and support

Category	ID	Identified Planning Issue	Justification	Consequences for Residents & Implication for Urban Planning	References and [Solutions in Erbil 2050 MP]
				Increased burden on younger generations to provide care and support for aging populations.	for aging populations, such as meals on wheels and home care services.
	SOC-07	Relatively* unstable urban security	PC-23 (general) PC-07 (wandering of stray dogs) PC-21 (substance addicted people) PC-24 (lack of security infrastructure)	Decreased quality of life and well-being for residents. Decreased investment and economic activity. Decreased tourism and cultural exchange. Decreased sense of community and social cohesion.	(*) Contrary to the comments in Public Consultation mentioned in Justification column, residents consulted in Household Survey explained that Safety for family (HS-01) is already existing in Erbil and it is what make them proud living in this city (ranked 1st).
Urban Environment & Land Use (URB)	URB-01	Dispersed urban structure and lack of Central Business District (CBD)	*Section 2.4.3*	Difficulty in implementing TOD approach and public transportation policies. Decreased economic efficiency due to spread-out businesses and services. Increased reliance on cars for commuting and accessing amenities. Decreased sense of community and social cohesion.	Promoting compact, mixed-use neighborhoods to reduce reliance on cars and create walkable communities. Developing a clear and functional transportation network to connect different parts of the city. Creating and revitalizing central business districts to serve as focal points for economic and cultural activity. Encouraging the redevelopment of brownfield and underutilized sites to create dense, livable communities within the city.
	URB-02	Low density of the majority of residential areas	*Section 2.4.4*	Increased urban sprawl and loss of farmlands and open spaces. Increased dependence on personal automobiles, leading to traffic congestion and air pollution. Reduced access to public transportation, employment opportunities, and amenities. Increased infrastructure costs on already strain public investment for extending services such as water, sewage, and electricity to low-density areas. Reduced opportunities for community interaction and social cohesion. Increase of land temperature and Urban Heat Island effect (CLI-02).	Promote compact, mixed-use development and higher-density housing in urban areas to reduce pressure on open space and agricultural land. Establish urban growth boundaries or similar policies to limit sprawl into surrounding areas. Promote infill development and redevelopment of underutilized or vacant land in urban areas. Foster collaboration between central government and concerned municipalities to plan and manage regional growth and development in a coordinated and sustainable manner.
	URB-03	Lack of functional mix inside residential fabrics (especially small-scale non-polluting manufacturing industries)	*Section 2.4.2*	Lack of functional mix in residential areas can have major disadvantages such as: Increased dependence on automobiles for transportation and longer commuting times. Reduced access to employment opportunities and services, particularly for low-income and vulnerable populations. Increased social and	The best land uses to be mixed with residential areas to create functional mix include the following: Commercial and retail spaces, such as shops, cafes, and restaurants, which provide access to goods and services within walking distance of residential areas. Offices and employment centers, which provide job opportunities for local residents
	URB-04	Conflicting neighboring uses in older residential fabrics	PM1-11 (motorcycle and poultry market) PM1-12 (industries)		

Category	ID	Identified Planning Issue	Justification	Consequences for Residents & Implication for Urban Planning	References and [Solutions in Erbil 2050 MP]
			PM2-5 (commercial) PM6-4 (oil vendors)	economic disparities between different parts of the city. However, if the land uses that are mixed with residential areas are disturbing for the residents in terms of noise and odor pollution (car workshop, gas station, slaughterhouse, poultry market), functional mix shall be avoided in this case.	and reduce the need for long commutes. Public and community spaces, such as parks, community centers, and libraries, which provide opportunities for social interaction and community building. Educational institutions, such as schools and universities, which provide learning opportunities and contribute to the cultural and intellectual life of a community. Cultural and entertainment venues, such as theaters, museums, and galleries, which contribute to the vibrancy and liveliness of a community.
	URB-05	Urban development based on extendable grid of ring roads and radials is disruptive for urban fabrics	HS-02	Increase of necessary driving distance leading to lack of sense of proximity (detour) and increase of air pollution. Ring Roads cuts residential areas in the middle, thus disconnects both sides of the neighborhood. Ring roads can encourage suburban development, which can lead to urban sprawl and loss of green space. Ring roads and radials can also increase noise pollution in suburban areas, which can negatively impact the quality of life for residents.	To be discussed (see next session (2) Crossover Strategic Planning Issues to Discuss).
	URB-06	Deterioration of historic urban fabrics surrounding Citadel	PC-25 HS-05 PM1-9 Majority of Erbil citizens agree that Urban Heritage (Citadel & Surroundings) should be protected (660 households, 96.5%), and a that it should be modernized (548 households, 80.1%) in Household Survey.	Reduced livability and quality of life for residents of older neighborhoods, including issues with safety, health, and social cohesion. Decreased attractiveness for visitors and tourists, leading to economic decline and reduced opportunities for local businesses. Increased vulnerability to natural (flooding) and man-made disasters due to outdated infrastructure and building standards. Loss of cultural and historical heritage, contributing to a sense of disconnection and disorientation among residents and visitors.	Promote the preservation and restoration of historic buildings and cultural heritage sites to maintain local identity and sense of place. Develop strategies for revitalizing traditional urban fabrics, including the rehabilitation of public spaces, pedestrianization of streets, and improvement of infrastructure and services. Develop redevelopment policies in line with TOD and public transportation development, while enforcing regulations to ensure that redevelopment projects respect the cultural and historical context of traditional urban fabrics. Support local businesses and cultural organizations that contribute to the vitality and vibrancy of traditional urban fabrics.
	URB-07	Urban encroachment of valuable agricultural lands	-	Loss of productive farmland, leading to reduced food security and increased reliance on imported food (AGR-01). Negative impacts on the	Identify and protect valuable agricultural and high-potential farmlands through land use planning, including the use of zoning and other regulatory tools to restrict development in

Category	ID	Identified Planning Issue	Justification	Consequences for Residents & Implication for Urban Planning	References and [Solutions in Erbil 2050 MP]
				natural environment, including loss of biodiversity and ecosystem services, increased greenhouse gas emissions, and reduced capacity for carbon sequestration. Increased risk of conflicts between urban and rural communities over land use, resource allocation, and environmental impacts.	key areas. Develop strategies to promote sustainable urban growth that minimizes the need for encroachment into agricultural lands. Promote urban agriculture and other forms of local food production to enhance food security and reduce dependence on imported food (AGR-01).
	URB-08	Urbanization on inappropriate location especially on watercourses	PC-18 (lack of urban control regulation)	Aggravation of flooding vulnerability (CLI-01). Threatening of freshwater ecosystems (BIO-02).	Identify and protect watercourses through the use of zoning and other regulatory tools to restrict development in sensitive areas.
	URB-09	Urbanization of groundwater recharge zone (GRZ) in Eastern Erbil threatens water availability	HYD-01	Urbanization often involves paving over large areas of land, reducing the amount of water that can penetrate into the ground and recharge aquifers. Contamination of groundwater by pollutants from sources such as sewage systems, landfills, and industrial facilities.	Restriction of urban development in GRZ in Erbil 2050 MP shall be discussed. Environmental conservation measures (recharge forests, reservoirs, pesticide-free agriculture) to be implemented in GRZ.
	URB-10	Presence of numerous ancient archeological sites in Western part of Erbil that may be threatened by urbanization	*Section 6.3.2*	Delay and increase the cost of the development process due to the need for archaeological survey and mitigation measures. Destruction of cultural heritage and loss of information about the past if the archaeological sites are not properly documented and preserved. Risks of damage or collapse to the existing infrastructure and buildings due to the fragility of the archaeological remains.	Collaborate with agencies which perform archaeological surveys and assessments prior to any development, in accordance with local and international legal requirements and standards. Designate archaeological sites as protected areas and restrict development activities in and around them in MP and Zoning Scheme. Develop strategies to integrate the archaeological sites into the design and use of urban space, such as creating heritage parks and tourism attractions.
Housing (HOU)	HOU-01	Lack of affordable housing options	-	Increased rates of housing insecurity, leading to social and economic instability. Reduced access to housing for low-income and marginalized communities, exacerbating social inequality and exclusion. Reduced economic productivity and innovation due to workforce shortages and reduced labor mobility.	Implement affordable housing policies for low- and middle-income residents to have access to safe, decent, and affordable dwellings, both rental and ownership.
Agriculture (AGR)	AGR-01	Robust urban agricultural sector playing a significant economic role, but facing new challenges and requiring both preservation and reinforcement	*Section 6.1.2* Results of Household Survey shows Erbil customers satisfaction and dedication to support local	Urban sprawl leading to loss of fertile agricultural land (URB-07) Lack of access to resources like water and arable land Limited access to markets for small-scale urban farmers Competition with industrial and residential development	Preservation of agricultural lands (URB- 07) by enforcing zoning regulations Encouraging urban agriculture by providing public land for farming Improve access to local markets in Erbil and direct access to customer to sell local agricultural produces

Category	ID	Identified Planning Issue	Justification	Consequences for Residents & Implication for Urban Planning	References and [Solutions in Erbil 2050 MP]
			agriculture: see *Section 6.1.2 (12)*		Engage in more qualitative agriculture in order to compete with imported products
Economic Sectors & Productive Industry (ECO)	ECO-01	Undiversified economy mostly relying on oil revenues	*Section 6.2.1* HS-11	Vulnerability to global oil price fluctuations Limited economic growth opportunities outside of the oil sector Overreliance on a single resource that is finite and non-renewable Lack of economic resilience and stability	Encouraging economic diversification through land use planning and development initiatives of various types of industrial zones *Except this, Erbil 2050 MP has limited leverages on this issue* Promoting and supporting small and medium-sized enterprises in various sectors Fostering innovation and entrepreneurship in new and sustainable industries Encouraging and facilitating foreign direct investment in non-oil sectors
Tourism (TOU)	TOU-01	Tourism sector with high potential but requesting more value-addition of urban heritage including the Citadel	*Section 6.3.1* PM1-14 (renovation needed of Sheikhalla and Qaisary markets)	Missed opportunities for economic development through heritage-based tourism Neglect of important cultural and historical sites Loss of cultural identity and sense of place Potential damage to fragile heritage sites due to increased traffic and overcrowding	Integrating heritage and archeological site preservation into Zoning Scheme of Municipality 6 Enhancing the accessibility and visibility of heritage sites through improved walking, transportation and signage *Except this, Erbil 2050 MP has limited leverages on this issue* Revitalizing the Citadel with various sustainable economic activities Encouraging sustainable tourism development that prioritizes the preservation of heritage sites and the local community
Basic Urban Infrastructures (BUI)	BUI-01	Incomplete penetration of basic urban infrastructure	PM5-4 PM3-2	Inadequate access to basic services such as clean water, sanitation, and electricity leading to poor living conditions for low-income population. Geographical disparities between communities living in the same city leading to social unrest.	Prioritizing investment in underserved areas to ensure equitable access to services. Engaging communities in the planning and decision-making processes to ensure their needs and priorities are considered.
Water Supply (WSU)	WSU-01	Low water use efficiency evidences by high water consumption by households and high Non-Revenue Water (NRW)	*Section 8.2.2* HS-08 PC-04 PM1-4 PM6-1	Strain on water resources and infrastructure, leading to potential water shortages and service disruptions. Increased energy use and greenhouse gas emissions associated with water treatment and distribution. Higher water bills for households and reduced affordability for low-income residents. Reduced municipal revenue for water utilities due to water losses from leaks and theft.	Implement water metering and billing systems that encourage conservation and discourage waste. Invest in water-efficient technologies and appliances in buildings, and provide incentives for their adoption. Conduct regular maintenance and repair of water infrastructure to reduce NRW. Use smart water management systems to detect leaks and monitor usage patterns. Promote water-saving landscaping and green infrastructure practices in urban design and planning.
	WSU-02	Limited water supply capacity	*Section 8.2.2* PC-19	Scarcity of clean water for households for drinking,	Urgent implementation of Ifraz 4 water treatment plant.

Category	ID	Identified Planning Issue	Justification	Consequences for Residents & Implication for Urban Planning	References and [Solutions in Erbil 2050 MP]
		and continuous 24-hour service	(insufficient water capacity)	cooking, and other daily activities. Overreliance on ground water sources leading to depletion and degradation (HYD-01). Inadequate firefighting capacity in emergency situations. Geographical disparities between communities living in the same city leading to social unrest.	Control of water consumption through water demand management.
	WSU-03	Very high turbidity of raw water	*Section 8.2.2*	Poor drinking water quality: High turbidity levels can make the water unsafe for human consumption, as it can contain harmful microorganisms, chemicals, and other contaminants. Increased treatment costs. Negative impact on aquatic ecosystems, as it can reduce the amount of light reaching aquatic plants, limiting photosynthesis and affecting their growth (BIO-02).	Develop a business continuity plan (BCP) to ensure that services can continue to be provided even in the event of an emergency such as high turbidity of raw water. Construction of sediment ponds and retention basins to capture and treat runoff from construction sites and other land-disturbing activities (agriculture, industry) through sustainable ecological engineering.
Stormwater Management (STO)	STO-01	Lack and poor maintenance of stormwater drainage infrastructure	*Section 8.3.2* PC-13 Stormwater drainage infrastructure only covers 20% of Erbil city.	Aggravating flooding phenomenon (CLI-01) Aggravating surface water pollution (POL-04)	Green infrastructure such as rain gardens, vegetated roofs, and permeable pavements, which can help to manage stormwater runoff sustainably (GAM-01, 05 & 07). Regular maintenance of existing drainage systems. Extension of stormwater drainage network in the city.
Wastewater (WWT)	WWT-01	Inadequate sewerage system and limited treatment capacity	*Section 8.3.2* PC-15 PC-16 PM6-2 PM6-3 PM1-2 PM4-2	Contamination of groundwater and surface water sources with untreated or partially treated sewage (POL-04). Increased risk of waterborne diseases and illnesses among populations. Unpleasant odors and unsanitary conditions in communities, leading to a decline in quality of life. Overloading of existing sewerage systems, leading to blockages, backups, and spills.	Improve the performance of existing facilities, including cleaning and updating existing sanitation facilities, rehabilitating drainage channels and planning for regular sludge withdrawal. Plan sludge treatment facilities. Assess the current status of stormwater drainage facilities and develop an improvement plan (STO-01).
Waste production (WPR)	WPR-01	Relatively high daily solid waste production rate per capita	*Section 8.4.2* PMB-1	Increased solid waste production results in the depletion of natural resources and can lead to pollution and contamination of soil, air, water and ecosystems (BIO-01 & 02). Large area needed for landfill constraints future urban development. Increase costs for collection, transportation, and disposal.	Encouraging recycling, composting, and reducing packaging can reduce the amount of waste generated. Improving collection and transportation infrastructure, as well as increasing the capacity of landfills, can reduce the impact of solid waste on the environment. Restoration of existing landfills by soil and groundwater remediation and then reclamation through repurposing for other uses,

Category	ID	Identified Planning Issue	Justification	Consequences for Residents & Implication for Urban Planning	References and [Solutions in Erbil 2050 MP]
					such as parks, forests or recreational areas.
	WPR-02	Irregular dumping of hazardous (medical & industrial) waste	*Section 8.4.1*	Contamination of soil, water, and air. This pollution can harm plant and animal life in the affected areas and have long-term effects on ecosystems (BIO-01 & 02). Exposure to toxic chemicals can cause a range of human health problems, from skin irritation and respiratory problems to cancer and neurological disorders.	Establishment of facilities or stations to treat hazardous waste from sectors (industrial, health, analytical and educational laboratories).
Electricity (ELC)	ELC-01	Incomplete electricity penetration rate of the power grid	*Section 8.5.1* PC-12 HS-07	Increased energy poverty and impacts the overall quality of life for residents, as well as their ability to participate in economic and social activities. Limited access to essential services such as lighting, cooling, and heating, which can negatively impact the health and well-being of residents. Forcing household to find alternatives on non-renewable energy sources such as fossil fuels (ELC-03).	Developing micro-grid systems that provide stable and reliable access to electricity to underserved communities. Encouraging renewable energy development such as solar and wind, and support the integration of renewable energy into the electricity grid. Improving energy infrastructure, such as power transmission and distribution lines, to increase access to electricity. Raising awareness and promoting energy conservation
	ELC-02	Instability of electricity grid leading to frequent power cuts	*Section 8.5.1* PC-10 PC-11 HS-07	Disruption of daily life and business operations. Damage to electronic equipment due to sudden power outages. Public safety concerns, especially for vulnerable populations like the elderly and medical facilities in a context of temperature rise and urban heat island (CLI-02). Increased carbon emissions as backup generators may be used in hotels, businesses and homes (ELC-03).	Diversify energy sources and invest in renewable energy infrastructure. Implement smart grid technologies for more efficient energy management. Improve energy efficiency of buildings through design and construction standards. Promote distributed generation and microgrids to increase energy resiliency. Create emergency response plans for power outages and coordinate with community resources.
	ELC-03	Dependency of a large portion of households on private generators	PC-22	Reliance on non-renewable energy sources such as fossil fuels can lead to increased air and water pollution (POL-01 & 04), and contribute to climate change. Higher energy costs for households (PC-22). Noise pollution and disturbance to local neighborhoods. Inefficient energy use and potential overuse of non-renewable resources.	Promote the expansion of reliable and affordable public electricity grids to reduce dependence on private generators (ELC-01). Encourage the use of clean and renewable energy sources for both public and private electricity generation. Regulate the installation and operation of private generators to ensure safety and mitigate noise pollution.
Transportation & Mobility (TRA)	TRA-01	High dependency on private cars for commuting and other trips	Over 70% of commuting is done by private car (Household Survey)	Important traffic congestion and air pollution (POL-01). Increased transportation costs for households. Increased risk of accidents and injury.	Encourage compact, mixed-use neighborhoods that allows for a range of transportation options, including public transportation, walking, and biking Develop and implement transportation demand

Category	ID	Identified Planning Issue	Justification	Consequences for Residents & Implication for Urban Planning	References and [Solutions in Erbil 2050 MP]
				Lack of physical activity and increased health problems. Increased greenhouse gas emissions and contribution to climate change.	management programs, such as car sharing and telecommuting programs, to reduce the number of single-occupancy vehicles on the road. Provide incentives for the development of alternative transportation options, such as high-speed rail and bus rapid transit (TRA-02).
	TRA-02	Lack of efficient public transport system	PM2-4 PM4-4 PM5-8	High dependency on private cars for commuting and other trips (TRA-01) Social exclusion and reduced mobility for low-income, elderly, and disabled residents.	Promote urban cores that can welcome the development of transit-oriented development (TOD) projects that integrate public transport and housing. Provide incentives for sustainable modes of transportation, such as bike-share programs and carpooling. Implement zoning and land use policies that encourage mixed-use development and reduce dependence on private cars.
	TRA-03	Lack of walkability and low adoption of walking and cycling as modes of transportation	PMA-2	Increased reliance on personal vehicles (TRA-01), leading to traffic congestion and increased carbon emissions. Reduced physical activity and associated negative health impacts. Poor safety for pedestrians and cyclists due to inadequate infrastructure and insufficient safety measures. Reduced social interaction and community cohesion due to less pedestrian activity.	Prioritize the development of safe and accessible pedestrian and cycling infrastructure, such as dedicated bike lanes, sidewalks, and crosswalks. Implement traffic calming measures, such as speed humps or roundabouts, to reduce vehicle speeds and improve safety for pedestrians and cyclists. Implement demand management strategies, such as congestion pricing or parking pricing, to incentivize the use of alternative modes of transportation.
	TRA-04	Low visibility of lane markings on urban roads	*Section 7.1.1(3)*	Confusion for car drivers, but also pedestrian and cyclists. Safety problems and increased risk of accident especially at night or during rain events. Decreased efficiency of traffic flow. Increased traffic violations. Decreased trust in road infrastructure.	*Erbil 2050 MP has limited leverages on this issue* Improve the quality and durability of road markings through better material selection and regular maintenance. Use smart materials that can be more easily seen by drivers, such as reflective paints or thermoplastics. Improve street lighting to enhance visibility at night. Implement traffic calming measures such as speed humps or chicanes to slow traffic and reduce the risk of accidents.
	TRA-05	Deterioration, bad state and lack of roads	*Section 7.1.1(3)* PC-03 (bad state of roads) HS-09 PM1-7 PM5-2 PC-20 (lack of roads)	Reduced access to essential services such as healthcare, education, and employment. Increased transportation costs for individuals and businesses due to vehicle damage and maintenance costs. Reduced economic productivity due to inefficiencies in the	Prioritize maintenance and repair of existing road networks to ensure safety and reliability. Increase investment in public transport infrastructure to provide alternative transportation options.

Category	ID	Identified Planning Issue	Justification	Consequences for Residents & Implication for Urban Planning	References and [Solutions in Erbil 2050 MP]
				transportation network. Public safety concerns due to increased accidents and difficulty in emergency response.	
	TRA-06	Road congestion in particular in central zone inside 60-meter road and sporadically at U turn points of roads	*Section 7.1.1(3)* *Section 7.1.3* Majority of commuting is concentrated towards central zone inside 60m road	<u>For citizens:</u> Increased travel time and frustration for drivers. Air pollution including particulate matter and nitrogen oxides, which can have negative impacts on public health (POL-01). Noise pollution which can negatively affect residents' quality of life and health. Reduced mobility for people to access employment, education, healthcare, and other essential services. Economic costs including lost productivity and high energy consumption (PC-22). <u>For urban planning:</u> Consider land use patterns that reduce the need for car trips, such as compact, mixed-use development patterns (traffic modeling will be done for each development alternative). Consider public transport systems to reduce traffic congestion, and prioritize investments in alternative modes of transportation such as biking and walking.	Completion of Erbil road network with the construction of 150-meter road (PMB-14). Construction of congestion avoidance infrastructure such as bridges (PM4-3 & PM5-6) and bypass streets (PM4-6). Implement efficient road network design, including reducing the number of U-turn points in central areas and using roundabouts or other efficient traffic flow designs (PM3-5). Rationalize commercial land use and limit mixed-use in poorly deserved dense areas to limit congestion (PM4-5). Promote mixed-use neighborhoods that allows individuals to live, work, and access essential services within a compact area, reducing the need for long commutes. Encourage alternative modes of transportation such as cycling or walking through improved infrastructure and incentives. Use smart city technologies to optimize traffic flow and reduce congestion on road networks.
	TRA-07	Insufficient and unregulated parking system	*Section 7.1.1(4)* PM1-8 PM2-3 PM6-8	Traffic congestion made of cars that are not able to find a parking lot, leading to increased air pollution and noise pollution. Decreased accessibility for non-motorized modes of transportation. Miss to win for municipal finances for not enforced fine policies in case of illegal parking.	Implementing demand-based pricing for parking spaces. Implementing regulations for maximum parking capacity and ratios in Zoning Scheme. Encouraging the use of public transportation, cycling and walking. Provide incentives in Zoning Scheme for retail developers who develop solutions for parking such as shared and automated parking systems. Encouraging the development of park and ride facilities near public transportation hubs.
Public Facilities (PBF)	PBF-01	Deficit of educational & healthcare public facilities to match the needs of citizens	*Section 9.1* PC-01 PC-05 PC-06 PM1-6 PM2-1 PM4-1	Increased inequality in access to essential services, leading to negative impacts on health and well-being. Increased healthcare costs due to the reliance on private education and healthcare services (PBF-05). Negative impacts on social cohesion due to disparities in access to public services. Reduced educational and employment opportunities	Enforce zoning regulations to ensure equitable distribution of public facilities across the city. Prioritize the development of multi-use facilities that can serve multiple purposes, such as combining a school and a community center in one building. Develop policies and incentives to encourage the private sector to invest in the development of public facilities.
	PBF-02	Inequal penetration rate of public facilities among sectors and neighborhoods throughout Erbil	*Section 9.1* PM5-7 PC-24: lack of security infrastructure, in link with		

Category	ID	Identified Planning Issue	Justification	Consequences for Residents & Implication for Urban Planning	References and [Solutions in Erbil 2050 MP]
			feeling of unsafety (SOC-09)	for individuals due to inadequate access to education and training facilities, leading to an economic deficiency and lack of competitiveness of the region.	Promote the development of mixed-income neighborhoods that include public facilities as part of the community design. Implement public-private partnerships to support the development of new facilities, including hospitals, schools, and community centers.
	PBF-03	Distance of public facilities from residential neighborhoods and inadequate size and infrastructure of public facilities	*Section 9.1* PM1-13		
	PBF-04	Encroaching and land use change of public land reserves planned for public facilities	-	Public reserved land planned for public facilities, being often replaced by another land use, shall be secured. Necessary large-scale land opportunities shall be secured as early as possible in the outskirts of the city.	Strict enforcement of zoning regulation contained in urban planning documents such as Zoning Scheme and Detailed Plans by relevant local administration and agencies.
	PBF-05	Spreading of private schools & clinics as supplier of education and health services	-	Exclusion of lower social classes from accessing decent educational & healthcare services. Overcrowding in certain areas due to the concentration of private schools and clinics, leading to traffic congestion (TRA-06)	Provide incentives for private institutions to serve underrepresented communities or to partner with public institutions to expand access to quality education and healthcare.
Green Area Management (GAM)	GAM-01	Lack of green areas in particular small-scale green spaces within the urban fabric	*Section 10.1.3* PC-02 HS-03 PM2-1 PM3-3 PM5-3 PM6-5 PMA-1 PMA-2 Creation of new Green Areas identified as 1st Hope in SEA Public Consultation (43 opinions, 16.9%) Lack of green space mentioned as 1st reason of dissatisfaction with Green Areas (61 households, 52,1%) in Household Survey Needed for carbon sequestration	Creation of green and public spaces is an opportunity to struggle against various environmental problems and foster walkability. Public Domain shall be maintained in planning.	Foster the multiplication of small-scale public green spaces in the urban fabric especially in lands owned by the municipality (PM1-1) and for example in cemeteries (PM3-4)
	GAM-02	Lack of major forest or green belt at the large metropolitan scale		Reduced biodiversity and habitat loss for wildlife (BIO-1). Increased air and water pollution due to lack of natural filtration and oxygenation (POL-01) and acceleration of climate change. Higher temperatures and reduced air quality due to lack of shade and cooling effects (CLI-02). Increased risk of flooding and erosion due to lack of natural water absorption and retention (CLI-01). Aggravation of the effects of dust storms (CLI-03).	Establish green belts and forested areas around the periphery of large metropolitan areas to promote ecological connectivity and maintain natural habitats.
	GAM-03	Over-scale of green areas and isolation from residential areas			Develop green areas that are easily accessible from residential areas, by reducing the scale (GAM-01) and exploring various greening types (GAM-04).
	GAM-04	Lack of diversity in greening typology			Consider the planning and development of various types of urban green areas, including the following. Urban parks and gardens (large green spaces designed for recreational and social purposes), Green corridors and networks (linear green spaces that connect larger green areas and promote ecological connectivity and the flow of natural resources), Street trees and urban forests (planted along streets and in public spaces that can provide shade, reduce air pollution, and improve the aesthetic quality of urban areas), Road median strip greening (PMB-4), Green roofs and walls (to reduce the urban heat island effect, improve
	GAM-05	Unbalanced coverage of green areas over Erbil's urban extent	Concentration of parks and green areas mostly in the eastern and south-eastern parts of Erbil		

Category	ID	Identified Planning Issue	Justification	Consequences for Residents & Implication for Urban Planning	References and [Solutions in Erbil 2050 MP]
					energy efficiency, and enhance biodiversity), Rain gardens and bioswales, Community gardens and urban agriculture, etc.
	GAM-06	Deficiency of water for irrigation of green areas	HYD-01		Use drought-resistant plant species that require less water for irrigation in public parks and green spaces. Promote the use of recycled water and rainwater harvesting for irrigation of public green spaces. Encourage the use of sustainable irrigation systems, such as drip irrigation or smart irrigation technology, that use water more efficiently. Create green spaces that are multi-functional, such as community gardens or urban farms, which can provide food as well as recreational opportunities.
	GAM-07	Unsafety of green areas	Mentioned as 2nd reason of dissatisfaction with Green Areas and Open Spaces (32 households, 27.4%) in the Household Survey	For citizens: feeling unsafety in parks leads to limit their access to outdoor recreation and green spaces, leading to decreased physical activity and social connectedness. For urban planning**:** unsafe green spaces can lead to a loss of trust in the ability of public authorities to provide safe and livable public spaces, then decrease investment in public spaces and make it more difficult to attract businesses and residents to the area.	Designing green spaces with safety in mind: proper general lighting, well-lit pathways, clear sight lines, and easily visible exits. Providing amenities such as restrooms, water fountains, and seating can help to attract more users to green spaces and increase a sense of ownership and pride in the space. Improving accessibility to green spaces, such as through the creation of pedestrian and bike-friendly pathways, can make it easier and safer for people to access and use the spaces.
Urban Landscape (ULA)	ULA-01	Car-oriented urban design, lack of sidewalks and planted trees	-	Decreased physical activity and increased health problems. Decreased sense of community and social interaction. Obstacle to develop walkability potential (TRA-03) Decreased pedestrian safety. Absence of shadow and cooling effect from sidewalk trees leads to more adverse impacts of high temperature (CLI-02).	Implement walkable urban design principles in Zoning Schemes and new development and redevelopment projects. Provide safe and accessible sidewalks and pedestrian crossings. Encourage the planting of street trees and green strips to improve the urban environment (GAM-04). Develop and implement educational programs and events that raise awareness of the importance of walkable urban design and active transportation options.
	ULA-02	Aerial cables and poles unpleasing for urban landscape coherence	-	Decreased visual appeal of the city. Decreased sense of pride in the city. Decreased economic benefits from tourism.	Develop and implement a comprehensive plan for undergrounding utility lines (PM1-5) Installation of trenches in the pavement for electricity cables, internet, cameras, etc. (PM6-6) Encourage the use of new technologies that reduce the number of aerial cables and poles.

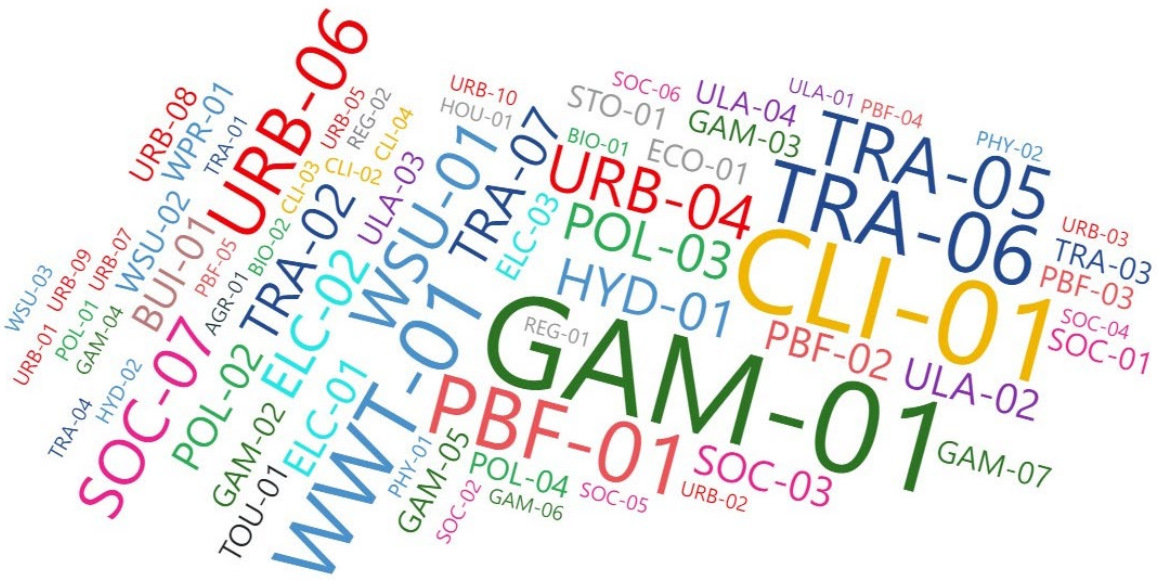
Category	ID	Identified Planning Issue	Justification	Consequences for Residents & Implication for Urban Planning	References and [Solutions in Erbil 2050 MP]
					Provide incentives in Zoning Scheme for building owners and developers to underground utility lines. Establish a city-wide task force to coordinate the undergrounding of utility lines and ensure that it is done in a consistent and efficient manner.
	ULA-03	Citadel's outstanding urban landscape not enough visible and highlighted at the scale of the city	-	Decreased sense of identity and pride in the city. Lack of recognition and appreciation of the city's cultural and historic resources. Risk of removal of UNESCO status in case of major landscape change of the surroundings. Decreased economic benefits from tourism and cultural heritage if the latter is not highlighted correctly.	Building height regulations in the surroundings of Citadel to increase the viewpoints from all the city (PM2-2). Develop and implement a consistent Urban Landscape Master Plan that identifies the visibility cones on city's landscape and cultural resources such as the Citadel. Provide incentives for building owners and developers to preserve and incorporate the city's cultural heritage into new buildings and public spaces.
	ULA-04	Unharmonized building height	PM2-6	Disruptive visual impact on the surrounding environment. Increased shadowing and reduction of sunlight. Decreased wind quality and increased wind velocity. Decreased sense of community and loss of social cohesion.	Considering the height of the buildings according to the airport guideline (PM2-6). Implement clear and consistent zoning regulations in Zoning Scheme that control building height and massing in order to be able to make shadow casting simulation.

Source: JICA Project Team

The relative importance of each of the 70 Planning Issues described above can be weighted based on the number of recommendations that they have received from citizens (see Section 4.1.1) and municipality directors (see Section 4.1.2) in addition to their identification by experts, as shown in Figure 4.1.2 below.

The 5 most important Planning Issues according to the number of recommendations are the following.

- GAM-01: Lack of green areas in particular small-scale green spaces within the urban fabric (10 recommendations);
- CLI-01: Intense rainfall causing flooding (9 recommendations);
- WWT-01: Inadequate sewerage system and limited treatment capacity (6 recommendations);
- TRA-06: Road congestion in particular in central zone inside 60-meter road and sporadically at U turn points of roads (6 recommendations);
- PBF-01: Deficit of educational & healthcare public facilities to match the needs of citizens (6 recommendations).



Source: JICA Project Team

Figure 4.1.2 Word Cloud of Weighted Planning Issues

(2) Crossover Strategic Planning Issues

1) Urban Structure Dispersion

Cities with organized urban structure typically have a Central Business District (CBD) where the majority of commercial, administrative, and employment functions are concentrated. This type of urban structure is commonly found in European cities and other cities that have been planned and developed over time according to a specific urban design. On the other hand, cities with dispersed urban structure, typically found in developing countries, tend to have a more unplanned and haphazard distribution of urban functions. This can be due to a lack of comprehensive planning and zoning regulations, as well as rapid and uncoordinated urbanization. In these cities, the urban functions tend to be spread out over a larger area without a clear center or central business district. This can lead to a number of negative consequences such as increased traffic congestion, poor accessibility, and a lack of a sense of community.

Nevertheless, cities can choose to promote a dispersed urban structure, such as in Main Development Concept included in Erbil 2030 MP (See Section 3.1.2).

It's important to note that these potential advantages of dispersed urban structure are not always realized and can depend on the context and the specific implementation of urban planning. It is important to balance the potential benefits with the drawbacks and come up with a comprehensive urban plan that addresses both.

Table 4.1.5 Advantages & Drawbacks of a Dispersed Urban Structure

Drawbacks		Advantages	
Increased transportation distance and costs	With urban functions spread out over a larger area, residents may have to travel longer distances to access jobs, services, and other amenities. This can lead to increased transportation costs, longer commute times, and increased air pollution from cars and other vehicles.	Reduced traffic congestion	With a dispersed urban structure, traffic congestion tends to be spread out over a larger area, rather than concentrated in a central business district. This can make it easier for residents to move around the city, if road infrastructure is adequately planned.
Reduced accessibility	A dispersed urban structure can make it difficult for residents to access essential services and amenities, such as healthcare, education, shopping and parks. This can lead to increased poverty and social exclusion for certain groups of people, such as the elderly, low-income households, and people with disabilities.	More housing options	A dispersed urban structure can provide more housing options for people, as there is a greater supply of land available for development. This can be beneficial for low-income households, as well as for people who prefer to live in single-family homes or in more suburban areas.
Reduced economic efficiency	A dispersed urban structure can make it difficult for businesses to cluster together, which can be detrimental to economic growth and productivity.	Increased economic opportunities	With a dispersed urban structure, there may be more opportunities for businesses to locate in different parts of the city, which can promote economic growth and create jobs.
Environmental degradation	A dispersed urban structure can lead to urban sprawl and increased land consumption, which can contribute to the destruction of natural habitats and ecosystems.	More opportunities for recreation and open space	With a dispersed urban structure, there is typically more open land available for parks, trails, and other recreational opportunities.
Reduced resilience to climate change and natural disasters	A dispersed urban structure can make it more difficult to respond to climate change and natural disasters, as emergency services and infrastructure may not be able to reach affected areas quickly.	Lower land prices	With a dispersed urban structure, land prices tend to be lower than in more compact, centralized cities. This can make it more affordable for people to buy or rent property.
Lack of a sense of community	Without a clear center or central business district, dispersed cities can lack a sense of community and social cohesion. This can make it difficult to create a shared sense of identity and belonging among residents.	-	-

Source: JICA Project Team

2) Expendable Ring Roads & Radial Grid

Cities often develop based on a road network consisting of ring roads and radials, where ring roads encircle the city centre and radials connect it to the suburbs. This model allows for efficient traffic flow and facilitates urban expansion. However, it is not the only model available. Some cities have grid-like street patterns or organic, non-linear street networks that arise from historical or geographical factors. Additionally, recent developments in transportation technology, such as the rise of mass transit systems, are leading to rethinking of traditional urban planning approaches. Advantages and drawbacks of the Expendable Ring Roads & Radial Grid Model promoted by Erbil 2030 MP is shown in Table 4.1.6 below.

Table 4.1.6 Advantages & Drawbacks of Expendable Ring Roads & Radial Grid Model

Drawbacks		Advantages	
Detour	Increase of necessary driving distance which leads to lack of sense of proximity.	Reduced congestion in the city center	By routing through traffic around the perimeter of the city, rather than through it, ring roads can help reduce congestion and improve traffic flow in the city center.
Increased suburban sprawl on unsuitable lands	Concentric development of the city in all directions can encourage suburban development, which can lead to urban sprawl on suitable lands, such as precious agricultural lands, archeological sites or groundwater recharge zones, in short, on lands that had an important intrinsic role.	Improved accessibility	Ring roads and radials can provide multiple points of entry and exit for a city, which can make it easier for people to get in and out of the city.
Increased air pollution	By routing more traffic around the perimeter of the city, ring roads and radials can increase air pollution in suburban areas.	Reduced travel time	By providing a network of roads that bypass the city center, ring roads and radials can help reduce travel time for people traveling through the city
Increased noise pollution	Ring roads and radials can also increase noise pollution in suburban areas, which can negatively impact the quality of life for residents.	-	-
Higher cost of maintenance and construction	Building and maintaining ring roads and radials can be more expensive than building and maintaining a traditional grid-based road network.	-	-
Community splitting	Ring Roads cuts residential areas in the middle, thus disconnects both sides of the neighborhood.	-	-

Source: JICA Project Team

4.2 Long-term Development Vision

4.2.1 Update of Long-term Development Vision from Erbil 2030 to 2050 MP

As mentioned in Section 3.1.1, KRG government is attached to the Long-term Development Vision classified under 4 themes. The update of Long-term Development Vision from Review is shown in Table 4.2.1. Factors of change and integration are clearly marked in the central column, and modifications and additions are underlined in the right column. Nevertheless, Long-term Vision for Erbil 2050 MP shall not only be based on the review of the current Long-term Vision of Erbil 2030 MP, but also on the consideration of new challenges and agendas identified. Those are also mentioned in the Table below.

Table 4.2.1 Update of Long-term Development Vision from Erbil 2030 MP to 2050 MP

(1) City role

Long-Term Vision in Erbil 2030 MP	Factors of Change & Integration	Updated Long-Term Vision in Erbil 2050 MP (modifications and additions are underlined)
1. Major Trading Centre Vision: A major trading center, similar to Dubai.	Partial change from Erbil 2030 MP Review	**1. Major Trading Core:** Enable Erbil as an active cog connected within various large-scale international and regional trading networks.
2. Administrative Capital Vision: The administrative capital of Iraq Kurdistan Regional Government, Erbil Governorate, Erbil Municipality, and any future larger Kurdistan association.	Partial change from Erbil 2030 MP Review	**2. Efficient Administrative Capital:** Improve and rationalize land use of governmental areas
3. International Quality Service Centre Vision: Meeting the higher-level needs (e.g. international quality universities, training centers, specialist hospitals, sports and other national facilities, and international business services) for all who live or work in KRI.	- Complete integration from Erbil 2030 MP Review; - In line with KRG Vision 2030 regarding importance of international ambitions.	**3. International Quality Service Centre:** Meeting the higher-level needs (e.g. international quality universities, training centers, specialist hospitals, sports and other national facilities, and international business services) for all who live or work in KRI.
4. Globally Significant Petrochemicals Industries Vision: Serving the needs of globally significant oil and gas industries within KRG, especially in conjunction with the World Bank proposed Ararat "Industrial City".	- Discontinuation from Erbil 2030 MP Review; - In line with KRG Vision 2030 regarding economic diversification.	**4. Diversified Economy:** Diversifying Erbil's economy, based on, for example petrochemical industry and agriculture, for a stronger, more resilient future for Kurdistan. By spreading economic risk across different industries and sectors, we can protect ourselves from market fluctuations and ensure sustainable growth for all.
5. Affordable Good Quality of Life Vision: Providing a good quality of life for people of all income levels who live or work in the expanded city. This includes choice of jobs, affordable housing, shops, services and access to social and recreational facilities; an attractive environment, and a low cost of living.	Partial change from Erbil 2030 MP Review	**5. Accessible & Affordable Services for Good Quality of Life:** As already stated in Iraqi urban planning criteria and housing standards, providing a good quality of life for people of all income levels who live or work in all the neighborhoods of the expanded city. This includes choice of jobs, affordable housing, easily accessible shops, social services and recreational facilities; an attractive environment, and a low cost of living.
6. Kurdish Homeland Vision: The city of Kurdish culture, that Kurds and others can be proud of, and a place of return for Kurds living or working in other countries.	Partial change from Erbil 2030 MP Review	**6. Kurdish Global city:** The city of Kurdish culture, honoring and preserving Kurdish identity and tradition, while embracing international diversity.

(2) City character

Long-Term Vision in Erbil 2030 MP	Factors of Change & Integration	Updated Long-Term Vision in Erbil 2050 MP (modifications and additions are underlined)
1. Unique Character Vision: A capital city worthy of the Kurdish people, with its own distinctive character. A pleasure to live in, work in and visit. Not an "anywhere city".	Complete integration from Erbil 2030 MP Review	**1. Unique Character Vision:** A capital city worthy of the Kurdish people, with its own distinctive character. A pleasure to live in, work in and discover, not just another anywhere destination.
2. Spacious City Vision: A predominantly low-density city, that has space for all activities, extensive landscaping and open spaces, free-flow transport, housing that meets people's preferences, and room for future expansion of local facilities. Not a congested city.	Discontinuation from Erbil 2030 MP Review	**2. Rationally & Reasonably Dense City:** A city which urban functions and densities are rationally and reasonably distributed, that has space for all activities, extensive landscaping and open spaces, free-flow transport, housing that meets people's preferences, and room for future expansion of local facilities. Not a congested city.
3. Rivers and Water Features Vision: A city that is renowned for its relationship with water, a relationship that Kurdish settlements have had throughout history. The improvement of existing watercourses and the creation of new ones throughout the existing and expanded city. The inclusion of water storage lakes, ponds, fountains and other water features for recreation, sport and amenity.	- Partial change from Erbil 2030 MP Review; - Considering SEA environmental issue "Risk of Water Disaster".	**3. Water-Conscious City:** A city that is renowned for its relationship with water, a relationship that Kurdish settlements have had throughout history. The non-encroachment and improvement of existing watercourses and the careful creation of new ones throughout the existing and expanded city. The inclusion of water storage lakes, ponds, fountains and other water features for recreation, sport and amenity to tackle flooding hazards and water scarcity problems.
4. Urban Greenways Vision: City-wide networks of landscaped parkland with picnic areas; pedestrian and cycle routes linking activity points such as public open spaces, sports fields, schools, shops, housing areas, work locations and countryside trails; including shade trees and other shade structures. A Green City, known for its water features, urban greenways, other landscaping, and generally for its cultured people-friendly character. A city not dominated by motor vehicles.	- Partial change from Erbil 2030 MP Review; - Considering SEA environmental issues relating to green areas.	**4. Green Fortress & Haven City:** A city that is protected by large-scale outside green spaces which sequestrate carbon and minimize the effects of dust storms, and in the inside, city-wide networks of landscaped parkland with picnic areas; pedestrian and cycle routes linking activity points such as public open spaces, sports fields, schools, shops, housing areas, work locations and countryside trails; including shade trees and other shade structures. A Green City where the temperature cools down at night, known for its water features, urban greenways, other landscaping, and generally for its cultured people-friendly character. A city not dominated by motor vehicles.
5. Congestion-Free Transport Vision: A genuine choice of affordable private or public transport, with an excellent public transport system that reduces the need to use cars. No significant traffic congestion, and pedestrian friendly local streets.	Partial change from Erbil 2030 MP Review.	**5. Public Transit-based Walkable City:** A genuine choice of affordable private or public transport, easily interchangeable through modal change, with an excellent public transport system that reduces the need to use cars. A walkable city where all commodities are reachable by walking 15 minutes.
6. City of Culture Vision: A city that stimulates the arts as well as being a thriving trading center. A city where public art is widespread and meaningful, especially that pertaining to Kurdish heritage and culture.	Partial change from Erbil 2030 MP Review.	**6. City of Culture & Modernized Heritage:** A modernized city rooted in its traditional culture and heritage, that stimulates the arts as well as being a thriving trading center. A city where public art is widespread and meaningful, especially that pertaining to Kurdish heritage and culture.
7. Variety and Identity Vision: A city that has a rich variety of different areas with their own identifiable characters, including gateway features that mark their entries and exits. Distinguished landmark buildings and other structures	Complete integration from Erbil 2030 MP Review	**7. Variety and Identity:** A city that has a rich variety of different areas with their own identifiable characters, including gateway features that mark their entries and exits. Distinguished landmark buildings and other structures that provide identity when moving

Long-Term Vision in Erbil 2030 MP	Factors of Change & Integration	Updated Long-Term Vision in Erbil 2050 MP (modifications and additions are underlined)
that provide identity when moving around the city. All utility cables, wires and pipes underground. A city of surprises, with neighborhoods in which local people can identify and be proud of.		around the city. All utility cables, wires and pipes underground. A city of surprises, with neighborhoods in which local people can identify and be proud of.
8. Sustainability Vision: A city that seeks to be cost-effective over the short, medium and long terms, not sacrificing future economic, social or environmental (natural and built) well-being for short-term gains. A city that cares for people and the natural environment.	Complete integration from Erbil 2030 MP Review	**8. Carbon-Neutral & Sustainable City:** A city that seeks to be cost-effective over the short, medium and long terms, not sacrificing future economic, social or environmental (natural and built) well-being for short-term gains. A carbon-neutral city. A city that cares for people and the natural environment.
(Inside 8. Sustainability Vision) A healthy city.	Extracted as New Vision Statement	**9. Healthy City:** A city that prioritizes the well-being of its citizens, characterized by clean water and air, low noise levels, ample opportunities for physical exercise through everyday walking and cycling, and easy access to comprehensive health services.

(3) International business centre

Long-Term Vision in Erbil 2030 MP	Factors of Change & Integration	Updated Long-Term Vision in Erbil 2050 MP (modifications and additions are underlined)
1. Hub City Vision: The premier regional trading center for goods and services being imported to and exported from Iraq and other nearby countries. An export-oriented, private-sector led business community.	Partial change from Erbil 2030 MP Review	**1. Connected Trading Core:** A premier regional trading core connected to Silk Road (to be discussed) and other major trading routes, for goods and services being imported to and exported from Iraq and other nearby countries. An export-oriented, private-sector led business community.
2. Competitive City Vision: Competitive with other trading centers, in terms of costs, efficiency and general ease of doing business. An enabling business environment. The absence of disabling obstacles to working and living.	Complete integration from Erbil 2030 MP Review	**2. Competitive City Vision:** Competitive with other trading centers, in terms of costs, efficiency and general ease of doing business. An enabling business environment. The absence of disabling obstacles to working and living.
3. Hub Aviation Vision: The hub of aviation-related activities within the region, including services to airlines, international business center, and free trade zone.	Complete integration from Erbil 2030 MP Review	**3. Hub of Aviation Vision:** The hub of aviation-related activities within the region, including services to airlines, international business center, and free trade zone.
4. Long Distance Land Transport Vision: Excellent Road transport links with other cities and towns in KRG and beyond.	Partial change from Erbil 2030 MP Review	**4. Long Distance Land Transport Vision:** Excellent Road, Toll Roads and Rail transport links with other cities and towns in KRG and beyond.
5. Available Serviced Land and Buildings Vision: Always having a large supply of affordable serviced land and buildings available for local and inward investors, especially for exporting businesses.	Complete integration from Erbil 2030 MP Review	**5. Available Serviced Land and Buildings Vision:** Always having a large supply of affordable serviced land and buildings available for local and inward investors, especially for exporting businesses.
6. Food Exports Vision: The center of a thriving agricultural subregion, with extensive food processing and major food export businesses.	Partial change from Erbil 2030 MP Review	**6. Food Sufficiency & Export:** The center of a thriving agricultural subregion, with extensive food processing and major food businesses that can help reaching food security and export.
7. Cybercity Vision: Full Information and Communications Technology (ICT) coverage throughout the city, with quick, efficient and free Internet access to all Government and urban services.	Complete integration from Erbil 2030 MP Review	**7. Cybercity Vision:** Full Information and Communications Technology (ICT) coverage throughout the city, with quick, efficient and free Internet access to all Government and urban services.

(4) Centre for Tourism

Long-Term Vision in Erbil 2030 MP	Factors of Change & Integration	Updated Long-Term Vision in Erbil 2050 MP (modifications and additions are underlined)
1. Multi-Product Tourism Vision: A wide variety of tourist attractions, and levels of affordability, within and outside the city, for both local and international tourists, at all times of the year. World-class product interpretation, niche tourism, tourism promotion, and customer services.	Complete integration from Erbil 2030 MP Review	**1. Multi-Product Tourism Vision:** A wide variety of tourist attractions, and levels of affordability, within and outside the city, for both local and international tourists, at all times of the year. World-class product interpretation, niche tourism, tourism promotion, and customer services.
2. Qalaa Citadel World Heritage Vision: The "jewel in the crown" of heritage tourism in KRG, to rival any other ancient citadel.	Partial change from Erbil 2030 MP Review	**2. Historical and Cultural Tourism:** Centered on renovated and revitalized Citadel, a global tourism strategy based on the enhancement of historical and cultural assets, such as urban heritage and surrounding archeological sites.
3. Mountain Tourism Vision: The development of national parks and visitor centers in suitable locations, with their own memorable identity. Enhancement of indigenous wildlife, vegetation and landscapes, with strong ecotourism.	Partial change from Erbil 2030 MP Review	**3. Nature Tourism:** The development of eco-tourism and eco-leisure parks in suitable locations, with their own memorable identity in link with water and mountain foothills. Enhancement of indigenous wildlife, vegetation and landscapes.

Source: JICA Project Team

4.2.2 Erbil 2050 MP Long-term Vision Statements

Based on the results of the update of Long-term Development Vision of Erbil 2030 presented above and officially validated during 3rd JCC Meeting, the Figure 4.2.1 below shows a global picture of the 25 Vision Statements of Erbil 2050 MP, classified by theme and reordered by importance.

Source: JICA Project Team

Figure 4.2.1 Erbil 2050 MP Long-term Vision Statements

Table 4.2.2 below summarizes the 25 Erbil 2050 MP Vision Statements. It also mentions the existing Planning Issues (See Section 4.1) that will be tackled by the implementation of each Vision Statement. Finally, the Table tentatively proposes indicators that will allow to monitor quantitatively the performance of the implementation of each Vision Statement. In prevision of the implementation of the Erbil 2050 MP and of the management of further MP updates (See Section 11.4), it will be necessary for the C/P agency to assess the relevance of those indicators and the availability of baseline data.

Table 4.2.2 Erbil 2050 MP Vision Statements and Possible Performance Indicators

(1) City role

Long-Term Vision:		Planning Issues:
MTC	**Major Trading Core (MTC)** Enable Erbil as an active cog connected within various large-scale international and regional trading networks.	REG-01 REG-02
Possible Performance Monitoring Quantitative Indicators:		Note:
MTC-1	Trade Volume Growth: Monitor the annual growth in the total value of goods and services traded through Erbil.	
MTC-2	Number of Trading Partners: Quantify the increase in the number of international and regional trading partners connected through Erbil.	
MTC-3	Infrastructure Investment: Track the investment in trading-related infrastructure projects, such as transportation hubs and customs facilities.	
MTC-4	Business District Development: Measure the growth and development of dedicated business districts or trading zones within Erbil to facilitate trade activities.	
DEC	**Diversified Economy (DEC)** Diversifying Erbil's economy, based on, for example petrochemical industry and agriculture, for a stronger, more resilient future for Kurdistan. By spreading economic risk across different industries and sectors, we can protect ourselves from market fluctuations and ensure sustainable growth for all.	ECO-01 AGR-01
Possible Performance Monitoring Quantitative Indicators:		Note:
DEC-1	Economic Diversity Index: Develop an index to measure the diversity of industries in Erbil's economy, including the petrochemical industry and agriculture.	
DEC-2	Economic Resilience Indicator: Assess the city's economic resilience by tracking its ability to withstand market fluctuations and sustain growth during economic challenges.	
DEC-3	Employment Distribution: Quantify the distribution of employment across different industries to ensure a balanced workforce.	
DEC-4	Investment in Agriculture: Measure the amount of investment directed towards the development of the agriculture sector as part of economic diversification.	
IQS	**International Quality Service Centre (IQS)** Meeting the higher-level needs (e.g. international quality universities, training centres, specialist hospitals, sports and other national facilities, and international business services) for all who live or work in KRI.	
Possible Performance Monitoring Quantitative Indicators:		Note:
IQS-1	Number of International Quality Institutions: Count the number of international quality universities, training centres, specialist hospitals, sports facilities, and international business service providers in Erbil.	
IQS-2	Quality of Healthcare Services: Develop a healthcare quality index to assess the standards of healthcare services provided by specialist hospitals.	
IQS-3	Accessibility to National Facilities: Measure the accessibility of national facilities, such as sports complexes, for residents and workers in KRI	
IQS-4	International Business Services Growth: Monitor the growth in the number of international business services available in Erbil.	
AAS	**Accessible & Affordable Services for Good Quality of Life (AAS)** As already stated in Iraqi urban planning criteria and housing standards, providing a good quality of life for people of all income levels who live or work in all the neighbourhoods of the expanded city. This includes choice of jobs, affordable housing, easily accessible shops, social services and recreational facilities; an attractive environment, and a low cost of living.	PBF-01 to 03
Possible Performance Monitoring Quantitative Indicators:		Note:
AAS-1	Affordable Housing Index: Develop an index to measure the affordability of housing for different income levels across all neighbourhoods.	
AAS-2	Accessibility to Social Services: Quantify the accessibility of social services, including healthcare and education, in various neighbourhoods.	
AAS-3	Job Opportunity Index: Assess the availability of job opportunities for residents of all income levels.	
AAS-4	Recreational Facilities Per Capita: Measure the number of recreational facilities per capita to ensure an attractive and balanced environment for residents.	

Long-Term Vision:		Planning Issues:
KGC	**Kurdish Global City (KGC)** The city of Kurdish culture, honouring and preserving Kurdish identity and tradition, while embracing international diversity.	
Possible Performance Monitoring Quantitative Indicators:		Note:
KCG-1	Cultural Preservation Index: Develop an index to measure the effectiveness of cultural preservation efforts, including museums, language education, and historical site conservation.	
KCG-2	International Collaboration Metrics: Quantify the number of international collaborations in cultural exchanges, education, and artistic endeavours to assess the city's embrace of international diversity.	
KCG-3	Tourism Impact Index: Assess the impact of cultural tourism on the city by tracking the number of tourists visiting for cultural experiences and the economic benefits derived from cultural attractions.	
KCG-4	Language Proficiency Levels: Monitor the proficiency levels and usage of the Kurdish language among residents, ensuring the preservation of Kurdish identity.	
EAC	**Efficient Administrative Capital (EAC)** Improve and rationalize land use of governmental areas.	
Possible Performance Monitoring Quantitative Indicators:		Note:
EAC-1	Land Use Efficiency Index: Develop an index to measure the efficiency of land use in governmental areas, aiming to optimize space utilization.	
EAC-2	Operational Cost Reduction: Quantify the reduction in operational costs associated with improved and rationalized land use in governmental areas.	
EAC-3	Streamlined Administrative Processes: Assess the efficiency of administrative processes through metrics such as processing times and cost-effectiveness.	
EAC-4	Employee Satisfaction Index: Measure employee satisfaction with the improved work environment resulting from efficient land use and streamlined administrative processes.	

(2) City character

Long-Term Vision:		Planning Issues:
CNS	**Carbon-Neutral & Sustainable City (CNS)** A city that seeks to be cost-effective over the short, medium and long terms, not sacrificing future economic, social or environmental (natural and built) well-being for short-term gains. A carbon-neutral city. A city that cares for people and the natural environment.	
Possible Performance Monitoring Quantitative Indicators:		Note:
CNS-1	Carbon Emission Levels: Measure and reduce the city's carbon emissions over time, aiming for carbon neutrality.	
CNS-2	Renewable Energy Adoption: Percentage of energy generated from renewable sources within the city.	
CNS-3	Green Building Index: Number of sustainable and energy-efficient buildings constructed.	
CNS-4	Waste Management Efficiency: Increase in recycling rates and reduction in overall waste generation.	
RRD	**Rationally & Reasonably Dense City (RRD)** A city which urban functions and densities are rationally and reasonably distributed, that has space for all activities, extensive landscaping and open spaces, free-flow transport, housing that meets people's preferences, and room for future expansion of local facilities. Not a congested city.	URB-01 URB-02
Possible Performance Monitoring Quantitative Indicators:		Note:
RRD-1	Land Use Efficiency: Evaluate the efficient use of land for various urban functions and activities.	
RRD-2	Public Transport Usage: Percentage of the population using public transportation instead of private vehicles.	
RRD-3	Green Space Ratio: Ratio of green spaces to built-up areas, ensuring sufficient open spaces and landscaping.	
RRD-4	Housing Satisfaction Index: Measure citizen satisfaction with housing options and neighbourhood amenities.	

Long-Term Vision:		Planning Issues:
	**Water-Conscious City (WCC)** A city that is renowned for its relationship with water, a relationship that Kurdish settlements have had throughout history. The non-encroachment and improvement of existing watercourses and the careful creation of new ones throughout the existing and expanded city. The inclusion of water storage lakes, ponds, fountains and other water features for recreation, sport and amenity to tackle flooding hazards and water scarcity problems.	CLI-01 HYD-01
Possible Performance Monitoring Quantitative Indicators:		Note:
WCC-1	Water Quality Index: Monitor and improve the quality of existing watercourses and new water features.	
WCC-2	Flood Resilience: Number of flood-resistant infrastructure and water storage systems implemented.	
WCC-3	Water Recycling Rate: Percentage of water recycled for non-potable uses, reducing overall water consumption.	
WCC-4	Green Infrastructure Expansion: Increase in the area of green infrastructure, including lakes, ponds, and parks.	
	**Green Fortress & Haven City (GFH)** A city that is protected by large-scale outside green spaces which sequestrate carbon and minimize the effects of dust storms, and in the inside, city-wide networks of landscaped parkland with picnic areas; pedestrian and cycle routes linking activity points such as public open spaces, sports fields, schools, shops, housing areas, work locations and countryside trails; including shade trees and other shade structures. A Green City where the temperature cools down at night, known for its water features, urban greenways, other landscaping, and generally for its cultured people-friendly character. A city not dominated by motor vehicles.	CLI-02 GAM-01 to 05
Possible Performance Monitoring Quantitative Indicators:		Note:
GFH-1	Green Cover Percentage: Increase the overall percentage of green cover, including parks and green spaces.	
GFH-2	Pedestrian & Cycle Network: Expand and enhance the network of pedestrian and cycle routes across the city.	
GFH-3	Vehicle-Free Zones: Number and extent of areas where motor vehicles are restricted or prohibited.	
GFH-4	Urban Heat Island Effect: Monitor and reduce the urban heat island effect, ensuring cooler temperatures at night.	
	**Public Transit-based Walkable City (PTW)** A genuine choice of affordable private or public transport, easily interchangeable through modal change, with an excellent public transport system that reduces the need to use cars. A walkable city where all commodities are reachable by walking 15 minutes.	TRA-01 to 03
Possible Performance Monitoring Quantitative Indicators:		Note:
PTW-1	Public Transit Accessibility: Number of households within a certain radius of public transit stops or stations.	
PTW-2	Walkability Index: Percentage of the city where essential services and commodities are reachable within a 15-minute walk (based on methodology of UN's Sustainable Development Solutions Network as part of the SDG Transformation Centre)	
PTW-3	Modal Change Rate: Percentage of the population using multiple modes of transport for their daily commute.	
PTW-4	Car Usage Reduction: Reduction in the percentage of the population using private cars as their primary mode of transportation.	
	**Healthy City (HLC)** A city that prioritizes the well-being of its citizens, characterized by clean water and air, low noise levels, ample opportunities for physical exercise through everyday walking and cycling, and easy access to comprehensive health services.	TRA-03 ULA-01
Possible Performance Monitoring Quantitative Indicators:		Note:
HLC-1	Air Quality Index (AQI): Monitor and improve air quality, as measured by AQI, ensuring it stays within healthy limits.	

HLC-2	Noise Pollution Levels: Measure and reduce noise pollution in residential and public areas.
HLC-3	Physical Activity Opportunities: Number and accessibility of parks, trails, and recreational spaces promoting physical exercise.
HLC-4	Healthcare Access Index: Accessibility and availability of healthcare services throughout the city.

City of Culture & Modernized Heritage (CMH)
A modernized city rooted in its traditional culture and heritage, that stimulates the arts as well as being a thriving trading centre. A city where public art is widespread and meaningful, especially that pertaining to Kurdish heritage and culture.

Possible Performance Monitoring Quantitative Indicators:		Note:
CMH-1	Public Art Density: Number of public art installations per square kilometre, especially those reflecting Kurdish heritage.	
CMH-2	Cultural Events Participation: Percentage of the population participating in cultural events and activities.	
CMH-3	Heritage Preservation Rate: Percentage of historic and cultural sites preserved and integrated into modern development.	
CMH-4	Arts and Trades Hub Index: Number of thriving arts and trading centres within the city.	

Unique Character (UNC)
A capital city worthy of the Kurdish people, with its own distinctive character. A pleasure to live in, work in and discover, not just another anywhere destination.

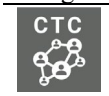
Possible Performance Monitoring Quantitative Indicators:		Note:
UNC-1	Distinctive Architecture Index: Measure the uniqueness and diversity of architectural styles across the city.	
UNC-2	Cultural and Culinary Diversity: Number of unique cultural and culinary establishments that contribute to the city's character.	
UNC-3	City Attractiveness Index: Perception survey on the city's attractiveness for residents and visitors.	
UNC-4	Local Identity Preservation: Efforts and success in preserving and promoting local traditions and identity.	

Variety and Identity (VID)
A city that has a rich variety of different areas with their own identifiable characters, including gateway features that mark their entries and exits. Distinguished landmark buildings and other structures that provide identity when moving around the city. All utility cables, wires and pipes underground. A city of surprises, with neighbourhoods in which local people can identify and be proud of.

Possible Performance Monitoring Quantitative Indicators:		Note:
VID-1	District Identity Score: Measure the distinct identity of different neighbourhoods within the city.	
VID-2	Landmark Density: Number of distinguished landmarks and structures contributing to the city's identity.	
VID-3	Underground Utility Implementation: Percentage of utility cables, wires, and pipes placed underground.	
VID-4	Neighbourhood Pride Index: Survey-based measure of local residents' pride and identification with their neighbourhood.	

(3) International business centre

Long-Term Vision:	Planning Issues:



Connected Trading Core (CTC)
A premier regional trading core connected to Silk Road (to be discussed) and other major trading routes, for goods and services being imported to and exported from Iraq and other nearby countries. An export-oriented, private-sector led business community.

Possible Performance Monitoring Quantitative Indicators:		Note:
CTC-1	Trade Volume Index: Total value of imports and exports passing through the trading core.	

CTC-2	Connectivity Score: Measure the accessibility and connectivity of the trading core to major trading routes.
CTC-3	Private Sector Investment: Amount of private sector investment in businesses within the trading core.
CTC-4	Export-to-GDP Ratio: Percentage of the city's GDP attributed to export-oriented businesses.

Competitive City (CMP)
Competitive with other trading centres, in terms of costs, efficiency and general ease of doing business. An enabling business environment. The absence of disabling obstacles to working and living.

Possible Performance Monitoring Quantitative Indicators:		Note:
CMP-1	Ease of Doing Business Index: Ranking based on the ease of conducting business within the city.	
CMP-2	Cost Efficiency Score: Evaluation of business costs, including taxes, labor, and operational expenses.	
CMP-3	Disabling Obstacles Reduction: Percentage reduction in obstacles to working and living within the city.	
CMP-4	Business Environment Index: Overall assessment of the business-friendly environment within the city.	

Hub of Aviation (HAV)
The hub of aviation-related activities within the region, including services to airlines, international business centre, and free trade zone.

Possible Performance Monitoring Quantitative Indicators:		Note:
HAV-1	Air Traffic Volume: Number of flights and passengers passing through the aviation hub.	
HAV-2	International Business Centre Index: Evaluation of the presence and growth of international business activities.	
HAV-3	Free Trade Zone Size: Measurement of the area designated as a free trade zone within the city.	
HAV-4	Aviation Services Hub Ranking: Assessment of the city's ranking as a hub for aviation-related services.	

Long Distance Land Transport (LDT)
Excellent Road, Toll Roads and Rail transport links with other cities and towns in KRG and beyond.

Possible Performance Monitoring Quantitative Indicators:		Note:
LDT-1	Road and Rail Network Efficiency: Evaluation of the efficiency and connectivity of road and rail transport.	
LDT-2	Toll Road Usage: Percentage of long-distance travellers using toll roads.	
LDT-3	Inter-city Transport Time: Reduction in travel time between the city and other major cities in the region.	
LDT-4	Rail Cargo Volume: Volume of cargo transported via rail to and from the city.	

Available Serviced Land and Buildings (ASL)
Always having a large supply of affordable serviced land and buildings available for local and inward investors, especially for exporting businesses.

Possible Performance Monitoring Quantitative Indicators:		Note:
ASL-1	Vacancy Rate: Percentage of available serviced land and buildings unoccupied.	
ASL-2	Affordability Index: Measure of the affordability of serviced land and buildings for investors.	
ASL-3	Investor Turnaround Time: Time taken for investors to acquire and start using serviced land or buildings.	
ASL-4	Inward Investment Growth: Percentage increase in inward investment in the city.	

Food Sufficiency & Export (FSE)
The centre of a thriving agricultural subregion, with extensive food processing and major food businesses that can help reaching food security and export.

Possible Performance Monitoring Quantitative Indicators:		Note:
FSE-1	Agricultural Productivity Index: Measurement of the city's agricultural productivity.	
FSE-2	Food Processing Business Growth: Number and growth of food processing businesses within the city.	
FSE-3	Food Export Volume: Volume of food products exported from the city.	

FSE-4	Food Security Index: Measurement of the city's ability to achieve food security for its residents.

Cybercity (CYB)
Full Information and Communications Technology (ICT) coverage throughout the city, with quick, efficient and free Internet access to all Government and urban services.

Possible Performance Monitoring Quantitative Indicators:		Note:
CYB-1	ICT Coverage: Percentage of the city covered by information and communications technology services.	
CYB-2	Internet Speed Index: Evaluation of the speed and reliability of Internet services.	
CYB-3	Digital Inclusion Score: Measure of the inclusivity of digital services across the population.	
CYB-4	Government Services Accessibility: Evaluation of the accessibility of government services through the internet.	

(4) Centre for Tourism

Long-Term Vision: Planning Issues:

Multi-Product Tourism Vision (MPT)
A wide variety of tourist attractions, and levels of affordability, within and outside the city, for both local and international tourists, at all times of the year. World-class product interpretation, niche tourism, tourism promotion, and customer services.

Possible Performance Monitoring Quantitative Indicators:		Note:
MPT-1	Tourist Attractions Diversity Index: Number and diversity of tourist attractions within and outside the city.	
MPT-2	Affordability Range: Range of price points for tourist activities, accommodations, and services to cater to various budgets.	
MPT-3	Tourist Satisfaction Index: Survey-based measure of local and international tourists' satisfaction with the tourism experience.	
MPT-4	Niche Tourism Growth: Percentage increase in niche tourism activities, such as cultural, adventure, or culinary tourism.	

Historical and Cultural Tourism (HCT)
Centred on renovated and revitalized Citadel, a global tourism strategy based on the enhancement of historical and cultural assets, such as urban heritage and surrounding archaeological sites.

Possible Performance Monitoring Quantitative Indicators:		Note:
HCT-1	Citadel Visitor Numbers: Number of visitors to the renovated and revitalized Citadel.	
HCT-2	Heritage Preservation Index: Assessment of efforts to preserve and enhance historical and cultural assets.	
HCT-3	Archaeological Site Accessibility: Evaluation of accessibility to surrounding archaeological sites.	
HCT-4	Global Tourism Ranking: Ranking in global tourism indices based on historical and cultural assets.	

Nature Tourism (NAT)
The development of eco-tourism and eco-leisure parks in suitable locations, with their own memorable identity in link with water and mountain foothills. Enhancement of indigenous wildlife, vegetation and landscapes.

Possible Performance Monitoring Quantitative Indicators:		Note:
NAT-1	Eco-Tourism Park Expansion: Increase in the number and size of eco-tourism and eco-leisure parks.	
NAT -2	Wildlife and Vegetation Index: Assessment of the enhancement of indigenous wildlife, vegetation, and landscapes.	
NAT -3	Memorable Identity Score: Measure of the uniqueness and memorability of eco-tourism park identities.	
NAT -4	Visitor Engagement with Nature: Survey-based measure of visitor engagement with nature and the outdoors.	

Source: JICA Project Team

4.2.3 Summarized Concepts & Pillars of Erbil 2050 MP Long-term Vision

In the case of a strategic document which mobilize a great variety of stakeholders, such as an urban development Master Plan, complex planning concepts are more effective when they are distilled into a concise and easily understandable format, such as a memorable slogan or a set of defining pillars. As a result, the 24 Vision Statements updated above can be summarized tentatively into the following concept and development pillars shown in Figure 4.2.2 below, regardless to their classification into traditional Themes.

Source: JICA Project Team

Figure 4.2.2 Summarized Concepts & Pillars of Erbil 2050 MP Long-term Vision

4.3 Socio-Economic Framework

As described in Section 3.2, the future population and economic growth rates in the Erbil 2030 MP did not go as planned due to various factors. In this section, the future Socio-Economic Framework for this Project is set based on the analysis of past and current demographic situation and on KRI's future plans.

4.3.1 Population Framework

(1) Estimation of Baseline Population as Planned Population Covered by Housing Projects

As explained at the beginning of the Project (See Section 2.1.2 of Inception Report), due to the absence of population census in the Kurdistan Region, the estimation of baseline population of the Target Area has been completed through a comprehensive analysis of various sources of empirical data, including GIS data and interviews with real estate companies. Therefore, the resulting estimation is considered to be highly accurate, providing a more reliable foundation for subsequent project phases compared to relying on vague assumptions. The estimation of baseline population has been done firstly through the estimation of the number of Dwelling Units, secondly through the estimation of the Household Size.

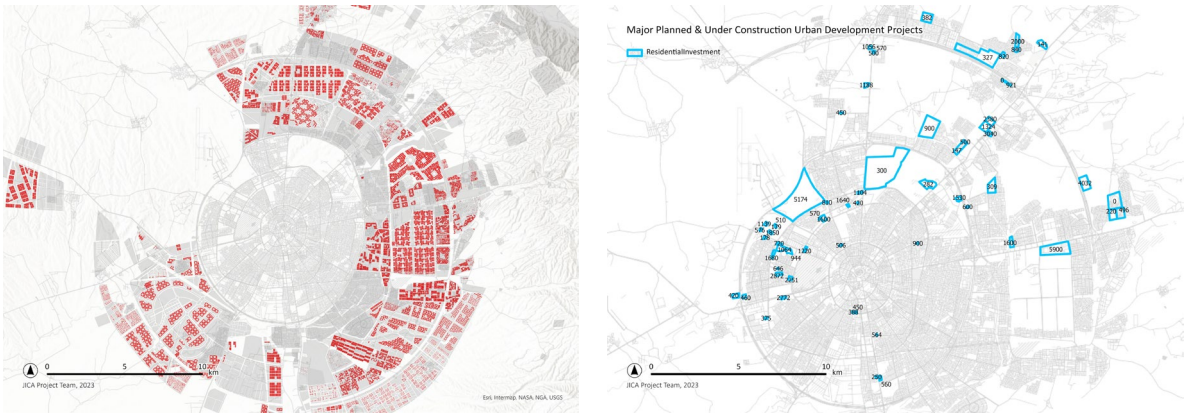
1) Estimation of Baseline Number of Dwelling Units

The number of Dwelling Units (DU) for Existing Baseline (2022) and Future Baseline, which includes the DU of approved subdivision plans and approved housing projects under construction or planning (estimated to be built by 2040), has been estimated based on the factors explained in Table 4.3.1 below.

Table 4.3.1 Estimation of Baseline Number of Dwelling Units

<table>
<tr><th>Area</th><th>Housing Typology</th><th>Existing Baseline (2022)</th><th>Future Baseline (2040)</th></tr>
<tr><td rowspan="4">Urban Area (inside Inner Green Belt + Municipalities outside Inner Green Belt)</td><td>Individual Housing in Subdivisions (Urban - inside Inner Green Belt Area)</td><td>285,402
Number of DU extracted from the counting of GIS building footprints polygons from procured 3D Building Data and which land use has been confirmed by Housing Typology Survey (See Section 2.4.4).</td><td>155,297
Number of DU extracted from the counting of GIS residential parcels polygons in approved Urban Detailed Plans, which construction has not started yet, provided by UPDOE in August 2023 (See Figure 4.3.1 below).</td></tr>
<tr><td rowspan="2">Private Housing Development Projects (Collective & Individual)</td><td>35,186 (Collective Housing)
5,363 (Individual Housing)
1,399 (Villas)</td><td>60,657 (Overall)</td></tr>
<tr><td colspan="2">Number of DU extracted from online survey and telephone interviews of all active Real-Estate and Developer Companies in Erbil. The totality of the number of current and future (under construction and construction not started) apartments, number of floors and current status for each Privately Owned Housing Development Project, accounting for 54 Projects, has been surveyed (See Section 2.4.5).</td></tr>
<tr><td>TOTAL Urban DU</td><td>327,250</td><td>215,954</td></tr>
<tr><td>Rural Area (outside Inner Green Belt)</td><td>Built-Up Area in Rural Areas</td><td>97,620
Number of DU estimated from the Built-Up Area extracted from Existing Land Use Land Cover Survey (See Section 2.4.2) multiplied by an average density of 8.0 DU/ha, corresponding to the lower end of the spectrum of commonly agreed density of low-rise rural individual housing patterns of Northern Regions of Iraq, as stated in “Estimating Population Density and Distribution in Iraq" by the Iraqi Ministry of Planning and Development (2019), the highest in Iraq being 12.0 DU/ha.</td><td>No estimation of Future Baseline DU has been done in Rural areas to the absence of subdivision plans and private urban development initiatives.</td></tr>
<tr><td></td><td>TOTAL DU</td><td>424,970</td><td>215,954</td></tr>
</table>

Source: JICA Project Team



Residential Parcels in Future Urban Detailed Plans　　Private Housing Development Projects

Source: JICA Project Team, UPDOE

Figure 4.3.1　　Coverage of Future Urban Plans and Housing Projects

2)　Estimation of Household Size

The Baseline Household Size (2022) has been estimated at 4.3 persons/household, corresponding to the average of the results of the Household Survey carried out by the JICA Project Team in 2022 of 3.6 persons/household and the estimation of KRSO of 5.0 persons/household in its Population analysis report, 2021.

The Future Household Size for each Project Horizons has been estimated based on assumptions and figures shown in Table 4.3.2 below. The demographic transition being a phenomenon that affects all parts of the world quite similarly[1], the decrease rate of the Household Size for the Target Area of the Project has been estimated based on the average decrease rate of the Household Size during the 2013-2023 decade in neighbouring countries of the region.

Table 4.3.2　　Estimation of Future Household Size

	Household Size		Decrease Rate
	2013	2023	
Saudi Arabia	5.10	4.90	0.20
Iraq	4.60	4.45	0.15
Egypt	4.30	4.15	0.15
Iran	3.90	3.75	0.15
Turkey	3.20	3.10	0.10
Israel	2.85	2.75	0.10
Average Decrease Rate			**0.14**

Project Horizon	Estimated Household Size in Erbil	Decrease Rate
2022	4.30	-
2030	3.69	0.14
2040	3.17	0.14
2050	2.72	0.14

Source: JICA Project Team, for Saudi Arabia: The 2020 General Population and Housing Census conducted by the General Authority for Statistics (GASTAT), for Iraq: The 2019 Household Survey conducted by the Ministry of Planning and Development (MoPD), for Egypt: The 2020 Population and Housing Census conducted by the Central Agency for Public Mobilization and Statistics (CAPMAS), for Iran: The 2022 Population and Housing Census conducted by the Statistical Center of Iran (SCI), for Turkey: The 2021 Population and Housing Census conducted by the Turkish Statistical Institute (TÜİK), for Israel: The 2022 Population and Housing Census conducted by the Central Bureau of Statistics (CBS).

3)　Estimation of Baseline Population as Planned Population Covered by Housing Projects

Based on estimated number of Dwelling Units and the Household Size explained above, the Baseline Population for existing situation (2022) and future situation (2040) is shown in Table 4.3.3 below. As stated above, the approved Urban Detailed Plans and housing developments are expected to be constructed steadily from 2022 and to finished by 2040, covering the housing needs of the population.

[1] Roser, M. (2014). The demographic transition: Why it matters in the 21st century.
United Nations. (2022). World population prospects: 2022 revision. Department of Economic and Social Affairs, Population Division.

The population growth from 2040 to 2050 is proposed by JICA Project Team in the framework of the current Project (See following chapters and Section 5.5).

Table 4.3.3 Estimation of Baseline Population Planned by Housing Projects

	2022	2040
Number of Dwelling Units (DU)	424,970	215,954
Household Size	4.30	3.17
IDP Population*	8,725	8,725
Baseline Population	**1,861,870**	-
Planned Population Covered by Future Housing Projects	-	796,869

Source: JICA Project Team

(2) Estimation of Net Migrations

Due to the absence of official figures on migrations in Erbil and in Kurdistan, estimation of Net Migration has been done based on the results of the Household Survey carried out by the JICA Project Team and on the assumptions explained hereafter.

Firstly, regarding the In-Migration, based on the fact that a total 9.83% of respondents of the Household Survey is coming from outside of Erbil (composed by Outside of Erbil City: 0.94%, Outside of Erbil Governorate: 5.12%, Outside of Kurdistan Region: 2.93%, Outside Iraq: 0.84%), the current number of immigrants can be estimated to 183,022.

Regarding the annual growth rate of In-Migration through history, based on the results of another question in the Household Survey asking for "when did you move to Erbil?", it can be estimated that the average annual growth rate of In-Migration on the 2000-2022 period is of 3% generally. The economic stability that represents Erbil compared to Baghdad or other province of Iraq makes assume that the number of In-Migration will continue to grow at the same pace.

Regarding the Out-Migration, although there is no scientific basis for this, it is assumed that, due to the current economic and political uncertainties of Kurdistan and the number of observed Kurd candidates to Europe immigration, for every 4 persons who migrate into Erbil in 2022, 1 person will go out of the city, giving a rate of 25% of In on Out Migration. Nevertheless, as Erbil's economy gradually improves, achieving the goals of the Long-term Visions (See Section 4.2), it is assumed that this rate will drop gradually to 16% in 2030 and 5% in 2040, and will stay constant at 5% until 2050.

(3) Future Population Forecast through Demographic Modelling Simulation

1) Outline of the Demographic Modelling Simulation

To ensure the most accurate Population Forecast for the future population of the Target Area in 2030, 2040 and 2050, a comprehensive demographic modelling simulation was conducted utilizing the well-known software Spectrum, incorporating, as inputs, the baseline population data of 1,861,870 explained above, the age-sex distribution and fertility rate figures provided by KRSO, and the Annual Net Migrations calculated above. Inputs and outcomes of the demographic modelling simulation are shown in Table 4.3.4 below.

The Spectrum software employed a cohort-component approach, tracking individuals through their lifecycles and accounting for demographic events such as births, deaths, and migration. The simulation considered the impact of various factors, including changes in fertility rates, mortality rates, and migration patterns, on the projected population.

2) Results of the Demographic Modelling Simulation

Summary Demographic Assumptions & Indicators

Table 4.3.4 below summarizes the demographic assumptions (inputs) and calculated indicators (outcomes) used in the Demographic Modelling Simulation for forecasting the future Population.

Table 4.3.4 Summary Demographic Assumptions & Indicators

	2022	2030	2040	2050	Source
Fertility					
Fertility Rate	3.05	2.80	2.50	2.20	KRIPAR 2021*
Gross Reproduction Rate	1.49	1.37	1.22	1.07	Simulation Outcome
Net Reproduction Rate	1.44	1.33	1.20	1.06	Simulation Outcome
Mean age of childbearing	28.00	27.90	27.70	27.60	UN Pop Div Reg**
Child-woman ratio	0.46	0.42	0.38	0.33	UN Pop Div Reg**
Mortality					
Male Life Expectancy	74.10	75.70	77.50	79.50	KRIPAR 2021*
Female Life Expectancy	76.80	78.50	80.60	82.60	KRIPAR 2021*
Total Life Expectancy	75.40	77.10	79.00	81.00	Simulation Outcome
Infant Mortality Rate	17.30	13.60	10.70	8.30	UN Pop Div Reg**
Under-5 Morality Rate	19.20	15.10	12.00	9.30	UN Pop Div Reg**
Total 45q15 Mortality	83.77	71.61	57.77	45.99	UN Pop Div Reg**
Vital Rates					
Crude Birth Rate per 1,000	25.10	23.00	19.80	16.50	Simulation Outcome
Crude Death Rate per 1,000	2.90	3.40	4.00	4.30	Simulation Outcome
Rate of Natural Increase	2.22	1.96	1.57	1.22	Simulation Outcome
Growth Rate	2.36	2.11	1.77	1.46	Simulation Outcome
Doubling time	29.70	33.10	39.50	47.70	Simulation Outcome
Annual births and deaths					
Births	47,224	50,078	51,397	49,461	Simulation Outcome
Deaths	5,379	7,460	10,527	12,884	Simulation Outcome
Annual Net Migration					
Male	1,458	1,960	2,956	4,102	JICA Project Team
Female	1,100	1,479	2,230	3,095	JICA Project Team
Total	2,558	3,439	5,186	7,197	JICA Project Team
Household Size					
Household Size	4.30	3.69	3.17	2.72	JICA Project Team
TOTAL Population					
TOTAL Population	1,861,870	2,220,443	2,620,343	3,008,501	JPT (2022), Outcome

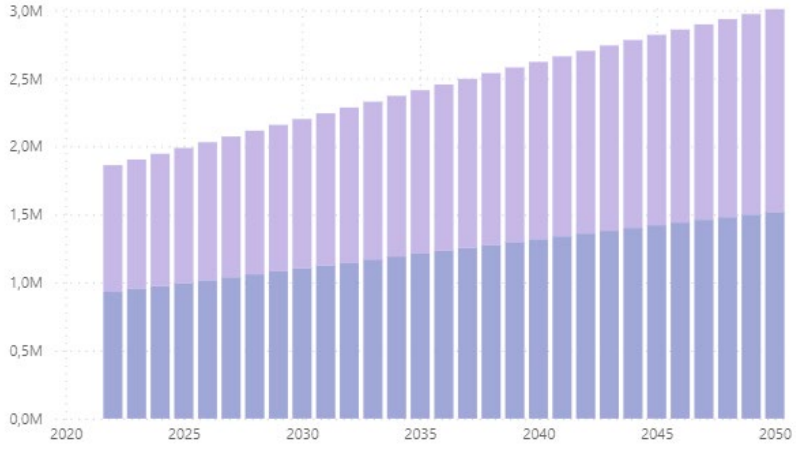
Source: JICA Project Team

(*) Kurdistan Region of Iraq - Population Analysis Report (2021) by KRSO and Ministry of Planning

(**) United Nations Population Division *World Population Prospects* (2022) averages for Middle-East Region

Total Population Forecast

Figure 4.3.2 below shows a graphic representation of the forecasted Future Population of the Target Area, as an outcome of the Demographic Modelling Simulation, with female in purple and male in blue.

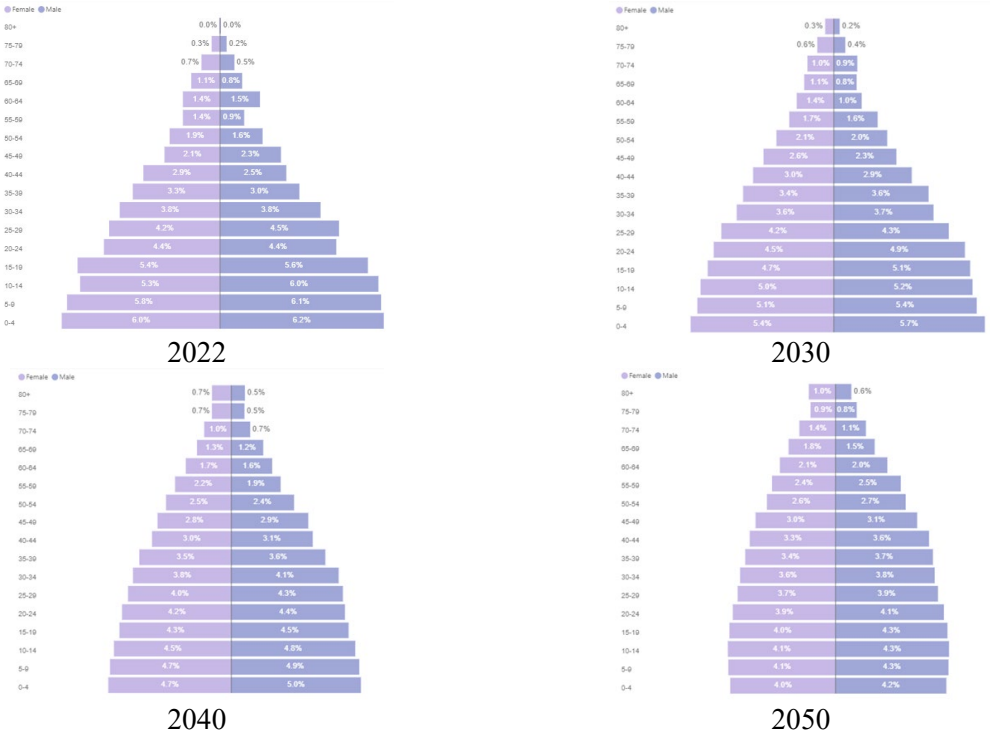


Source: JICA Project Team

Figure 4.3.2 Forecasted Future Population of the Target Area

Age Group Distribution

Figure 4.3.3 below shows a graphic representation of the forecasted Future Population of the Target Area, as an outcome of the Demographic Modelling Simulation, with female in purple and male in blue.



Source: JICA Project Team

Figure 4.3.3 Future Population Age Group Distribution

4.3.2 Economic Framework

(1) Estimation of Baseline Employment and GRDP

1) Baseline Employment

Total Baseline Employment by Age Group

Employment is estimated by multiplying the sex- and age-specific distribution (Source: KRIPAR 2021, KRSO) by the economically active population rate (Source: KRIPAR 2021, KRSO) to estimate the economically active population available for work, and then considering the unemployment rate (Source: KRIPAR 2021, KRSO) to calculate the overall working population. Table 4.3.5 shows the estimated employment for 2022, estimated to be approximately 415,000 for the entire target area.

Table 4.3.5 Baseline (2022) Total Employment

	Economically Active Population Rate		Unemployment Rate		Number of Employment by Age		
	Male	Female	Male	Female	Male	Female	Total
15-19	32.4%	7.6%	24.1%	69.1%	25,622	2,360	27,982
20-24	32.4%	7.6%	24.1%	69.1%	20,131	1,923	22,054
25-29	87.8%	26.7%	11.0%	36.1%	65,508	13,357	78,865
30-34	87.8%	26.7%	11.0%	36.1%	55,317	12,084	67,401
35-39	94.7%	17.4%	4.2%	12.4%	50,684	9,355	60,039
40-44	94.7%	17.4%	4.2%	12.4%	42,236	8,222	50,458
45-49	85.6%	16.2%	4.1%	4.9%	35,186	6,005	41,191
50-54	85.6%	16.2%	4.1%	4.9%	24,476	5,433	29,909
55-59	62.6%	10.5%	4.7%	0.0%	9,994	2,737	12,731
60-65	62.6%	10.5%	4.7%	0.0%	16,659	2,737	19,396
65+	17.2%	1.0%	4.5%	0.0%	4,902	371	5,273
Total					350,715	64,584	**415,299**

Source: JICA Project Team

Baseline Employment by Sector

The Household Survey results show that the service sector accounts for more than 70% of the total employment, and the tertiary industry accounts for more than 80%. It is assumed that this is because the Household Survey sampling is more concentrated in urban centres, and the primary and secondary industries are lower than they actually are. Therefore, it is deemed appropriate to use the KRSO ratio for the whole Kurdistan for the employment distribution by industry.

Table 4.3.6 Baseline (2022) Employment by Sector

Sector	KRSO Ratio by Sector			Baseline Employment		
	Male	Female	TOTAL	Male	Female	TOTAL
Agriculture	5.07%	2.22%	4.63%	17,774	1,436	19,210
Oil-related	5.18%	5.47%	5.23%	18,185	3,530	5,117
Manufacturing	4.44%	2.63%	4.16%	15,555	1,702	33,869
Housing	10.26%	0.44%	8.76%	35,995	287	36,282
Commercial	16.05%	7.96%	14.81%	56,293	5,138	61,431
Transportation	11.36%	1.39%	9.83%	39,851	897	40,748
Services	47.63%	79.89%	52.58%	167,061	51,595	218,656
Total	100.0%	100.0%	100.0%	350,714	64,585	**415,299**

Source: JICA Project Team and KRSO

2) Estimation of Baseline GRDP

The estimation of the Gross Regional Domestic Product (GRDP) for Baseline year 2022 for the Project Area has been carried out based on the best available data, including KRSO 2018 GRDP figures published in August 2022 (hereafter "KRSO 2018", See Section 2.3), Board of Investment (BoI) List of Licensed Projects in Erbil up to the year 2021 (hereafter "BoI 2021") and KRSO Land Use Land Cover data provided by the MoAWR (hereafter "LULC 2022", See Section 6.2.1). Other sectoral data provided by KRG has also been utilized.

Table 4.3.7 below shows the estimated Baseline GRDP, and subsequent paragraphs detail how the calculation was done based on those three datasets, providing a robust and comprehensive economic assessment for the Project Area.

Table 4.3.7 Baseline (2022) GRDP by Sector

Sector	GRDP (2022) in million IQD	Share (%)	Note
Agriculture	247,693	2.5%	
Oil-related	48,970	0.5%	
Manufacturing	995,091	9.9%	
Housing	1,455,757	14.4%	
Commercial	2,588,032	25.7%	
Transportation	3,619,355	35.9%	
Services	1,124,884	11.2%	
Total	**10,079,782**	**100%**	

Source: JICA Project Team, KRSO and BoI

Agriculture sector

The agricultural sector's economic contribution of the Project Area was determined by proportionally allocating the area's agricultural land relative to the total agricultural area of Kurdistan Region.

Specifically, the Target Area encompasses 71,573 hectares of winter crops (LULC 2022), which represents 23% of the KRI's total winter crop area of 304,735 hectares (KRSO Agricultural Statistics Department, Winter Crops Planted Area 2016-2017). Consequently, given that the KRI's agricultural sector's overall economic input recorded at 1,054,596.5 million IQD (KRSO 2018), the Project Area's agricultural contribution for 2022 can be extrapolated to be 23% of this figure, equating to an estimated 247,693 million IQD.

Oil-related sector

The oil-related sector's contribution to the GRDP was derived from the KRG Ministry of Natural Resources' latest Oil Production, Export and Consumption Report, published in 2015.

In this report, it is stated that the oil production output in the Hawler block, which approximately corresponds to the Project Area, equals to 921,824 barrels per year, corresponding to 0.44% of the total oil production in KRI of 210,709,588 barrels per year. In addition, annual oil exports in Hawler block accounts to 785,235 Barrels of Oil Equivalent (BOE), corresponding to 0.55% of the total oil exports in KRI of 143,200,279 BOE. Given the total economic input of the KRI's oil-related sector of 9,794,002 million IQD (KRSO 2018), the contribution of the Project Area's oil-related sector for 2022 can be inferred by averaging the percentages of oil production and exports, approximately 0.5%. Consequently, this translates to an estimated contribution of about 48,970 million IQD for the oil-related sector.

Manufacturing sector

The contribution to the GRDP of the manufacturing sector was established based on a mix of information of investments and spatial data.

Over the 255 industrial projects licenced up to 2021 by the BoI in the whole KRI accounting for a total area of 1,226 ha, Erbil governorate accounts for 113 industrial projects (44%) covering an area of 565 ha (46%). Given that the Project Area has 460 ha of manufacturing area according to the MoTI (see Section 6.2.4), the contribution of manufacturing sector to the economy can be estimated at 37.5% of the KRI figures. Given the total economic value of the KRI's manufacturing sector including electrical industry of 2,652,351 million IQD (KRSO 2018), the contribution of the Project Area's manufacturing sector for 2022 can be estimated to 37.5% of this figure, hence 995,091 million IQD.

Housing sector

The contribution to the GRDP of the housing sector was established based on investment information provided by BoI. This data can be considered accurate since all housing projects shall obtain the approval of BoI before acquiring a land and being implemented.

Over the 17,253,129,138 USD invested up to 2021 in the housing sector in the whole KRI, Erbil governorate accounts for 11,053,126,025 USD, representing 64% of the total investment of the KRI.

Given the total economic value of the KRI's housing sector of 2,272,331 million IQD (KRSO 2018), the contribution of the Project Area's housing sector for 2022 can be estimated to 64% of this figure, hence 1,455,757 million IQD.

Commercial sector

The contribution to the GRDP of the commercial sector was established based on investment information provided by BoI. This data can be considered accurate since all commercial projects shall obtain the approval of BoI before acquiring a land and being implemented.

Over the 4,764,029,323 USD invested up to 2021 in the commercial sector in the whole KRI, Erbil governorate accounts for 3,377,113,195 USD, representing 71% of the total investment of the KRI. Given the total economic value of the KRI's commercial sector of 3,650,887.60 million IQD (KRSO 2018), the contribution of the Project Area's commercial sector for 2022 can be estimated to 71% of this figure, hence 2,588,032 million IQD.

(2) Estimation of Future Employment and GRDP

1) Concepts of Economic Diversification

Considering the KRG Vision 2030 (see Section 2.5), the diversification of Erbil's economy has been set-up as an important framing Long-term Vision entitled Diversified Economy (DEC) and formulated as follows: Diversifying Erbil's economy, based on, for example petrochemical industry and agriculture, for a stronger, more resilient future for Kurdistan. By spreading economic risk across different industries and sectors, we can protect ourselves from market fluctuations and ensure sustainable growth for all (see Section 4.2.2).

Diversification of Erbil's economy shall be done (i) between main economic sectors, for example between oil-related industry and tourism, but also (ii) internally within each economic sector, i.e. efforts should focus on identifying and nurturing the highest-value opportunities in each sector. For instance, in agriculture, this could involve investing in both high-value crops through organic agriculture, and at the same time agriculture intensive production to reach food security and exportation; and in tourism, promoting cultural heritage and eco-tourism, but also recreational activities that maximize profits. This diversification approach not only creates a more resilient economic framework but also generates diverse employment opportunities, enhances local expertise, and attracts foreign investment. Ultimately, a well-diversified economy will empower Erbil to adapt to global economic changes and secure a prosperous future for its residents.

To achieve a truly diversified and resilient economy, it is essential to foster close collaboration between economic planning, investment planning, and spatial planning. The Ministry of Planning (MoP), the Board of Investment (BoI), and the Ministry of Municipalities and Tourism (MoMT) must work in unison to align their strategies, ensure cohesive development, and monitor the distribution of sector and sub-sectors according to macro and spatial KPIs. This integrated approach enables the efficient allocation of resources, the identification of strategic investment opportunities, and the optimization of land use. By coordinating efforts, these institutions can create a synergistic environment that supports balanced economic growth, maximizes investment potential, and ensures sustainable urban development, ultimately enhancing the quality of life for all residents of Erbil.

2) Future Employment

Total Future Employment by Age Group

The future employment is similarly calculated using the future population by sex and age (Source: Spectrum Demographic Modelling Simulation by JICA Project Team). In this case, the future economically active population ratio is considered to be the same as the current situation, while unemployment rate is expected to drop by 5 points until 2050, considering the increase of GDP. Table 4.3.8 to 10 shows the results of the future employment calculations.

Table 4.3.8 Future (2030) Total Employment

	Economically Active Population Rate		Unemployment Rate		Number of Employment by Age		
	Male	Female	Male	Female	Male	Female	Total
15-19	32.4%	7.6%	23.7%	68.3%	27,825	2,504	30,329
20-24	32.4%	7.6%	23.7%	68.3%	26,771	2,386	29,157
25-29	87.8%	26.7%	10.1%	35.3%	74,951	16,046	90,997
30-34	87.8%	26.7%	10.1%	35.3%	64,979	13,854	78,833
35-39	94.7%	17.4%	3.2%	11.6%	71,658	11,497	83,155
40-44	94.7%	17.4%	3.2%	11.6%	58,981	10,224	69,205
45-49	85.6%	16.2%	3.1%	4.3%	42,738	8,939	51,677
50-54	85.6%	16.2%	3.1%	4.3%	36,520	7,300	43,820
55-59	62.6%	10.5%	3.4%	0.0%	21,747	3,846	25,593
60-65	62.6%	10.5%	3.4%	0.0%	13,766	3,188	16,954
65+	17.2%	1.0%	3.2%	0.0%	8,592	627	9,219
Total					448,528	80,411	**528,939**

Source: JICA Project Team

Table 4.3.9 Future (2040) Total Employment

	Economically Active Population Rate		Unemployment Rate		Number of Employment by Age		
	Male	Female	Male	Female	Male	Female	Total
15-19	32.4%	7.6%	22.2%	67.5%	29,664	2,773	32,437
20-24	32.4%	7.6%	22.2%	67.5%	28,747	2,707	31,454
25-29	87.8%	26.7%	8.1%	34.5%	90,476	18,167	108,643
30-34	87.8%	26.7%	8.1%	34.5%	87,014	17,296	104,310
35-39	94.7%	17.4%	2.3%	10.8%	87,380	14,315	101,695
40-44	94.7%	17.4%	2.3%	10.8%	75,623	12,337	87,960
45-49	85.6%	16.2%	2.2%	3.5%	64,729	11,549	76,278
50-54	85.6%	16.2%	2.2%	3.5%	52,738	10,212	62,950
55-59	62.6%	10.5%	2.9%	0.0%	30,018	5,928	35,946
60-65	62.6%	10.5%	2.9%	0.0%	24,818	4,776	29,594
65+	17.2%	1.0%	2.7%	0.0%	12,860	945	13,805
Total					584,067	101,005	**685,072**

Source: JICA Project Team

Table 4.3.10 Future (2050) Total Employment

	Economically Active Population Rate		Unemployment Rate		Number of Employment by Age		
	Male	Female	Male	Female	Male	Female	Total
15-19	32.4%	7.6%	19.1%	64.1%	33,611	3,317	36,928
20-24	32.4%	7.6%	19.1%	64.1%	32,548	3,210	35,758
25-29	87.8%	26.7%	6.0%	31.1%	96,921	20,667	117,588
30-34	87.8%	26.7%	6.0%	31.1%	93,890	20,162	114,052
35-39	94.7%	17.4%	2.0%	7.4%	103,628	16,642	120,270
40-44	94.7%	17.4%	2.0%	7.4%	99,534	15,821	115,355
45-49	85.6%	16.2%	2.0%	2.0%	78,510	14,505	93,015
50-54	85.6%	16.2%	2.0%	2.0%	67,371	12,443	79,814
55-59	62.6%	10.5%	2.0%	0.0%	45,828	7,633	53,461
60-65	62.6%	10.5%	2.0%	0.0%	36,378	6,675	43,053
65+	17.2%	1.0%	2.0%	0.0%	20,410	1,459	21,869
Total					708,629	122,534	**831,163**

Source: JICA Project Team

Total Future Employment by Sector

The sector distribution of employment in the future is estimated based on the application of the concepts of Economic Diversification (see above). Table 4.3.12 shows the future employment by sector.

Table 4.3.11 Future Employment Ratios by Sector

Sector	2022	2030	2040	2050	2022-2050 Change
Agriculture	4.6%	5.6%	6.0%	6.4%	+1.8%
Oil-related	5.2%	5.7%	5.9%	6.0%	+0.8%
Manufacturing	4.2%	5.1%	5.7%	6.0%	+1.8%
Housing	8.8%	8.0%	7.5%	7.3%	-1.5%
Commercial	14.8%	14.0%	13.6%	13.3%	-1.5%
Transportation	9.8%	9.0%	8.6%	8.3%	-1.5%
Services	52.6%	52.6%	52.7%	52.7%	+0.1%
Total	100.0%	100.0%	100.0%	100.0%	-
Diversity Index	*1.49*	*1.50*	*1.51*	*1.52*	-

Source: JICA Project Team

Table 4.3.12 Future Employment by Sector

Sector		2022	2030	2040	2050 base	2022-2050 Change	
1	Agriculture	19,237	29,621	41,104	53,194	33,957	277%
2	Oil-related	21,712	30,150	40,419	49,870	28,158	230%
	Manufacturing	17,274	26,976	39,049	49,870	32,596	289%
	Housing	36,376	42,315	51,380	60,675	24,299	167%
3	Commercial	61,508	74,051	93,170	110,545	49,037	180%
	Transportation	40,844	47,605	58,917	68,987	28,143	169%
	Services	218,348	278,221	361,033	438,022	219,674	201%
	Total	**415,299**	**528,939**	**685,072**	**831,163**	**415,864**	**200%**

Source: JICA Project Team

3) Future GRDP

As explained above, to ensure sustainable economic growth and resilience for Erbil, it is essential to focus on developing and diversifying the economy towards various sectors, and particularly accompanying industrial competitiveness and tertiarization of the society. The growth targets set for each sector as well as the projected future GRDP is shown in Table 4.3.13 below.

Table 4.3.13 Future GDP by Sector

Items	2022 GRDP		2050 GRDP		2022-2050 Growth
	million IQD	%	million IQD	%	
Agriculture	247,693	2.5%	495,386	2.2%	200%
Mining & Oil-related	48,970	0.5%	206,881	0.9%	422%
Manufacturing	995,091	9.9%	3,480,292	15.2%	350%
Construction	1,455,757	14.4%	2,911,513	12.7%	200%
Commercial	2,588,032	25.7%	5,176,064	22.6%	200%
Transportation	3,619,355	35.9%	7,238,711	31.6%	200%
Services	1,124,884	11.2%	2,249,768	14.7%	300%
Total	12,215,519	100.0%	21,758,615	100.0%	-

Source: JICA Project Team

The services sector, for instance, is expected to triple from 1,124,884 million IQD in 2022 to 2,249,768 million IQD by 2050, increasing its share from 11.2% to 14.7%. This substantial growth highlights the potential of the services sector, including tourism, in contributing to Erbil's economic development. Similarly, the manufacturing sector is projected to grow more than threefold, from 995,091 million IQD

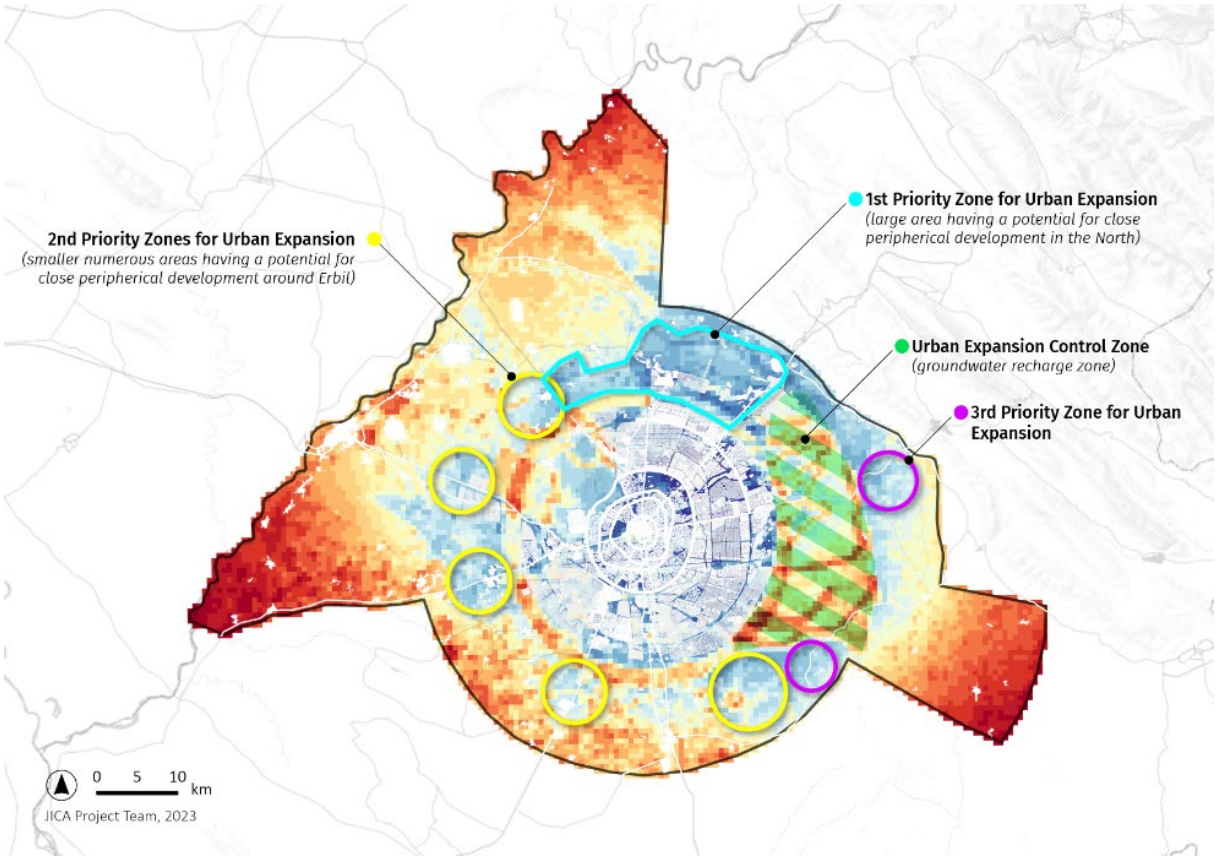
to 3,480,292 million IQD, increasing its share from 9.9% to 15.2%. Mining and oil-related industries are expected to quadruple their contribution, from 48,970 million IQD to 206,881 million IQD. Both agriculture and construction sectors aim to double their outputs, with agriculture growing from 247,693 million IQD to 495,386 million IQD and construction from 1,455,757 million IQD to 2,911,513 million IQD. Commercial and transportation sectors are also set to double, with commercial activities growing from 2,588,032 million IQD to 5,176,064 million IQD and transportation from 3,619,355 million IQD to 7,238,711 million IQD.

CHAPTER 5
SPATIAL PLANNING

5.1 Preparatory Analysis for Spatial Planning

(1) Urban Expansion Potential Analysis

Based on the calculation of 19 collectively agreed factors relating to existing attractiveness and repulsiveness of urbanization in Erbil (See Section 2.4.6), the Urbanization Potential Analysis has been produced and its results can be interpreted as shown on the Figure 5.1.1 below.



Source: JICA Project Team

Figure 5.1.1 Priority Zones for Urban Expansion

High urbanization potential score is displayed in blue while low urbanization potential score is displayed in red. Knowing that, as mentioned above, already planned urbanization on short term through approved detail plans and private investments in housing sector will occupy almost totally the lands situated inside the Inner Green Belt, Urbanization Potential Analysis within the framework of the Project is willing to answer the question of what will be the most attractive areas for the future urbanization for Erbil beyond the Inner Green Belt.

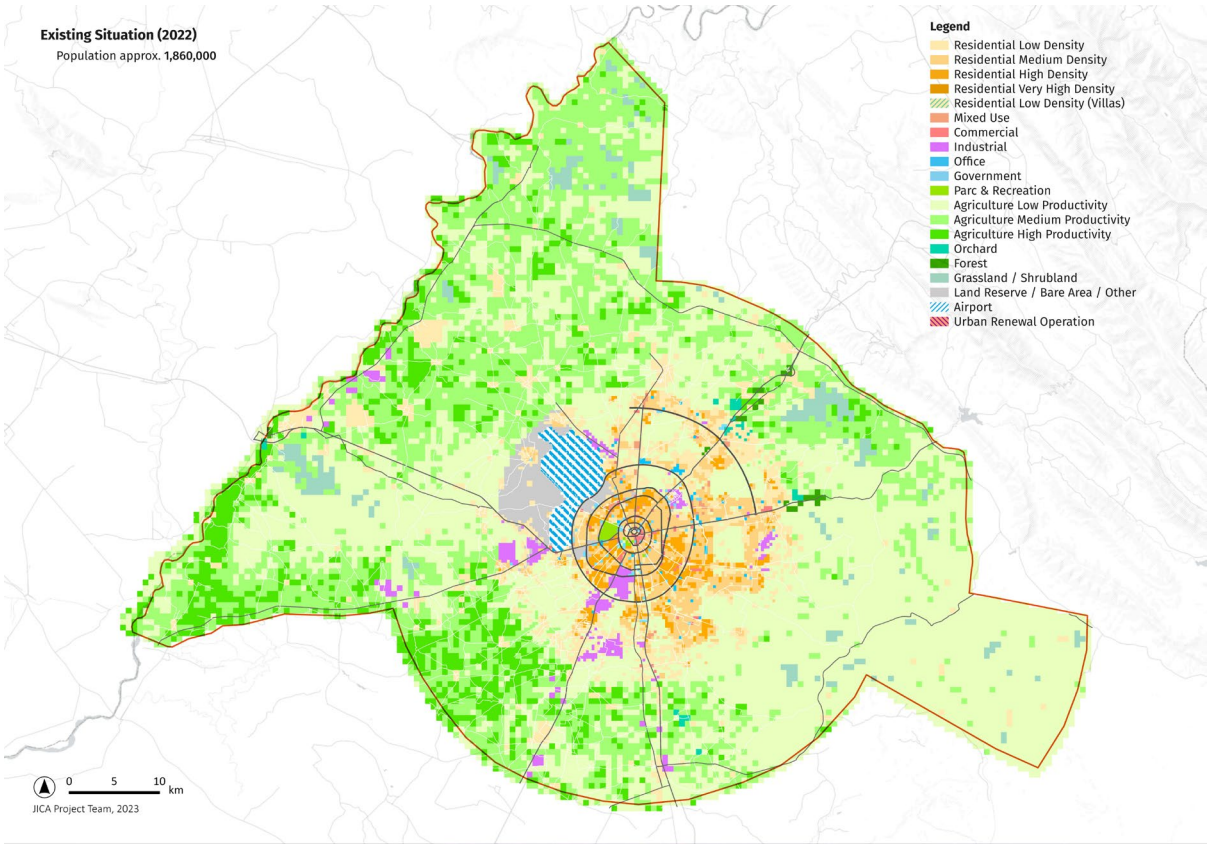
Results of Urbanization Potential Analysis can be interpreted in terms of composition into several geographic entities, as described below.

- **1st Priority Zone for Urban Expansion:** A large crescent area in the Northern part of the city, with the current neighbourhood of Bahirka in the centre, has the highest score;
- **2nd Priority Zones for Urban Expansion:** Smaller, numerous areas also show relatively high scores of urbanization potential in the close periphery outside Inner Green Belt;

- **Groundwater Recharge Zone:** In order to allow the rainwater to infiltrate the soil and thus recharge the groundwater resources, the delineated groundwater recharge zone shall be established as an Urban Expansion Control Zone as soon as possible;
- **3rd Priority Zone for Urban Expansion:** Relatively high urbanization potential scores can also be found in the Eastern direction, beyond the groundwater recharge zone. Nevertheless, this area remains the least priority for urbanization due to the following factors:
  - ✧ Remoteness from city centre;
  - ✧ Some parts are prone to flooding to some extent;
  - ✧ On the way of streamline corridor.

(2) Existing and Future Baseline Situation of Land Use

The existing situation of Erbil in terms of land use for spatial planning, shown in Figure 5.1.2 below, replicates the Existing Land Use Land Cover data developed within the framework of the Project (See Section 2.4.2) and, based on various types of previously explained population calculations (See Section 4.3), sets up the spatial frame for the baseline 424,970 Dwelling Units (DU), or approximately 1,861,870 residents in 2022.



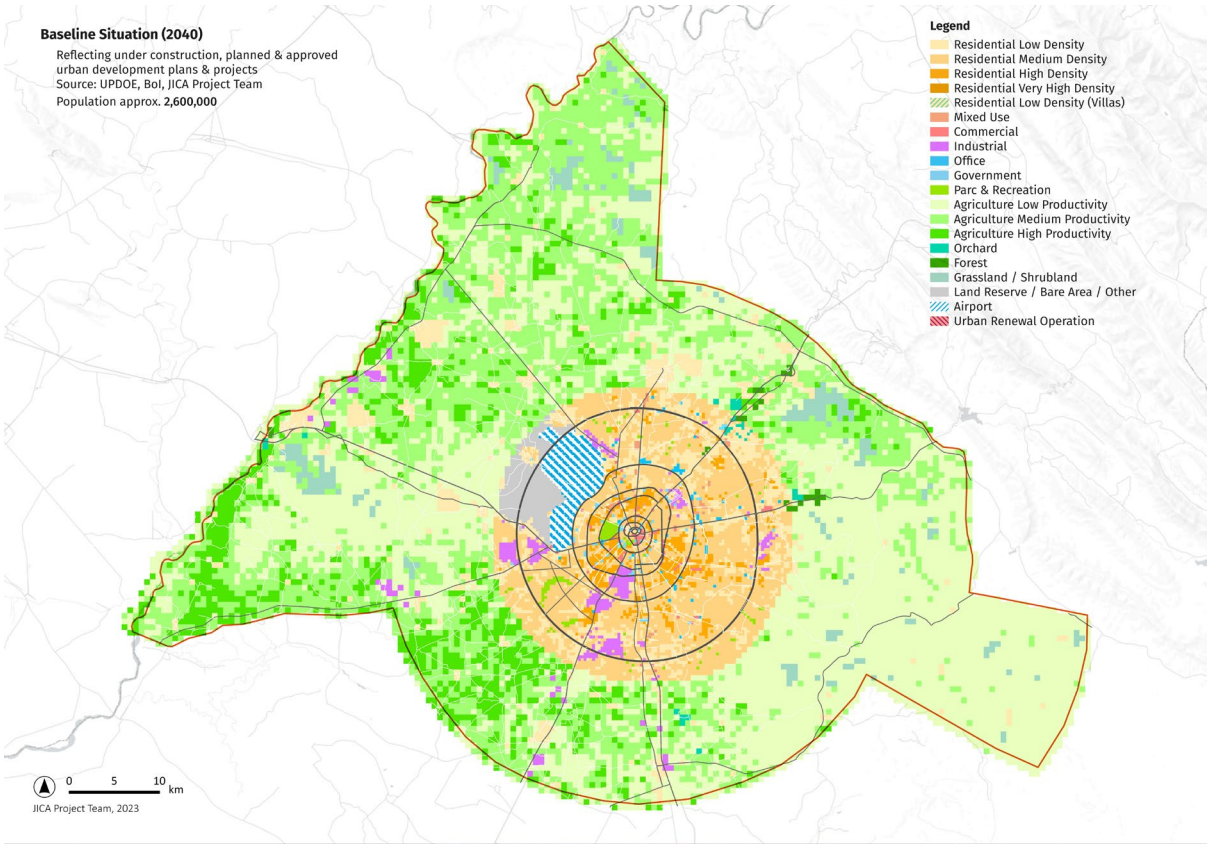
Source: JICA Project Team

Figure 5.1.2 Existing Baseline Land Use Situation for Spatial Planning (2022)

In order to set up the Baseline situation of land use for 2050 information regarding the urbanization which is likely to occur on short et medium terms, namely the officially approved detailed urban plans and private investments in the housing sector, have been collected from KRG organization and real estate companies, and housing supply has been calculated (See Section 4.3) and the results of this calculation demonstrates the following.

- **Approved Urban Detailed Plans:** housing needs of 155,297 DU will be covered by the 34 approved detailed urban plans to be implemented between the 120-meter Ring Road and the outside limit of the Inner Green Belt.
- **Private investments in the housing sector:** housing needs of approximately 60,657 DU will be covered by apartments and villas to be built under private initiative.
- Therefore, the **total of the urbanization** which is likely to occur on short et medium terms accounts for 215,954 DU, which represents approximately half of the total number of DU in the existing city.

Therefore, the future Baseline Situation of land use in 2040, as show in Figure 6.1.3 below, is a combination of the Existing Baseline (424,970 DU) and of the urbanization which is likely to occur on short and medium terms (215,954 DU) and accounts for a total of 640,924 DU, which represents, in addition to the residential areas in the rural part of the Target Area, approximately 2.6 million residents in 2040.

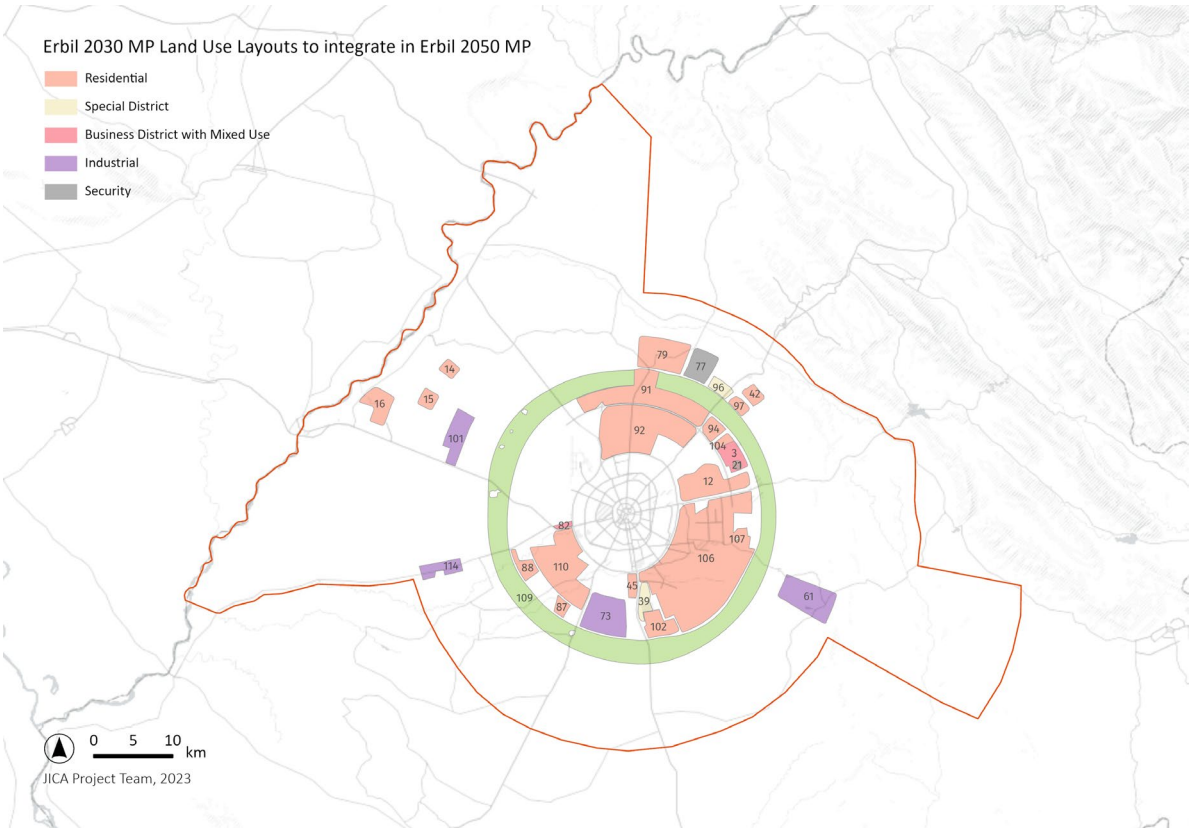


Source: JICA Project Team

Figure 5.1.3 Future Baseline Land Use Situation for Spatial Planning (2040)

(3) Erbil 2030 MP Land Use Layouts to Integrate in Erbil 2050 MP

Based on the in-depth Review of Proposed Land Use Layouts of Erbil 2030 MP (See Section 3.3), the Land Use Layouts that have been decided to integrate Erbil 2050 MP Land Use are shown on Figure 5.1.4 below. Those are mainly the on-going residential developments located between 120-meter Ring Road and 150-meter Ring Road, now materialized in Urban Detailed Plans, the four major industrial zones of Punjina Bestana, Ararat, Tiemar and Gwer Road, and other smaller Land Use Layouts. Those will be integrated directly in the Future Basic Spatial Composition of the Urban Structure (See Section 5.3.1).



Source: GDUP/MoMT

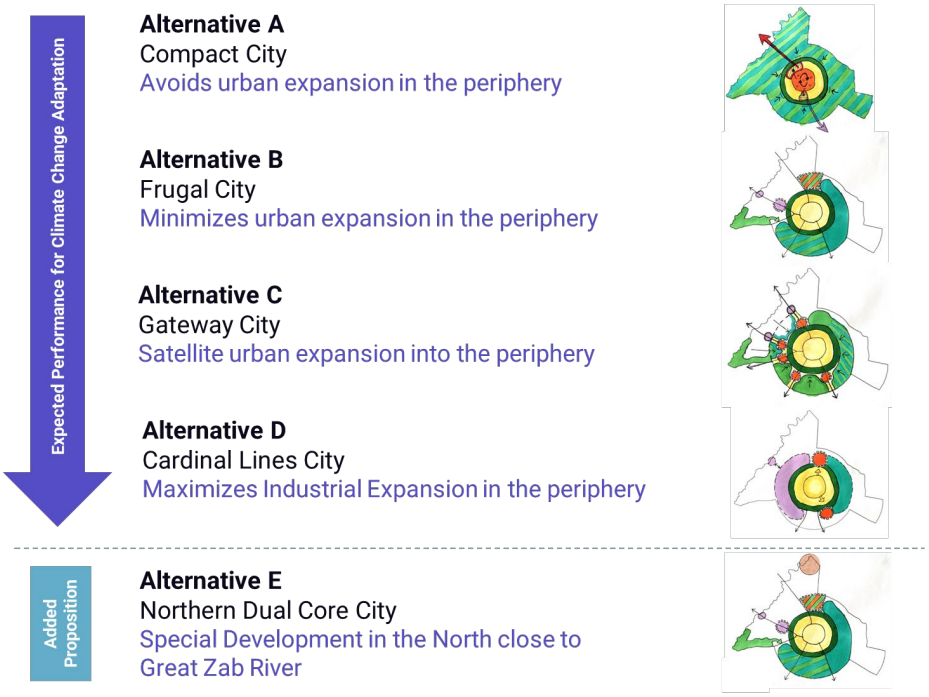
Figure 5.1.4 Erbil 2030 MP Land Use Layouts to Integrate in Erbil 2050 MP

5.2 Development Alternatives

The Development Alternatives are exploring the possible development paradigms and spatial patterns for Erbil city at horizon 2050 and have been elaborated though intense discussions with GDUP and related organization through Technical Working Group (TWG).

The concepts of possible development paradigms and spatial patterns elaborated for the Development Alternatives are shown in Figure 5.2.1 below. All the formulated Development Alternatives are based on the same analysis of existing situation of Erbil and try to maximize in different ways the results of the Urban Expansion Potential Analysis, by exploring various conventional urban development spatial paradigms such as the compact city, the multi-core city, corridor city etc.

Since one of the major approaches of the Project is to realize a low-carbon city, the Development Alternatives have been classified according to the expected performances of their urban structures for climate change adaptation.



Source: JICA Project Team

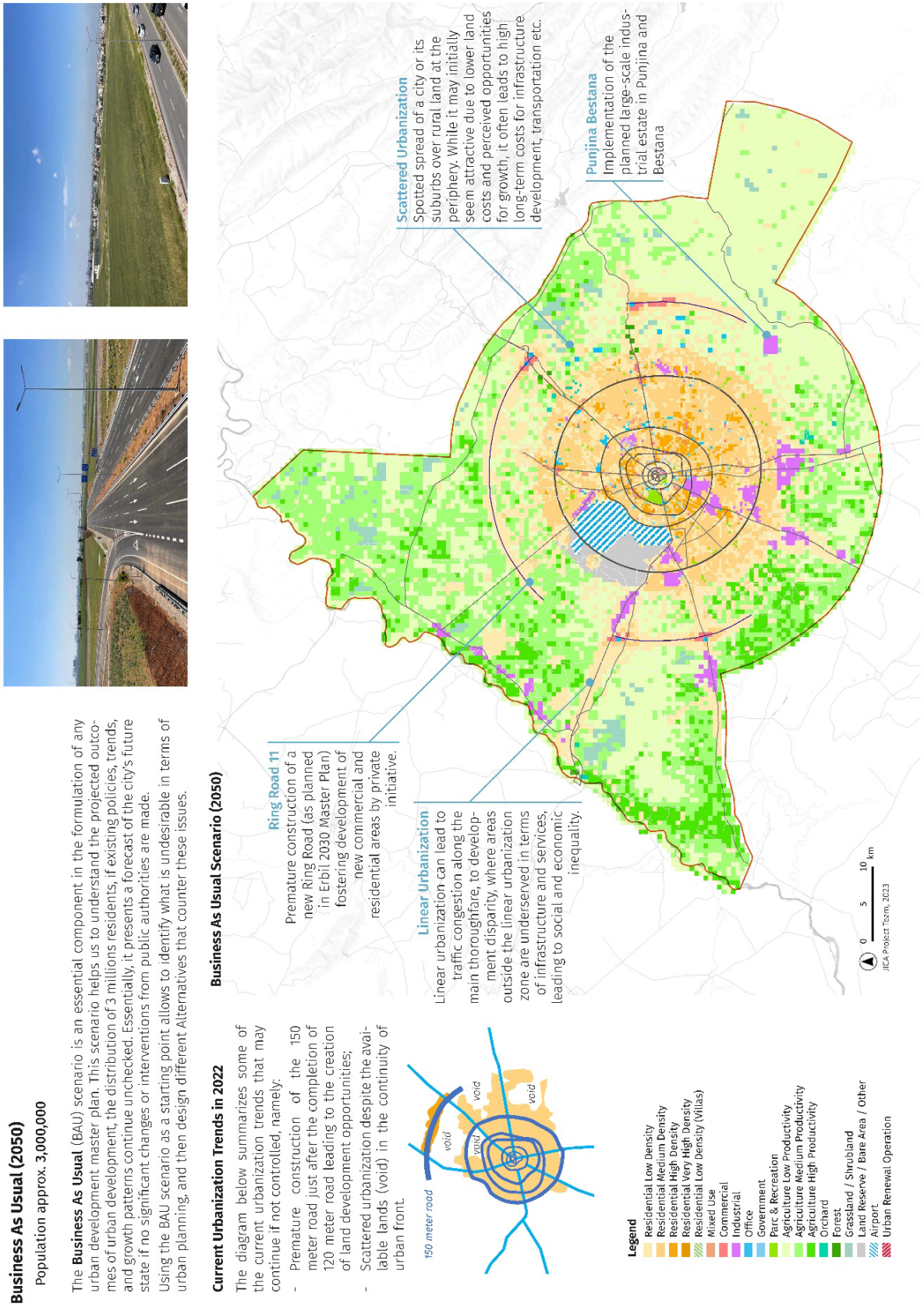
Figure 5.2.1 Concepts of Development Alternatives

Based on those concepts, and as a result of the synthesis of technical expertise and discussions, seven different Development Alternatives, detailed in Figures 5.2.3 to 5.2.8 below, have been formulated, including a Business-as-Usual scenario in Figure 5.2.2.

The various impacts of each Development Alternative on the natural and social environment have been assessed through SEA and supported by the 2nd Round of Consultation (see Part III, Chapter 3).

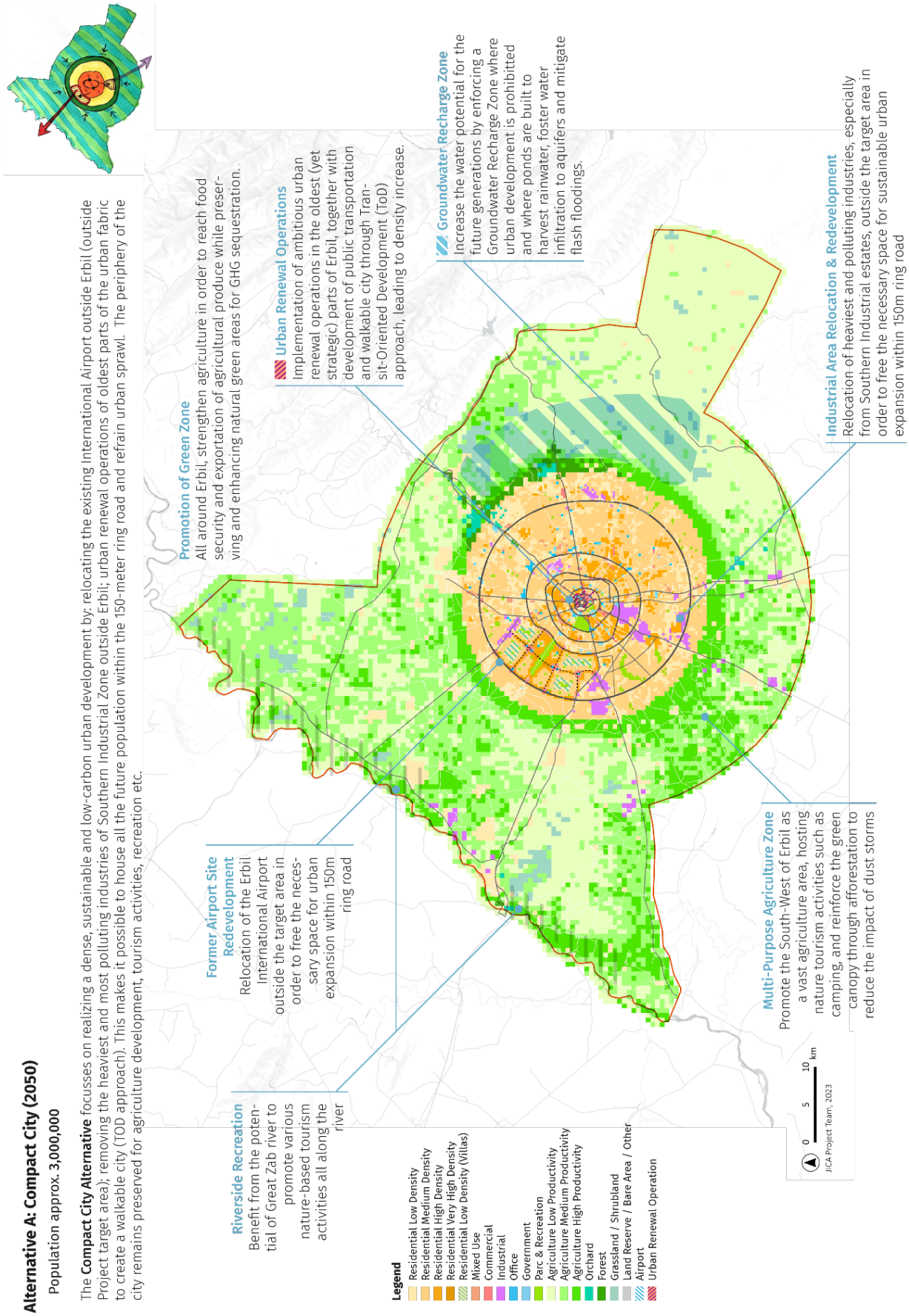
It is worthy to note that the spatial Development Alternatives outlined in this section are showcasing different possible spatial development and preservation patterns, but do not include consideration of the implementation or non-implementation of external projects from KRG or Iraqi Federal Government's independent initiatives, such as the Kurdistan Inter-City Railway (Project by MoHC of KRG) or the Mandawa Dam (Joint Project by KRG and Iraqi Federal Government). Therefore, those projects, for which the feasibility of the implementation is under confirmation, are not assessed in the SEA at this stage.

5.2.1 Presentation of Development Alternatives



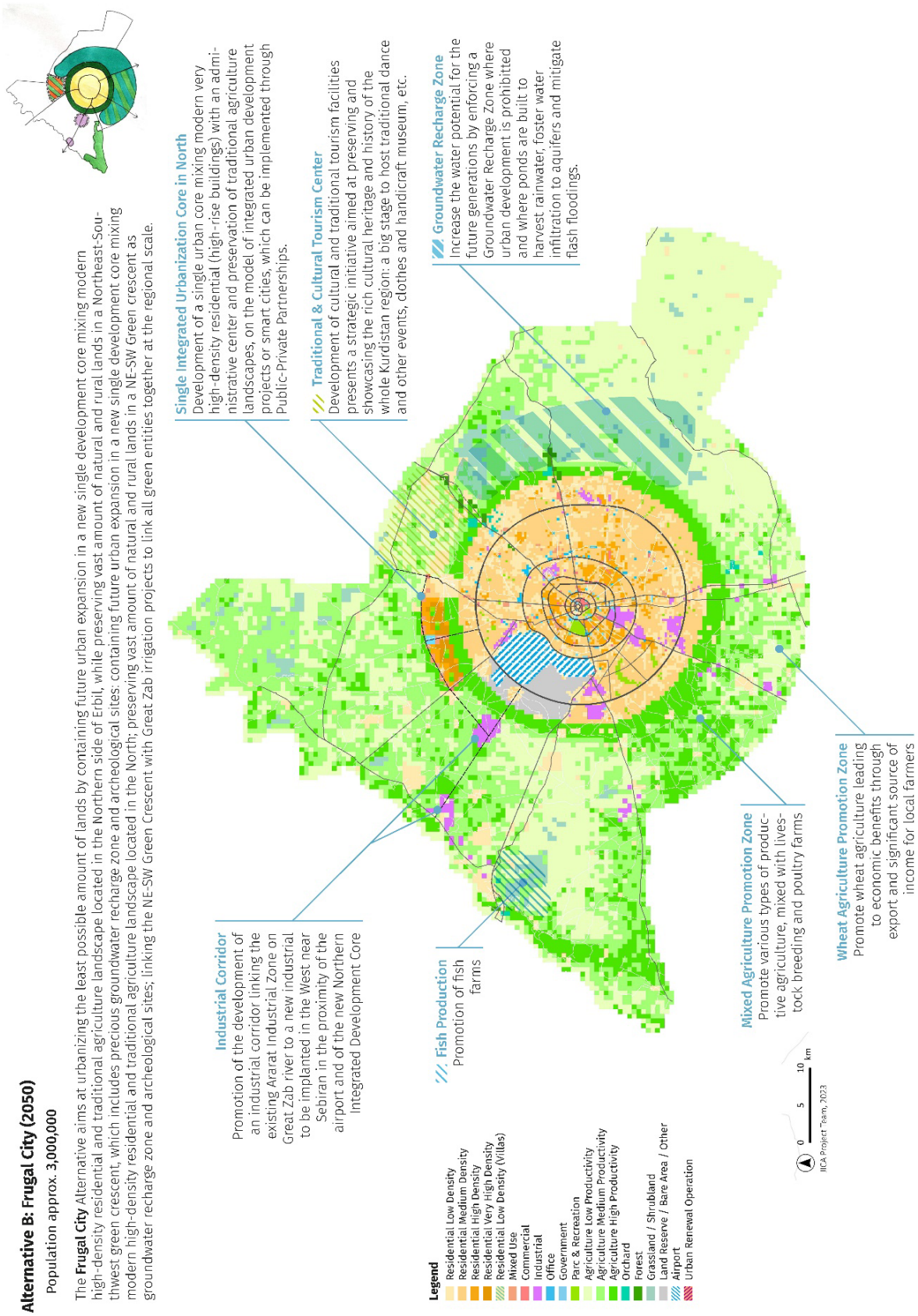
Source: JICA Project Team

Figure 5.2.2 Development Alternative: Business As Usual (2050)



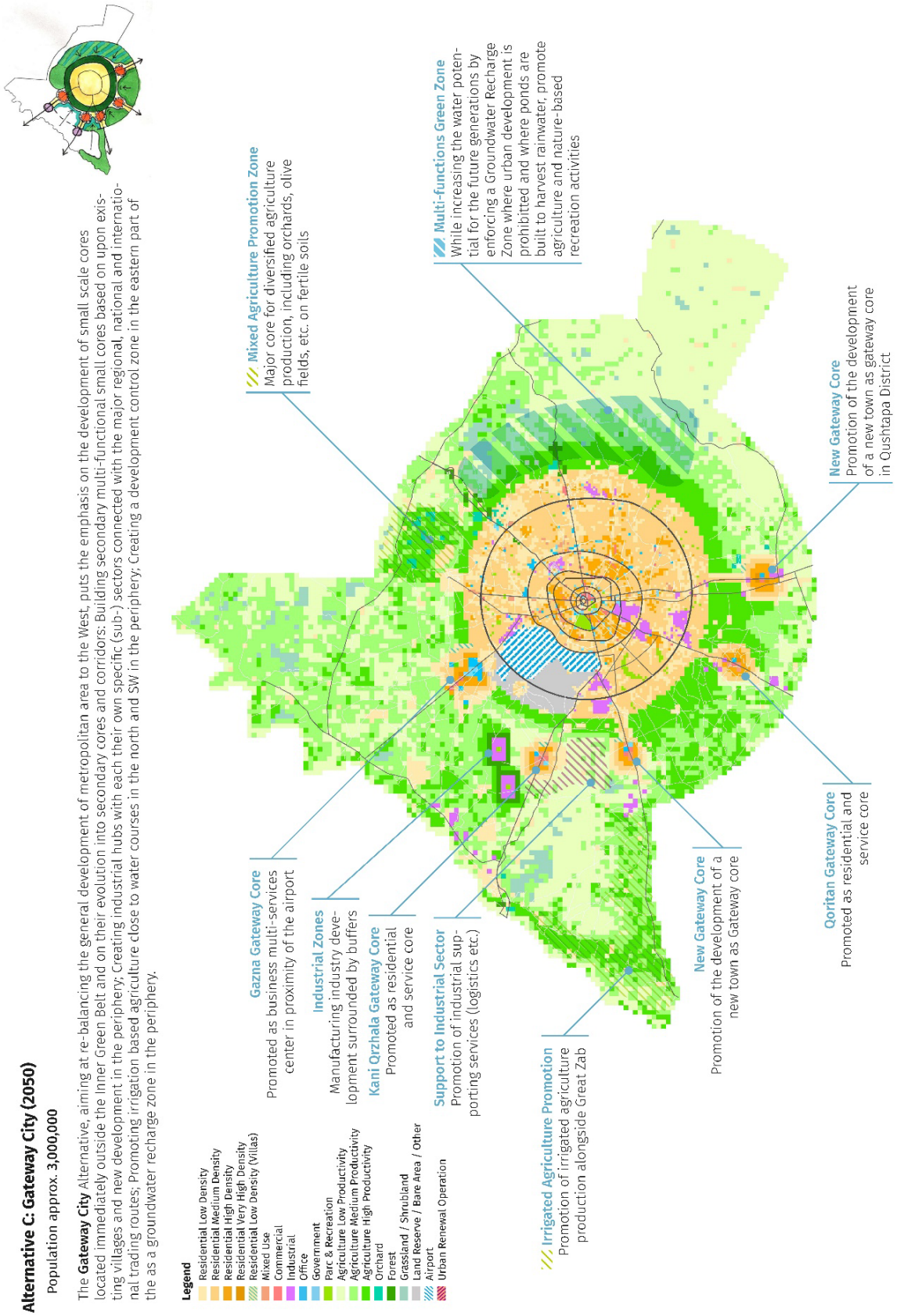
Source: JICA Project Team

Figure 5.2.3 Development Alternative A: Compact City (2050)



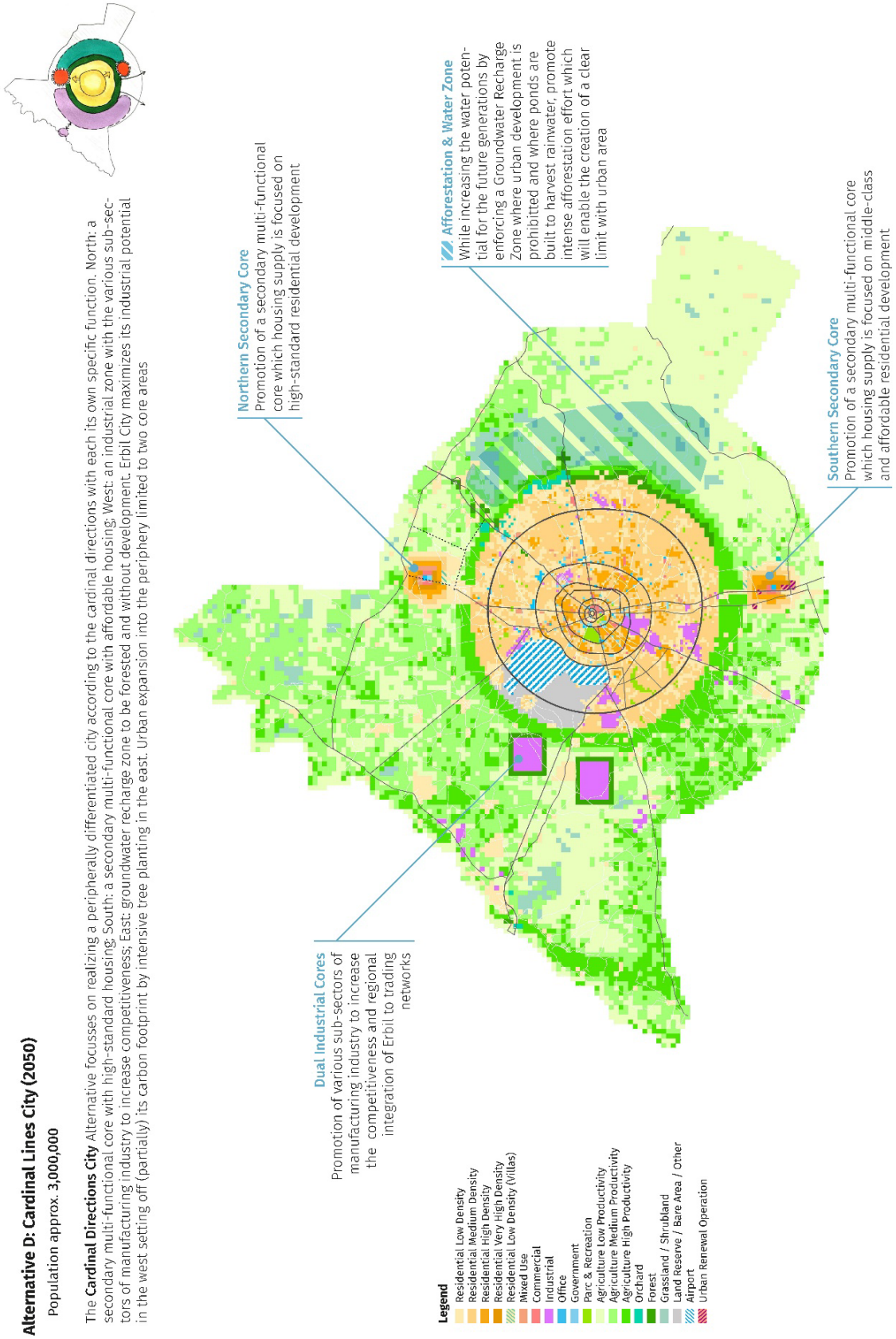
Source: JICA Project Team

Figure 5.2.4 Development Alternative B: Frugal City (2050)



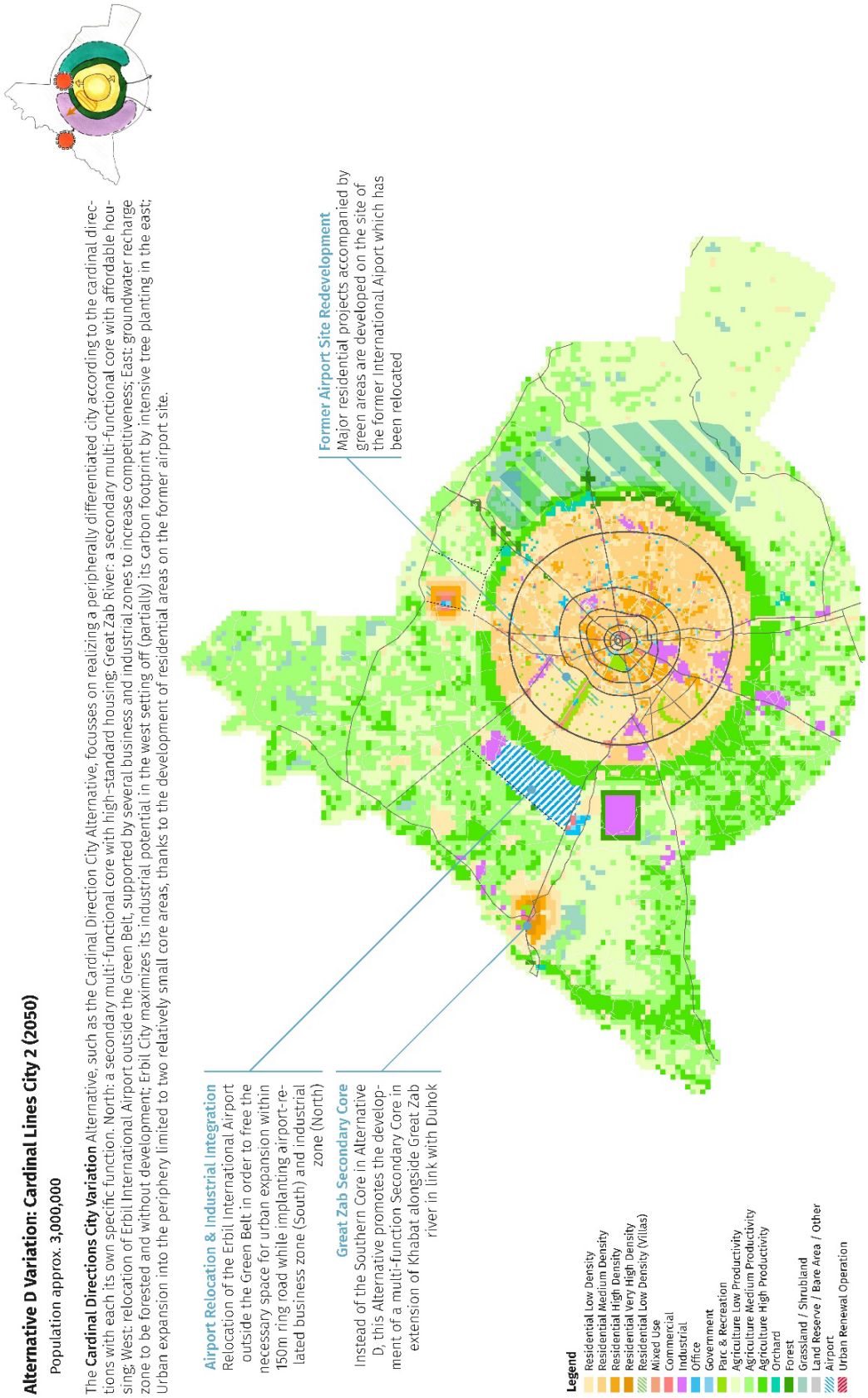
Source: JICA Project Team

Figure 5.2.5 Development Alternative C: Gateway City (2050)



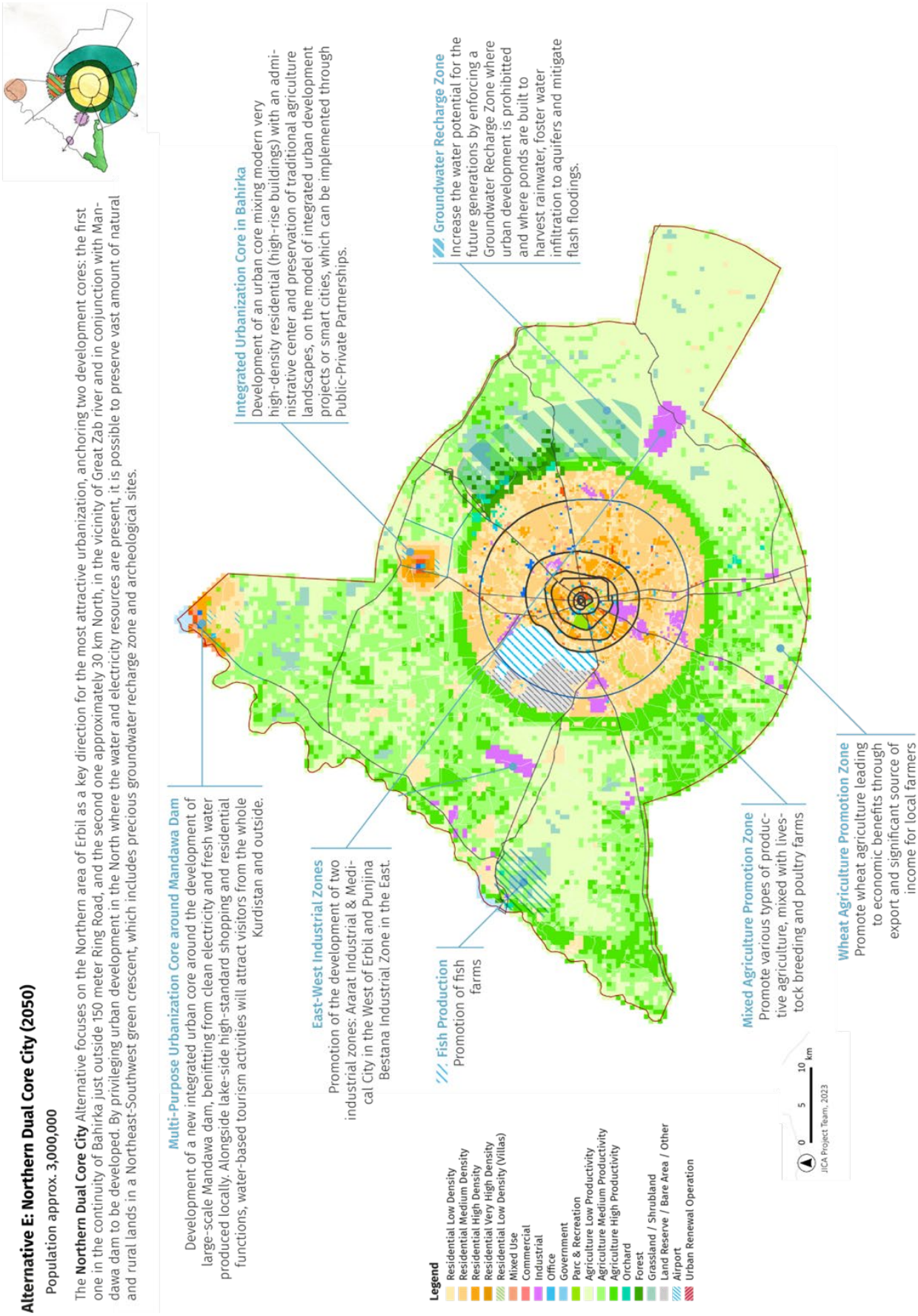
Source: JICA Project Team

Figure 5.2.6 Development Alternative D1: Cardinal City (2050)



Source: JICA Project Team

Figure 5.2.7 Development Alternative D2: Variation of Cardinal City (2050)

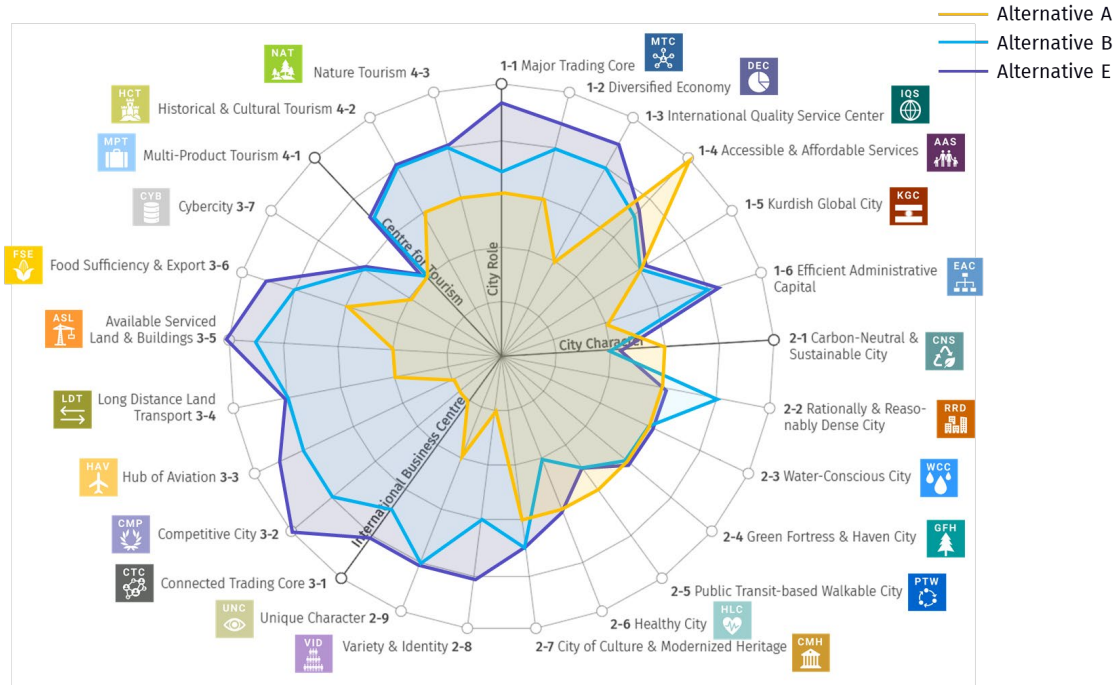


Source: JICA Project Team

Figure 5.2.8 Development Alternative E: Northern Dual Core City (2050)

5.2.2 Long-term Vision Achievement Performance Assessment

Based on the above-mentioned assessment of natural and social environment impacts of each Development Alternative undergone through the SEA (see Part III, Chapter 3), Alternatives BAU, C, D1 and D2 have been judged to have too many negative impacts and not enough positive impacts on the environment. Therefore, the remaining Alternatives A, B and C have been evaluated based on their performance on the achievement of the 25 Long-term Development Visions (See Section 4.2), as shown in Figure 5.2.9 below. The Synthesis Alternative, explained in next Section, is formulated by maximizing, as much as possible, the best performances on each Long-term Visions by all Development Alternatives.



Source: JICA Project Team

Figure 5.2.9 Matrix of Long-term Vision Achievement Performance Assessment

Alternative A, The Compact City, stands out for its emphasis on walkability and accessibility from public transportation, therefore performs well on PTW, AAS and HLC Visions. The Compact City model excels in promoting walkable environments, where residents can easily access essential amenities and services on foot. This not only enhances their quality of life but also contributes to a more sustainable and environmentally friendly urban landscape. Additionally, a well-integrated public transportation network ensures seamless connectivity across the city, reducing reliance on private vehicles and minimizing traffic congestion. This aspect will be integrated in Synthesis Alternative.

While Alternative B and E offer promising solutions for accommodating economic growth, they also present potential challenges. Alternative E, with its focus on satellite city development far from the city centre, risks exacerbating the need of commuting. Careful land use planning and incentives for job creation in satellite city development is crucial to mitigate these drawbacks. Alternative E, while promising in terms of creating new economic hubs, may require significant investment in new public transportation infrastructure. The potential benefits, however, could outweigh the initial costs, leading to long-term economic gains and improved quality of life for residents in the whole Metropolis of Erbil.

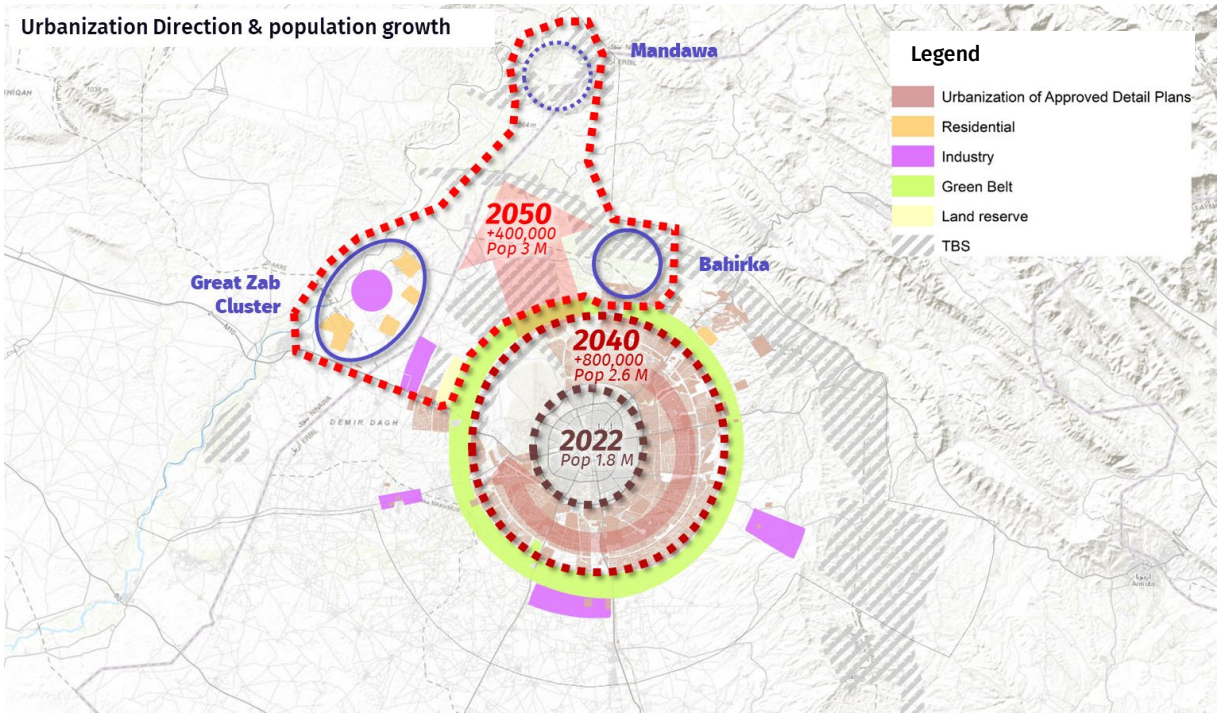
5.2.3 Pre-Selection of Best Alternative & Formulation of Synthesis Alternative

Based on the SEA assessment of each Development Alternative and on the above Long-term Vision Achievement Performance Assessment, a Synthesis Alternative is expected to become the basis of the Urban Structure, developed based on the fusion of Alternative B and E, but also taking some fundamental principles from the Compact City (Alternative A).

5.3 Urban Structure

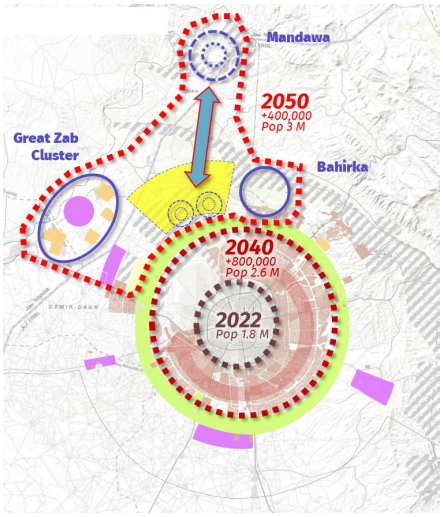
5.3.1 Future Basic Spatial Composition & Road Skeleton

Based on the formulation and comparison of Development Alternatives explained above (Section 5.2), the global direction of the urban development and population growth of the Urban Structure has been defined as shown in Figure 5.3.1 below.



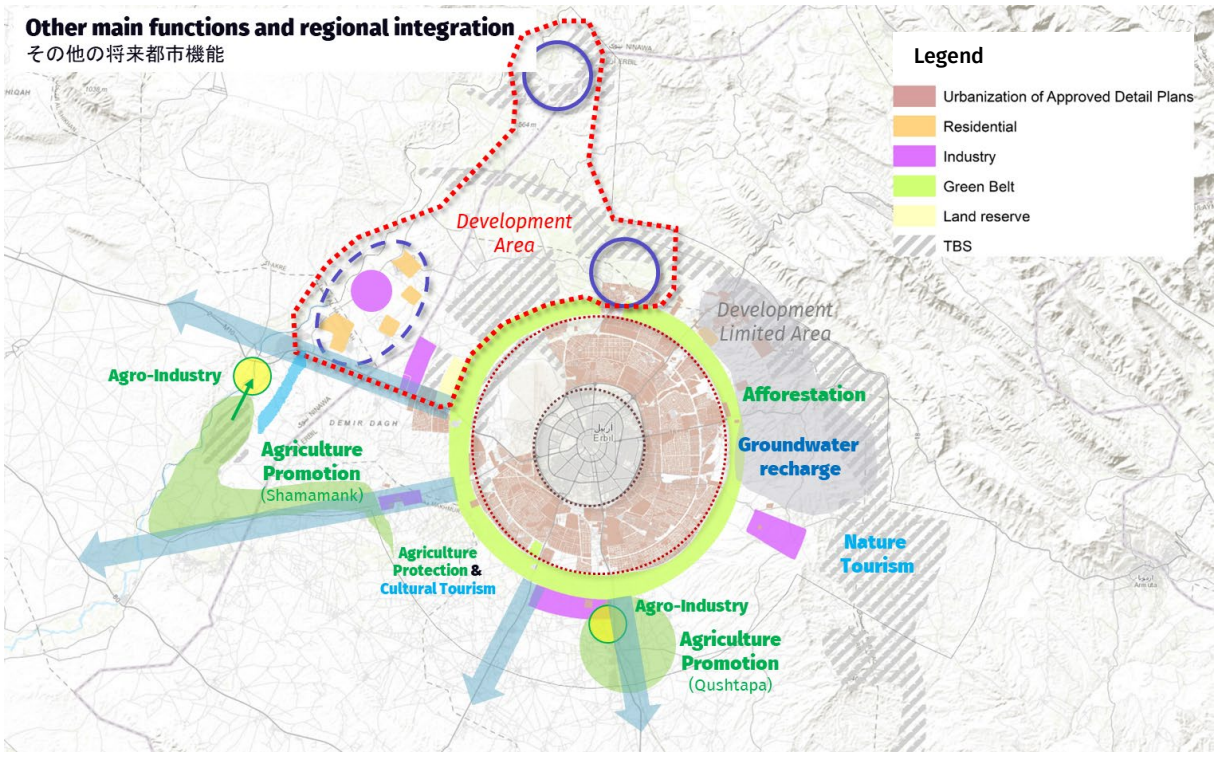
Source: JICA Project Team

Figure 5.3.1 Proposed Future Urbanization Direction & Population Growth



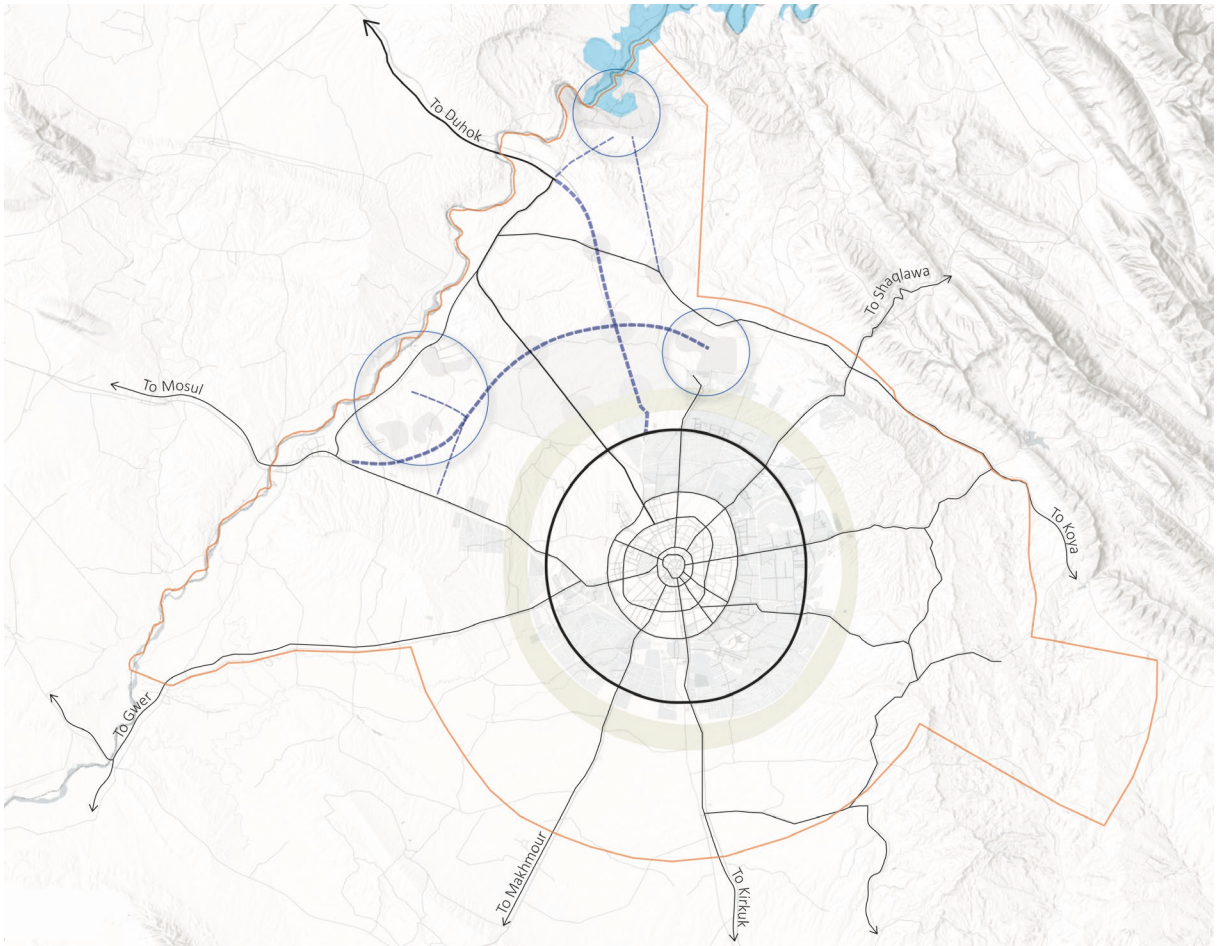
The proposed Future Basic Spatial Composition is characterized by the development inside the Inner Green Belt until 2040, and in a large Northern Urban Development Area up to 2050, while preserving the Southern area for economic development including agriculture and industry, and the Eastern direction for ground water recharge an afforestation, as shown in Figure 5.3.2.

The urbanization proposed in Northern Urban Development Area is polarized in a Multi-Core City model composed of the 3 Primary Cores of Bahirka, Great Zab Cluster and Mandawa, and of a supporting residential area depicted in yellow in Figure on the left. The ambition of Mandawa development in terms of development area, number of population or jobs, is currently under consideration. Tentatively, it will be considered as a proper satellite city, but population can be shifted to the yellow residential area in case the ambition for Mandawa is decreased.



Source: JICA Project Team

Figure 5.3.2 Future Basic Spatial Composition



Source: JICA Project Team

Figure 5.3.3 Future Road Skeleton & Main Development Cores

As shown in Figure 5.3.2, the proposed Future Basic Spatial Composition intends to define the intention in terms of development or perseveration according to the existing conditions and potentials of the areas surrounding the existing city.

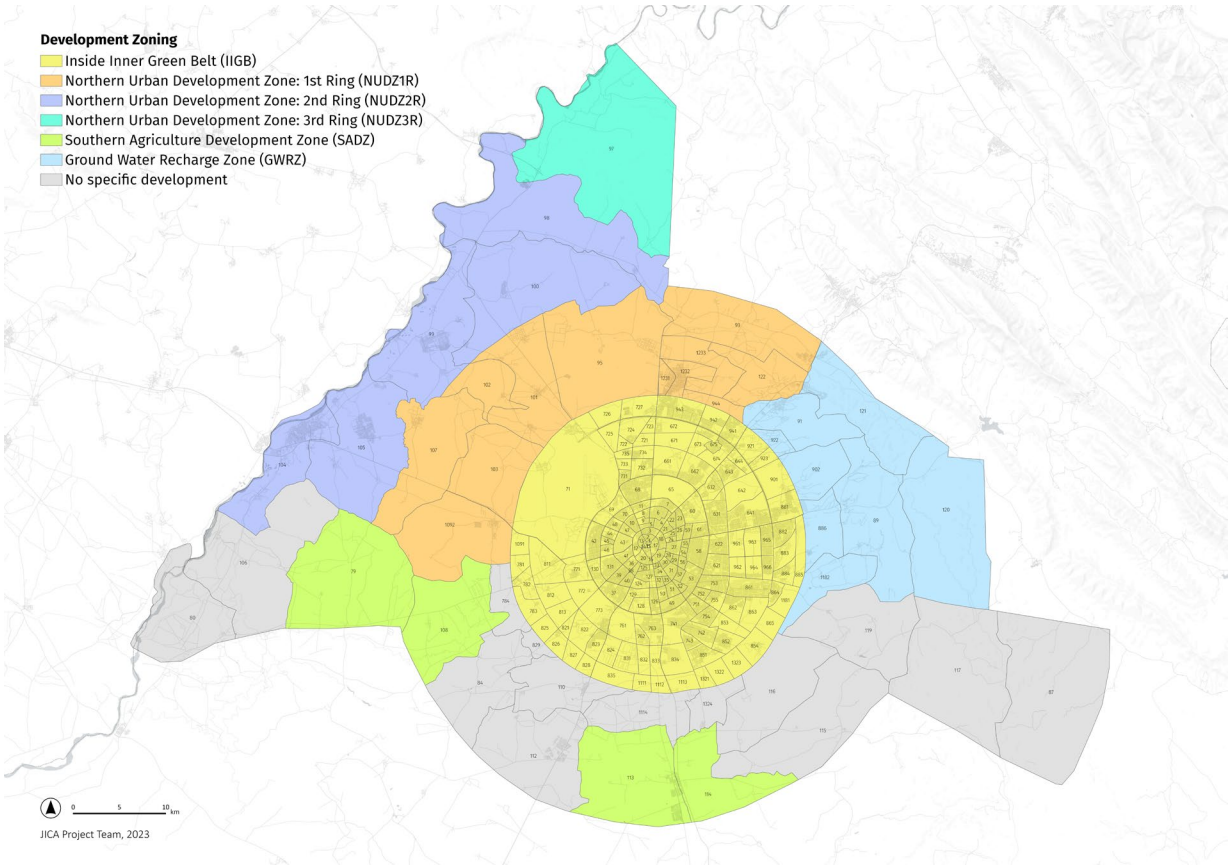
Concentric development of a city in all directions can contribute to suburban development and subsequently lead to urban sprawl. This unchecked expansion has the potential to encroach upon valuable lands, including but not limited to precious agricultural areas, archaeological sites, and groundwater recharge zones. These lands often hold intrinsic significance, playing vital roles in sustaining ecological balance, preserving cultural heritage, and ensuring the availability of crucial resources like water. Recognizing the importance of protecting such areas becomes imperative in urban planning to mitigate the negative consequences of urban sprawl and promote sustainable development that respects and preserves the intrinsic roles of diverse landscapes.

Road Skeleton

That is why the Expendable Ring Road Model, considered as a Crossover Strategic Planning Issue (See Section 4.1.4), supporting the concentric expansion of the city, has been partly abandoned. The proposed Road Skeleton, shown on Figure 5.3.3 above, aims at connecting (1) the city centre of Erbil to the proposed Northern Development Area and (2) each future new development cores together. It recommends the construction of a circle-shape trunk road, parallel to the 150m Ring Road, linking Bahirka Core and Mosul Road, which can be optionally extended to Kirkuk Road (See SO5 Section 5.4.5), and of a new radial from Duhok Road that goes through Qafar and Ashukan.

Development Zoning

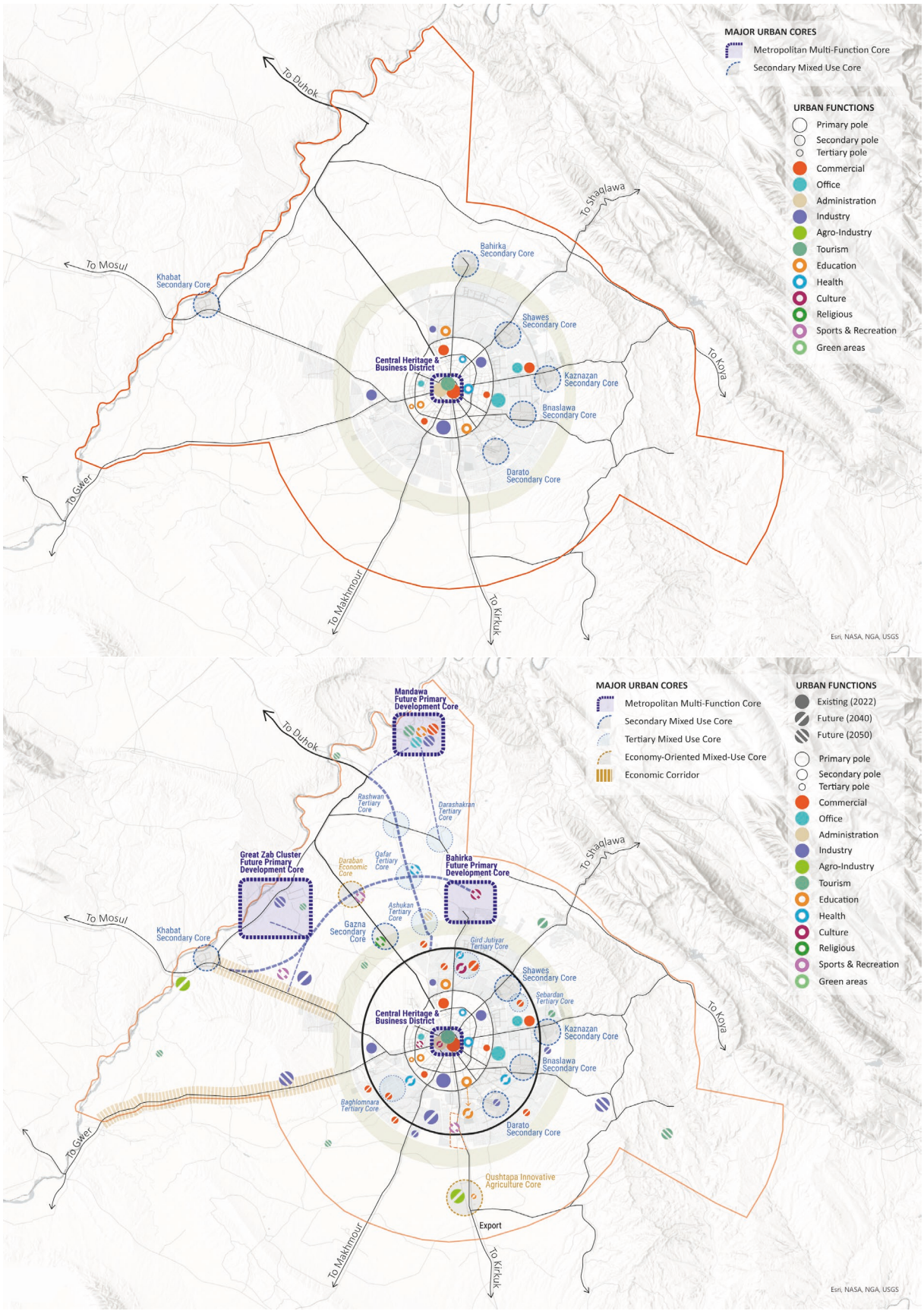
Figure 5.3.4 below shows the proposed Development Zoning, based on the Traffic Zones, that reflect the different areas of the proposed Future Basic Spatial Composition. The Development Zoning will be referred in subsequent sections regarding specific measures applying differentially on the Target Area, and for the Distribution of Population by Traffic Zone (See Section 5.5).



Source: JICA Project Team

Figure 5.3.4 Future Urban Structure (Major Urban Cores)

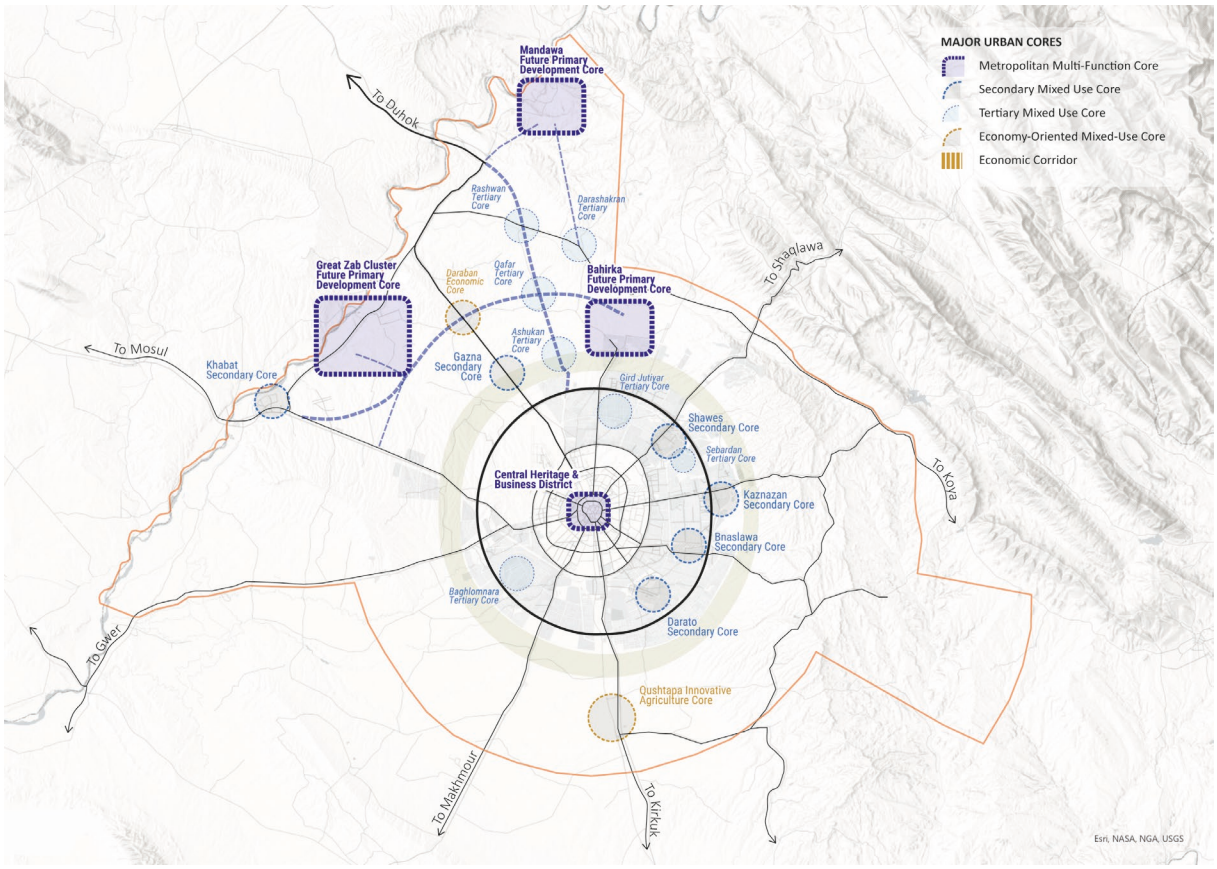
5.3.2 Urban Functions & Cores



Source: JICA Project Team

Figure 5.3.5 Baseline (2022) and Proposed Future (2050) Urban Functions & Cores

Figure 5.3.5 above shows Baseline (2022) and Proposed Future (2050) Urban Functions & Cores.



Source: JICA Project Team

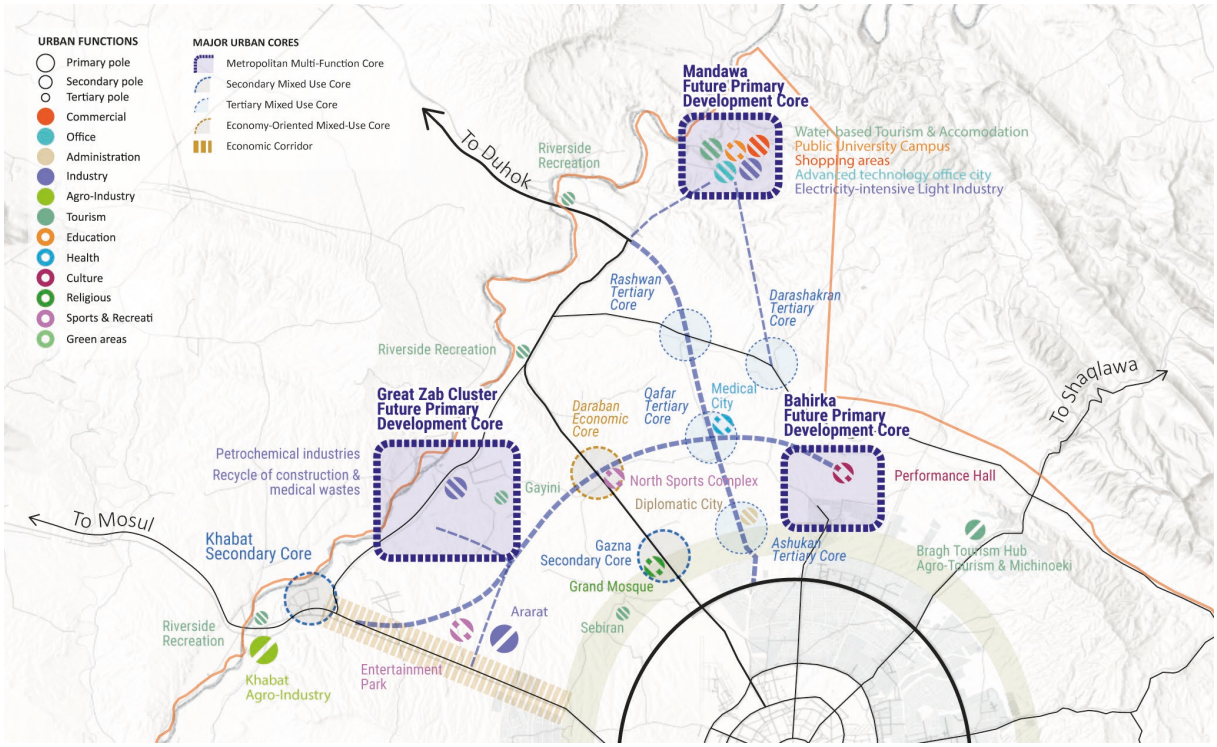
Figure 5.3.6 Proposed Future (2050) Urban Core Hierarchy

Figure 5.3.6 above shows the Proposed Future (2050) Urban Core Hierarchy. The definition of the expected future role of all the categories of Urban Cores in the Hierarchy and the Main Development Issues & Perspectives of each Urban Core is explained in Table 5.1.3 below.

Table 5.3.1 Outline of Proposed Future Urban Core Hierarchy

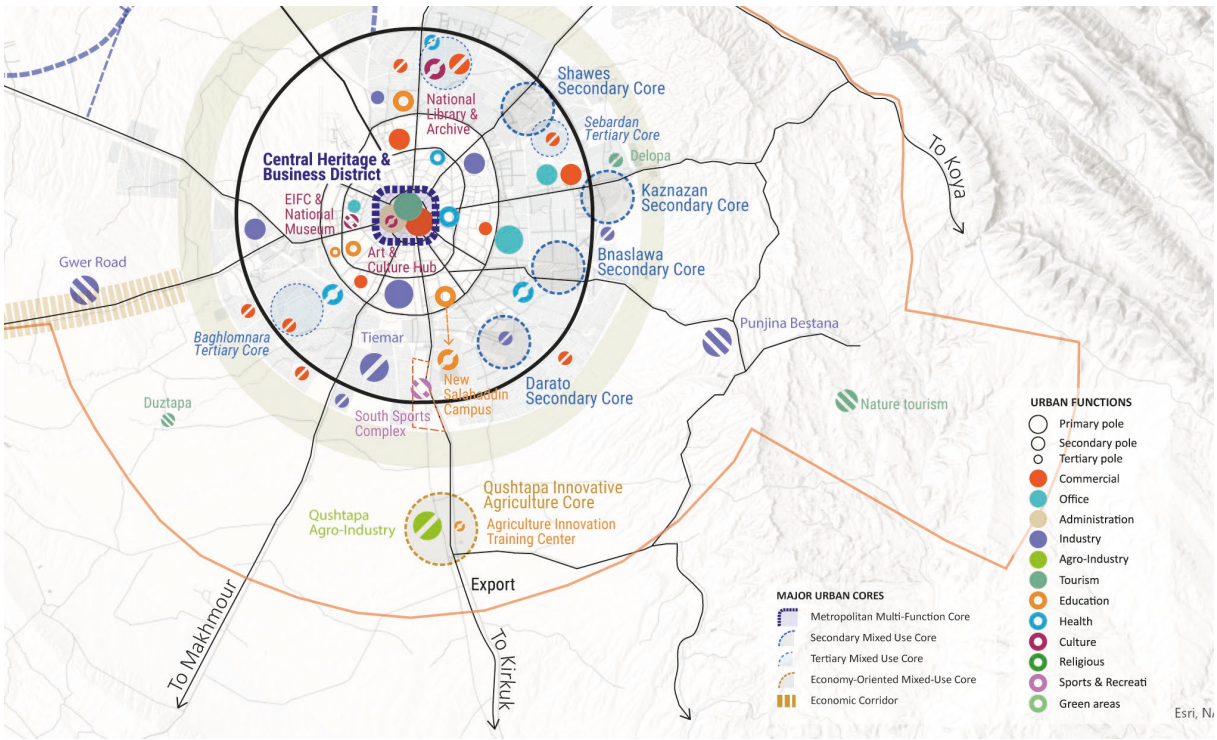
Urban Core Hierarchy	Definition	Zone	#	Urban Core Name	Main Development Issues & Perspectives
Metropolitan Multi-Function Core	Ensures unique urban functions at the scale of the whole city of Erbil, and beyond.	IIGB	1	Central Heritage & Business District	- In 2022, concentrating all major urban functions of the city, but some neighborhood has old urban fabrics that might need urban renewal
		NUDZ1R	2	Bahirka Future Primary Development Core	- Can be considered in 2022 as one of the most thriving suburban residential developing areas, especially with affordable apartment condominiums; - Due to its land availability, can be considered as one of the most strategic locations for Erbil's future close suburban development, evolving as a Primary Development Core; - Nevertheless, there is a need for diversification of housing options in order to reach higher levels of real-estate attractivity and attract other social classes.
		NUDZ2R	3	Great Zab Cluster Future Primary Development Core	- Complex planning: the area is a cluster of big villages and small towns, petrochemical industries, thriving agriculture and archeological sites
		NUDZ3R	4	Mandawa Future Primary Development Core	- Only very limited development (village and oil extraction) in this area in 2022; - The ambition and scale of urban development around Mandawa dam must be discussed (See Section 5.3.1).
Secondary Mixed-Use Core	Accommodates large population and show up specific identity. Works in relation with primary cores.	IIGB	1	Shawes Secondary Core	- No development in those areas in 2022; - Development planned in Detail Plans.
		IIGB	2	Bnaslawa Secondary Core	- Can be considered as secondary cores having an important population, economic activities and urban services at some extent, even in 2022; - Located opposed to the future direction of development, shall find opportunities for sustainability and attractivity.
		IIGB	3	Kaznazan Secondary Core	
		IIGB	4	Darato Secondary Core	
		NUDZ2R	5	Khabat Secondary Core	- Existing small town in 2022; - Proximity to river and to Mosul Road.
		NUDZ1R	6	Gazna Secondary Core	- No development in this area in 2022; - Proximity to Erbil International Airport.
Tertiary Mixed-Use Core	Satisfies only local needs of the neighbor-hood, without having unique role at the metropolitan scale.	IIGB	1	Sebardan Tertiary Core	- No development in those areas in 2022; - Relatively compact Mixed-Use development including residential, commercial, public facilities etc. specified in approved Detailed Plans and likely to be implemented by 2040.
		IIGB M6	2	Baghloom Mnara Tertiary Core	
		NUDZ2R	3	Rashwan Tertiary Core	- No development in this area in 2022; - Far from City Centre, post-2050 devt.
		NUDZ2R	4	Darashakran Tertiary Core	- No development in this area in 2022; - Far from City Centre, post-2050 devt.
Tertiary Unique Core	Satisfies local needs of the neighborhood, while having unique role at the metropolitan scale.	IIGB	1	Grid Jutiyar Tertiary Core	- In 2022, some development started, crucial position between Erbil - Bahirka; - Development planned in Detail Plans.
		NUDZ1R	2	Ashukan Tertiary Core	- Only very limited development in 2022; - Proximity to Erbil city and to 150 m Ring Road, but no connecting radial.
		NUDZ1R	3	Qafar Tertiary Core	- Only very limited development in 2022.
Economy-Oriented Mixed-Use Core	Has economic activities in addition to local services to the neighborhood.	NUDZ1R	1	Daraban Economic Core	- Only very limited development in 2022.
		SADZ	2	Qushtapa Innovative Agriculture Core	- Connection to Kirkuk Road can be an asset to foster exports.
Economic Corridor	Concentrates economic activities along a road.	-	1	Mosul Road Economic Corridor	- Economic development visible in 2022.
		-	2	Gwer Road Economic Corridor	- Economic development visible in 2022.

Source: JICA Project Team



Source: JICA Project Team

Figure 5.3.7 Detail of Proposed Future (2050) Urban Functions & Cores (North)



Source: JICA Project Team

Figure 5.3.8 Detail of Proposed Future (2050) Urban Functions & Cores (South)