PATHWAYS FOR ***CLIMATE INVESTMENT IN IRAQ***

2025 - 2030

TECHNICAL INVESTMENT REPORT

Transitional phase I

As of June 2025, the Government of Iraq, under the leadership and coordination of the Ministry of Environment, has issued the country's inaugural Biennial Transparency Report (1st BTR). This milestone document includes the calculation of national greenhouse gas (GHG) emissions for the years 2020 and 2021, disaggregated by key emitting sectors. This achievement reflects Iraq's substantial progress in establishing robust emission baselines and developing comprehensive GHG inventories, which are essential for formulating a credible Business-As-Usual (BAU) scenario and for enhancing the ambition of its Nationally Determined Contributions (NDCs).

GHG emissions Calculations for 2021 - 1st BTR of Iraq (under publishing)

CRT Category	2021(KtCO2eq)	Contribution	Cumulative Total of contribution	KCA rank T1 in level
1.A.1 - Energy Industries	68 532	33,4%	33,4%	1
1.A.3 - Transport	33 853	16,5%	49,9%	2
1.B - Fugitive emissions from fuels	24 080	11,7%	61,6%	3
1.A.2 - Manufacturing Industries and Construction	16 388	8,0%	69,6%	4
2.C.1 - Steel production	14 434	7,0%	76,6%	5
1.A.4 - Other Sectors	9 751	4,7%	81,4%	6
2.A.1 - Cement production	7 875	3,8%	85,2%	7
5D. Wastewater treatment	6 925	3,4%	88,6%	8
5A. SWDS	6 385	3,1%	91,7%	9
3.A - Enteric fermentation	5 676	2,8%	94,4%	10
3.D - Agricultural soils	4 909	2,4%	96,8%	11
5C. Open burning and Incineration	1 695	0,8%	97,7%	12
4. LULUCF	1 675	0,8%	98,5%	13
2.A.2 - Lime production	1 266	0,6%	99,1%	14
2.B.1 - Ammonia production	667	0,3%	99,4%	15
3.C - Rice cultivation	661	0,3%	99,7%	16
3.B - Manure management	284	0,1%	99,9%	17
3.H - Urea application	271	0,1%	100,0%	18
1.A.5 - Non-Specified	-	0,0%	100,0%	19
Total with LULUCF	205,328		100%	

The Pathways for Climate Investment Plan was submitted during late 2024 and formally endorsed in February 2025, marking a strategic step forward in Iraq's commitment to climate action and sustainable economic transformation

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Acronyms

ADB	Asian Development Bank
AFOLU	Agriculture, Forestry, and Other Land Use
CBA	Cost-Benefit Analysis
CBI	Central Bank of Iraq
CDM	Clean Development Mechanism
CEDAW	Committee on the Elimination of Discrimination against Women
CIFs	Climate Investment Funds
CIP	Climate Investment Plan
CMA	Meeting of the Parties to the Paris Agreement
CPEIR	Climate Public Expenditure and Institutional Review
CTF	Clean Technology Fund
DALY	Disability-adjusted life years
EASA	European Authority for Aviation Safety
EBRD	European Bank for Reconstruction and Development
EOLV	End-of-life vehicles
ETF	Enhanced Transparency Framework
ETS	Emissions Trading Schemes
EVs	Electric vehicles
FDI	Foreign direct investment
FFER	Facility for Economic Reform
FMIS	Financial Management Information Systems
GCC	Gulf Cooperation Council
GCF	Green Climate Fund
GEF	Global Environment Facility
GDP	Gross Domestic Product
GHG	Greenhouse gases
GII	Gender Inequality Index
GoI	Government of Iraq
GWP	Global warming potential
HFCs	Hydrofluorocarbons
HPE	Heavy precipitation event
IGCO	Iraqi Green Climate Organization
ISEPI	Iraqi Society for Environmental Protection and Improvement
ILO	International Labour Organization
IOM	International Organization for Migration
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
ICAO	International Civil Aviation Organization
KRG	Kurdistan Regional Government
KRI	Kurdistan Region of Iraq
LT-LEDS	Long-Term Low Emission Development Strategies
MDBs	Multilateral Development Banks
MoHEn	Ministry of Health and Environment
MRV	Measurement, reporting, and verification
MTEF	Medium Term Expenditure Framework
MTFF	Medium Term Fiscal Framework
MW	Megawatt
M&E	Monitoring and Evaluation
NAMA	Nationally Appropriate Mitigation Action
NAP	National Adaptation Plan
NC	National Communication
NCCC	National Centre for Climate Change
NDC	Nationally Determined Contribution
NDP	National Development Plan
NIC	National Investment Commission
ODA	Official Development Assistance
OECD	Organization for Economic Co-operation and Development
OPEC	Organization of the Petroleum Exporting Countries
PFM	Public Financial Management
PPCR	Pilot Program for Climate Resilience
PPP	Public-Private Partnership
RCP	Representative Concentration Pathways
SAM	Social Accounting Matrix
SCF	Strategic Climate Fund
SDGs	Sustainable Development Goals
SDS	Sand, and dust storms
SMEs	Small & Medium Enterprises
STEM	Science, Technology, Engineering and Mathematics
SWM	Solid Waste Management
TNA	Technology Needs Assessment
UN	United Nations
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNSDCF	United Nations Sustainable Development Cooperation Framework
USAID	United States Agency for International Development
USD	United States Dollar
VCM	Voluntary Carbon Market
WASH	Water, sanitation and hygiene
WTO	World Trade Organization

List of contributors/participants

from the government and private sectors in technical meetings and workshop

Department/Section	Ministry/Entity	Name
Dr. Mona Sabah Qasim	National Investment Commission	Advisor to the National Investment Commission for Energy Affairs
Ali Bassem Salman	National Investment Commission	Office of the Chairman of the Commission
Yousef Moayad Youssef	Ministry of Environment	Directorate of Climate Change
Dr. Zaid Abdulla Saeed	Ministry of Environment	Directorate of Climate Change
Esraa Yassin Abdulhussain	Ministry of Environment	Technical Department
Sorour Abdulwahab Yassin	Ministry of Environment	Directorate of Climate Change
Amna Salam Abdulrahman	Ministry of Environment	Directorate of Climate Change
Dr. Ahmed Muhammad Hassan	Ministry of Planning	Chairman of the Committee of Experts
Jabbar Juma Luaibi	Ministry of Planning	Committee of Experts
Walid Khalif Jabara	Ministry of Finance	Economic Department/Director of International Economic Relations Department
Hussein Abdul Amir	Central Bank of Iraq	Head of Financial Inclusion
Muhammad Ali Mirjan	Ministry of Oil	Head of Investment Planning Department
Maha Ibrahim Dawood	Ministry of Electricity	Head of Environment Department – Department of Planning and Studies
Anwar Reda Nour	Ministry of Transport	Environment Department - Technical Department
Dr. Thaer Moneim Hamed	Ministry of Higher Education and Scientific Research	Head of Innovation & Projects
Sana Sami Aziz	Ministry of Construction, Housing, Municipalities and Public Works	Head of Environment Department - Technical Department
Suad Abd Mahdi	Mayoralty of Baghdad	Head of Climate Change Department
Dr. Raed Abdulhai Ibrahim	Ministry of Agriculture	Head of Investment Planning Department
Riyam Mohammed	Ministry of Water Resources	Chief Engineer
Dr. Iyad Hamid Abbas	Ministry of Water Resources	Expert/Consultant
Dr. Maytham Adham Reda	Ministry of Industry and Minerals	Head of Environment Department – Department of Industrial Development and Organization
Emad Tariq Mohamed	Ministry of Health	Chief Engineer
Zuhair Sabri Botros	Contractors Union	President of the Federation
Awni Kamel Shaaban	Engineers Syndicate	Head of Green Buildings Section
Maan Thabit Aref	Federation of Chambers of Commerce	Expert/Consultant
Kurdistan Region		
Dr. Assad Hamad Razzaq	Board of Investment Kurdistan Region	Director General of the Department of Promotion, Evaluation and Granting of Investment Licenses
Dr. Kanar Fadel Hedayat	Ministry of Planning Kurdistan Region	Director-General for Development Cooperation and Coordination

Dr. Shara Kamal	Kurdistan Region Council of Ministers	Consultant - University Professor
Haval Ahmed Mohammed	Kurdistan Region Environmental Protection and Improvement Authority	Director of Climate Change Department
Bhutan Tahir Mustafa	Presidency of the Council of Ministers Kurdistan Region	Supreme Council for Investment
Govar Mohammad Hama Sharif	Kurdistan Region Board of Investment	Senior Engineer / Head of Green Investment Unit
Luqman Rahman Mouloud	Kurdistan Region Environmental Protection and Improvement Board	Directorate of Quality Assurance
Muhannad Ayoub Mustafa	Kurdistan Region Environmental Protection and Improvement Board	Head of Mitigation and Adaptation Section - Department of Climate Change
Sardar Karim Ismail	Ministry of Planning Kurdistan Region	Director of Economic Planning
Sally Salah Abd	Ministry of Planning Kurdistan Region	Institutional Capacity Development Coordination Manager
Shajwan Rebwar Mohammad Karim	Ministry of Planning Kurdistan Region	Office of the Director General for Development Cooperation and Coordination
Ajeen Abubakar Kawais	Ministry of Planning Kurdistan Region	Office of the Director General for Development Cooperation and Coordination
Sherin Taha Bahauddin	Ministry of Finance and Economy Kurdistan Region	Technical Department
Diyar Yasin Mustafa	Ministry of Natural Resources Kurdistan Region	Department of Health and Environment
Dilshad Mohammad Amin Aljaf	Ministry of Electricity Kurdistan Region	Chief Engineer
Abdul khaliq Ali Fathallah	Ministry of Transport and Communications Kurdistan Region	Expert Engineer/Director of Transportation of Erbil Governorate
Ranj Ali Mohammad Amin	Ministry of Housing and Construction Kurdistan Region	Senior Chief Engineer
Qarman Qadir Mawloud	Ministry of Agriculture and Water Resources Kurdistan Region	Chief Agricultural Engineer
Salman Karim Hamad	Ministry of Agriculture and Water Resources Kurdistan Region	Head of Studies and Designs Department / Directorate of Water Resources
Araz Fouad Saber	Ministry of Municipalities and Tourism Kurdistan Region	Directorate of Services - Environmental Protection and Solid Waste Treatment
Sarwood Ahmed Feqi Yousef	Ministry of Commerce and Industry Kurdistan Region	Director of Planning Department - Directorate General of Industrial Development
Dr. Suzy Ahmed Saleh	Ministry of Health Kurdistan Region	Quality Assurance Directorate - Head of Climate Change Department
Duraid Efram Saeed	Kurdistan Region Engineers Syndicate	Head of Follow-up Department for Engineering Projects and Consulting Offices
Khurshid Abdul latif Mazouri	Kurdistan Region Investors Union	Member of the Board of Directors of the Kurdistan Investors Union
Diyar Nouri Bapier	Kurdistan Region Economic Union	Head of Research and Economic Feasibility Studies Department

List of

UNDP contributors/participants

Ines Zegoulli	United Nations Development Programme (UNDP)	Project Manager
Fatimah Jihad	United Nations Development Programme (UNDP)	Project Coordinator
Alexander Borde	United Nations Development Programme (UNDP)	International Expert
Abbas Balasem	United Nations Development Programme (UNDP)	National Expert
Amr Osama	United Nations Development Programme (UNDP)	International Expert
Ahmed Azzam	United Nations Development Programme (UNDP)	International Expert
Susan AlBanna	United Nations Development Programme (UNDP)	National Expert
Mamdouh Mahdi	United Nations Development Programme (UNDP)	National Expert
Othman Ali Karim	United Nations Development Programme (UNDP)	National Expert

Preamble

The need for climate change adaptation in the Mena region is acute and undermine sustainable development efforts. This is exacerbated in Iraq that suffered from fragility and conflicts in the past, despite its economic classification as middle-income country. The idea for an investment plan for Iraq stems from the success of the first Iraqi Pavillion during UNFCCC COP 28 in Dubai in 2023 and the role that the country ambitions to play internationally.

The country abounds of economic and investment opportunities and has a wealth of untapped human capital in its young and diverse population. However, clear pathways for strengthening resilience towards climate change while recovering from past fragilities are not yet defined. While the country is working on the revision of the national determined contributions (NDC) to the Paris Agreement goals to be submitted in 2025, discussions with government stakeholders and the international community has sparked a growing interest for a tailored investment plan for the country that contributes to the economic diversification in a sustainable manner while consolidating the society and the diverse Iraqi communities.

A tailored investment for the country can only be achieved by understanding the links between climate change projections and economic growth projections and how best to implement the required changes and adaptation measures in Iraq. This has led to undertake a stepwise approach that best matches the development of the country:

1. **Phase I:**

   A transitional plan for the period 2025 - 2030 that identifies the strengths and weaknesses of the current economic sectors, and the impacts of climate change on each sector. This phase defines how best to assist each sector to adapt to climate change at a national level. The phase ensures to build a solid base for a climate robust economy and draw the pathways for a sustainable transformation.

2. **Phase II:**

   A detailed investment plan for 2030 – 2050 to scale up the transformation of the economy and define project level detailed investment plan for each economic sector that covers the tailored needs of each governorate.

Executive Summary

Iraq's Climate Investment Plan (CIP) marks a turning point in the nation's ambition to tackle climate change impacts and drive economic diversification through strategically integrating climate change aspects in future investments. The country's economy relies heavily on oil and gas revenues while concurrently suffering from the impact of climate change. The transition to a low carbon economy should therefore be planned carefully. This transitional phase should steer technological transfer and adequate innovation and mobilize financial resources to address the most pressing climate change adaptation and mitigation challenges while scaling up the transition to a more sustainable and bright future for its population. Iraq contributes to 0.27% of the global (GHG) emissions and is committed to fulfill its international commitments. But it also has an immense potential for low carbon fuels and renewable energy uses, making it an ideal country for climate investment various opportunities.

The report starts with a chapter providing an overview of the current context in Iraq: the institutional framework for climate change and for domestic and international investments. The next chapter describes briefly the current climate change impacts and the current economic context in Iraq.

The country is facing increasing temperatures and heat waves and changing precipitation patterns that are negatively impacting food security, water security, social security, and the well-being of an increasingly young population. Additionally, sea-level rise poses a threat to high-value ports that are the single marine entry point for the country. Sea level rise will also heavily increase pressure on agriculture due to water and soil salinization.

The current economic situation highlights the dominance of mitigation sectors in the country revenues and the imbalance in revenue sources with most revenues stemming from the oil and gas sector. This requires a careful transition that balances economic diversification with climate change resilience strengthening in the vulnerable adaptation sectors such as the water and agriculture sectors. This economic chapter ends with an estimation of the economic investments costs and benefits in climate friendly activities pertinent to each economic sector in Iraq described in the table below.

Table 1: Sectoral investment needs and economic benefits (authors estimation)

Sectorial estimation	Investment Required (USD)	Expected Annual Economic Benefits (USD)
Water Resources Management	7.5 billion	7.95 billion
Agriculture	5.1 billion	8.3 billion
Biodiversity and Ecosystem protection	2.15 billion	1.1 billion
Health sector	600 million	2.5 billion
Infrastructures	2.87 billion	2.5 billion
Education	0.85 billion	0.85 billion
Tourism	0.53 billion	0.53 billion
Oil and Gas Transition	11.8 billion	14.6 billion
Electricity	23.25 billion	8.7 billion
Transportation	13.4 billion	9.8 billion
Industries	7.95 billion	4.1 billion
Waste and Wastewater Circular Economy	7.05 billion	3.4 billion

The identified needs to strengthen the economy of the country against climate change impacts and extreme natural events while transitioning to low carbon energies amounting to USD 82.85 billion by 2030.

The following chapter describes briefly global climate finance environment and the finance environment in Iraq, the trends in climate financing and different official development assistance (ODA) contributions to Iraq.

Chapter 4 assesses the opportunities offered by the country in climate change that would strengthen the economic sectors most affected by climate change impacts while diversifying sources of energies for power and electricity generation and modernizing the economically dominant mitigation sectors via the introduction of climate smart and adapted technologies and innovations. The assessment of the current completed, and operational projects demonstrates that despite its turbulent past, the country can fulfill its international commitments. In fact, the country has already started implementing energy efficiency and methane and gas capture projects that will contribute to fulfilling the unconditional GHG emissions reduction commitments of 2%. Within the last three years, the country has implemented USD 2.3 billion worth of projects in adaptation and mitigation (50%,50%). Furthermore, USD 16 billion is already planned (13.4 in mitigation and 2.6 in adaptation) for the next five years. The country is already working on the fulfillment of the signed Methane Pledge that requires to capture all methane emissions by 2028. However, the road to economic transformation is not yet fully determined.

The transition to low low-carbon economy for Iraq has substantial implications and requires high amounts of upfront costs that cannot only be sustained by the national budget. A careful and stepwise approach to the transition would require an active role from direct and indirect foreign investment in the specific economic areas described that will enable a long-term transition.

The country offers many opportunities for investments that would scale up the transition. These were defined into five main funding streams that are deemed most pertinent for the sustainable transformation of the economy:

Funding stream 1: Research, innovation, technology transfer, and capacity building.

Funding stream 2: Adaptation projects dedicated to specific issues in the water and agriculture sector.

Funding stream3: Adaptation and mitigation projects that contribute to GHG reduction while strengthening the resilience of communities.

Funding stream 4: Renewable energy scale-up at a governorate and district level.

Funding stream 5: Methane and gas capture projects that require substantial upfront costs and a dedicated technology transfer.

Key sectorial priorities identified for the next 5 years are estimated to amount to USD 36.85 billion. These are listed and described briefly in the table below.

Table 2: Key sectorial priorities for the transitional period 2025-2030 (authors estimation)

Initiative	Investment Required (USD)	Expected Annual Economic Benefits (USD)	Description
Modernizing Cement Production	1 billion	500 million	Upgrading cement production technologies to reduce energy consumption and greenhouse gas emissions.
Implementing Cleaner Technologies in Petrochemicals[1]	2.75 billion	412.5 million	Integrating cleaner technologies in the petrochemical industry to reduce emissions and improve waste management.
Energy Efficiency in Metal Processing	600 million	400 million	Investing in energy-efficient equipment for metal processing to reduce energy costs.
Promoting Recycling and Material Recovery	1.5 billion	300 million	Developing infrastructure for recycling and material recovery to reduce raw material costs.
Sustainable Agriculture[2]	1.5 billion	150 million	Investing in sustainable agricultural practices to improve crop yields and soil health.
Protection ecosystems	1.8 billion	800 million	Increasing carbon sequestration through reforestation and afforestation efforts.
Combating Land Degradation	500 million	600 million	Investing in soil restoration and management to enhance agricultural productivity.
Promoting Agroforestry	400 million	500 million	Establishing agroforestry systems to improve crop diversity and yields.
Livestock Management	300 million	100 million	Investing in sustainable livestock systems to increase meat and dairy productivity
Resilient Water Management	2.5 billion	1.0 billion	Sustainable and efficient water management including storages
Waste and Wastewater Circular Economy	2.0 billion	300 million	Significant reduction in greenhouse gas emissions: Enhanced environmental compliance and potential for international funding.
Sustainable Cities	4.0 billion	1.0 billion	Meet the high demand for housing and accommodation while avoiding extensive GHG emissions
Low Carbon & Public Transportation	3.0 billion	600 million	Reduced traffic congestion and pollution while providing affordable transportation
Gas capture and reuse	5.0 billion	1.0 billion	Increased energy efficiency and GHG avoidance
Transmission lines and transformers	10.0 billion	TBD	Enabling better energy transfers, reducing loads, and stabilizing power supply, which will, in turn, support development across other sectors.

The current economy is based on the dominance of the state-owned enterprises. By adopting and implementing a strong corporate social and environment responsibility vision that aligns with the climate vision and sustainable development goals of the country, state owned enterprises can play a pivotal role in the low carbon transition and resilient diversification of the economy.

The successful implementation of these programs and projects requires enhanced participation from the private sector. The contribution of the private sector and potential entry points are described briefly in the chapter 4.3. highlighting already undertaken analysis with the SDG Mapping for SMEs but also the identified technological needs assessments reported in the national documents TNA for adaptation and mitigation. Climate change is already part of daily life in Iraq. The country is ready to act fast in transitioning to a more climate resilient and sustainable economy. Modernization of the mitigation sectors and increasing the role and resilience of the adaptation sectors while improving and scaling up services and essential infrastructures is a challenge the country is ready to face provided the innovation, technological transfer and required capacity building is timely provided and adequately implemented The second phase of the climate investment plan 2030 -2050 that would align the long-term climate goals of the country with the international Paris agreement with the global goal of keeping the temperature increase below 1.5 Celsius is a much-needed step in the right direction that would need to be started soon in alignment with the revision of the NDC due in 2025.

[1] *Based on the assumption of ROR value of 15%*
[2] *Assuming ROR of 10%*

1. Vision and Goals

Iraq's Climate Investment Plan (CIP) Project was officially initiated on May 16, 2024, marking a pivotal moment in the country's commitment to addressing climate change through strategic investments. This plan is designed to provide viable pathways for both public and private sectors to fulfill Iraq's climate national and international commitments while fostering a conducive environment for local and foreign investments. It aligns closely with Iraq's broader vision to promote climate action and integrate sustainability into its national development strategy. The plan's vision is to facilitate a smooth transition to low carbon energies while diversifying stepwise its economy in a climate resilient society. The CIP embodies Iraq's vision of sustainable development and climate resilience. The plan sets out to implement measures that contribute directly to Iraq's Nationally Determined Contributions (NDC, 2021) targets and beyond, focusing on reducing emissions, enhancing adaptive capacities, and promoting sustainable development pathways. This vision is rooted in the principles of environmental sustainability and social equity, aiming not only to mitigate the impacts of climate change but also to empower communities and enhance their resilience to climate-related risks.

This vision is aligned with Iraq's broader development agenda, present in frameworks such as Climate Vision 2030[3] and the Sustainable Development Goals (SDGs) and other national policies prioritizing inclusive and sustainable growth across all sectors of society. The goals of Iraq's CIP are multi-faceted and ambitious, aiming to achieve several key objectives over its implementation period. The CIP has been divided into 2 phases to align with the Iraq's voluntary commitments to the Framework Convention on Climate Change and the Paris Agreement attached to it (NDC 2021). Phase I, which constitutes this report covers the period 2025-2030 corresponding to the revision of the NDC due in 2025 and is regarded as a transitional phase that puts in place the necessary institutional, financial and economic adjustments required for a tailored stepwise introduction of low carbon energies. Phase II that covers 2030 – 2050 is more comprehensive and should set the detailed steps projects and investments required for the implementation of a low carbon economy in Iraq that is perfectly suited to the culture and society in Iraq while fulfilling the global agenda of keeping the temperature increase below 1.5.

First and foremost, the CIP seeks to showcase the greenhouse gas (GHG) emissions reduction achieved by the country, aligning with global climate targets and commitments under international agreements like the Paris Agreement and in line with the emission reduction rates contained in the Nationally Determined Contributions document.

Secondly, it aims to enhance climate resilience across various sectors of Iraq's economy, ensuring that infrastructure, communities, and natural resources are better prepared to withstand climate impacts such as extreme weather events and changing precipitation patterns but also withstand the negative impacts of slow onset changing weather patterns. Moreover, the CIP strives to foster sustainable economic growth by promoting energy efficiency investments and sustainable water and agriculture practices. By doing so, it aims to create new job opportunities, spur innovation, modernize its multi-faceted industries and services, and diversify Iraq's economy.

Through these strategic goals, Iraq's CIP not only addresses immediate climate challenges but also lays the groundwork for a more resilient, sustainable, and low-carbon future for all Iraqis. It underscores the country's commitment to global environmental sustainability efforts while leveraging international support and expertise to maximize impact and achieve tangible results.

[3] *https://planipolis.iiep.unesco.org/sites/default/files/ressources/iraq_vision_2030_en.pdf*

2. Iraqi Country Context

2.1. Iraqi Country Profile

Table 3: Iraqi Country Profile

Iraqi Country Profile[4]	
Population (NDP, 2024)	Estimated 44.4 million Population Growth 2.24 Percent
Area	435,052 km^2
GDP (IMF, 2024)[5]	264,182,174,000 USD (5,591per capita in 2023) Contributions to GDP by sector[6]: Industry incl. Oil and Gas: 54% Services (public and private): 42% Agriculture: 4%
Climate and weather	Summers are hot and dry; with no cloud coverage for 4 months. Winters are cool. The monthly mean maximum temperatures for July range from 38°C at Rutba to 43°C in Baghdad. The highest maxima are in June, July, and August ranging between 43°C and 50°C. The monthly mean minima for January range between 1°C in the southwestern desert and the northeastern foothills to 8°C in the central part of the river plain. The lowest minimum is about -14.5°C in the northern desert, -11°C in the foothills, and -8°C in the central part of the river plain.
Energy Access (Tracking SDG 7)	Urban 100% (electricity - intermittent)
	Rural 100% (electricity - intermittent)
Water Access (2022)	98% population connected (intermittent) 42% connected to wastewater services
Deforestation (Global Forest Watch/ICAT, 2023)	7 hectares/year. A 0.80% decrease in tree cover since 2000.
Desertification	39% of Iraq's territory Degraded lands: 69.8% (2021) Soil salinization: 54% increase in agricultural lands.
Important Bird and Biodiversity areas (IBAS)	Iraq has 42 IBAS including 23 Key Biodiversity Areas (KBA)
Total GHG emissions by sector (2021)[7]	Energy: 177.62 $MtCO_2e$ (72.5%)
	Transportation: 21.65 $MtCO_2e$ (12.2%)
	Waste: 19.1 $MtCO_2e$ (10.73%)
	AFOLU: 5.65 $MtCO_2e$ (3.18%)
	Industrial Processes: 2.41 $MtCO_2e$ (1.36%)
Key Climate Risks (NDC 2021)	Heat Waves
	Water stress & rise in waterborne parasitic diseases
	Floods & severe droughts
	Ecosystem stress
	Dust storms
Priority technologies for Adaptation (TNA, 2022)	Agriculture sector: 1) Agriculture water management – drought-resistant crop varieties 2) Improvements in freezing technology 3) Postharvest/processing/distribution 4) Conservation-friendly agriculture – drip feed irrigation

4 https://iraq.un.org/en/214461-iraq-country-climate-and-development-report
5 Iraq: 2024 Article IV Consultation-Press Release; Staff Report; and Statement by the Executive Director for Iraq
6 https://www.focus-economics.com/countries/iraq/
7 https://www.climatewatchdata.org/countries/IRQ

	Water Resources sector: 1) Wastewater treatment: Pond systems and growth treatment technologies. 2) Wastewater treatment: Nutrient removal activated sludge processes. 3) Flood Management: Flood Mapping 4) Flood Management: Low data probabilistic flood forecasting
Priority technologies for mitigation (TNA, 2022)	Energy sector: 1) Off/On-grid Rooftop Solar PV 2) Solar Water Heater 3) Solar farms 4) Wind Farms 5) Concentrating Solar-Thermal Power (CSP) 6) Green Hydrogen 7) Combined Cycle Gas Turbine (CCGT)
	Industry sector: 1) Gas to power 2) LNG and CNG Production 3) Hydrogen production 4) Reduction of methane leaks & vents - Systematic advance leak 5) Reduction of methane leaks & vents - VRU for storage tanks 6) Use of less emitting fuel - Burning Fuel in brick and plaster 7) Heat recycling in cement production plants

2.2. Institutional Framework for the CIP

United Nations' calls to act against climate change have led several international institutions with similar or dissimilar objectives to play important roles in combating such phenomenon. Thereby, information and experience have increasingly been exchanged among countries. Besides, it has increased the possibilities of multilateral environmental agreements (MEAs), partnerships, and international networks, as for some countries, the appropriation of these international norms can lead to improvement in orders, regulations, and laws at the national level. In particular, the environmental improvement that comes with advancements resulting from climate change has, in some cases, effects on public health, energy safety, possible uses of this energy, social development, poverty easing, and other benefits[8].

2.2.1. Institutional Framework for Investment

National Investment Law No. 13 of 2006 was amended to Law No. 2 of 2010 and, subsequently, to Law No. 50 of 2015, where this law Offers investors generous benefits, guarantees, and exemptions for qualifying investments, including:

- National and provincial Investment Commissions (NIC) and (PIC)s were created in each governorate of Iraq to facilitate all essential and necessary approvals to obtain an investment license, and facilitate the creation of successful and sustainable investment projects through the 'One-Stop Shop;'
- Ten-year exemption from taxes from the date of commercial operations and for each stage of the project (Article 15/First/A of the Investment Law)
- Right to repatriate investments and revenues (Article 12/First of the Investment Law)
- Right to employ necessary foreign labour (Article 12/First of the Investment Law)
- Exemption from import duties for necessary equipment and materials throughout the period of project implementation, and before the start of commercial operations (Article 17/First of the Investment Law)
- Exemption from taxes and fees for primary materials imported for commercial operations based on the percentage of locally produced materials being used in the project (Article 17/Fifth of the Investment Law)

8 Stacy-ann Robinson1and etal (2023) The dynamics of institutional arrangements for climate change adaptation in small island developing states in the Atlantic and Indian Oceans

- Protection from nationalization or expropriation (Article 12/Third/A and B of the Investment Law).

Investment Law No. (4) of 2006 is a legislative framework for the KRI region for attracting and employing national and foreign capital, jointly or individually, in investment projects in a way that contributes to the process of economic development, infrastructure development and job creation in the region. Green investment is the investment that contributes to reducing CO_2 emissions and increasing O2 emissions by increasing green spaces and reducing desertification, which is one of the Sustainable Development Goals SDGs and Vision 2030.

Law No. 50 of 2015 is one of the most comprehensive and modern investment laws in the region compared to similar regional laws like Qatar (2000), Yemen (2002), Saudi Arabia (2000), Algeria (2001), Kuwait (2003), Egypt (2005), Jordan (2003) and a new Syrian investment law entered into force in 2007 where foreign investors or developers are entitled to make investments in Iraq without limits.

2.2.2. Institutional Frameworks for Climate Change

Institutional frameworks for climate change are a complex web of international agreements, national policies, and stakeholder involvement designed to address this global challenge[9]. The cornerstone of this framework is the United Nations Framework Convention on Climate Change (UNFCCC), which establishes a foundation for international cooperation and sets the goal of stabilizing greenhouse gas concentrations. This framework is further strengthened by agreements like the Paris Agreement, which outlines ambitious emission reduction targets for all countries[10]. However, the effectiveness of these frameworks relies heavily on national governments translating international commitments into concrete policies and strategies. These policies can encompass a variety of instruments like carbon pricing, renewable energy targets, and energy efficiency standards[11]. Additionally, a wide range of stakeholders, including NGOs, businesses, and local communities, play a crucial role in driving climate action through advocacy, project implementation, and public pressure. In essence, institutional frameworks for climate change provide a platform for coordinated action at all levels of governance, aiming to mitigate climate change and adapt to its inevitable consequences.

National Policies and Strategies

Policy Development

National climate policies and strategies are essential for addressing climate change effectively. The development of these policies involves a comprehensive process that includes scientific assessment, stakeholder engagement, and careful policy formulation. The first step is often the collection and analysis of scientific data on climate impacts and emission sources. This data serves as the foundation for setting national targets for greenhouse gas (GHG) emissions reductions and identifying priority areas for action. Policymakers then engage with a wide range of stakeholders, including government agencies, private sector entities, non-governmental organizations (NGOs), and the public, to ensure that the policies are inclusive and can be effectively implemented. This participatory approach helps to build consensus and ensures that the policies reflect the diverse needs and capacities of different sectors and communities within the country[12].

[9] United Nations Framework Convention on Climate Change secretariat(2020) Handbook on institutional arrangements to support MRV/transparency of climate action and support
[10] The Paris Agreement is a legally binding international treaty on climate change. It was adopted by 196 Parties at the UN Climate Change Conference (COP21) in Paris, France, on 12 December 2015. It entered into force on 4 November 2016.
[11] https://unfccc.int/process-and-meetings/the-paris-agreement
[12] IPCC. (2014). Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Retrieved from IPCC

Iraqi Policies and Strategies for Climate Change

Overview of Climate Challenges in Iraq

Iraq faces significant climate change challenges due to its geographical location and socio-economic conditions[13]. The country experiences extreme temperatures, frequent droughts, and water scarcity, which are exacerbated by climate change. Additionally, political challenges and economic challenges complicate Iraq's ability to implement effective climate policies. However, despite these obstacles, Iraq has made strides in developing national policies and strategies to address climate change, focusing on both mitigation and adaptation efforts.

The country has already developed many policies and strategies related to climate change, protection of the environment and biodiversity and disaster risk reduction and recovery. It is also in the process of developing all national and local policies required under the NDC.

Iraq's Nationally Determined Contribution (NDC)

As part of its commitment to the Paris Agreement, Iraq submitted its Nationally Determined Contribution (NDC) in 2021. The NDC outlines Iraq's climate action plan, focusing on reducing GHG emissions and enhancing climate resilience. Key targets include a reduction in GHG emissions by 1-2% by 2030, with conditional targets of up to 15% reduction with international support. The NDC emphasizes the need for capacity building, technology transfer, and financial support from the international community to achieve these goals[14].

One of the critical components of Iraq's climate strategy is the promotion of renewable energy and energy efficiency. Iraq aims to diversify its energy sources by increasing the share of renewable energy in its energy mix. The government has set ambitious targets to develop solar and wind energy projects. Additionally, efforts are being made to improve energy efficiency in various sectors, including industry, transportation, and residential buildings. These initiatives are expected to reduce GHG emissions, enhance energy security, and create job opportunities[15].

Given the critical issue of water scarcity, Iraq's climate policies prioritize sustainable water management. The government is working on improving irrigation efficiency, developing water-saving technologies, and restoring degraded wetlands and ecosystems. In agriculture, Iraq is promoting climate-smart practices to enhance food security and resilience to climate impacts. This includes crop diversification, soil conservation, and the use of drought-resistant crop varieties[16].

13 The National Environmental Strategy and Action Plan for Iraq (2013 – 2017)
14 Republic of Iraq. (2020). Iraq's Nationally Determined Contribution. Retrieved from Iraq NDC
15 International Renewable Energy Agency (IRENA). (2019). Renewable Energy Outlook: Iraq. Retrieved from IRENA
16 FAO. (2018). Iraq Agriculture and Water Policy Report. Retrieved from FAO

Table 4: Paris Agreement structure and the NDC of Iraq

<table>
<tr><td colspan="9">UNFCCC
Paris Agreement (PA)</td></tr>
<tr><td colspan="9">→ Nationally Determined Contribution (NDC)
→ Low carbon Climate Resilient Pathway for Iraq</td></tr>
<tr><td colspan="9">→ Long Terms Strategy / Response Mechanisms
→ NDC Progress Tracking System
→ National Stocktake
→ National Communications</td></tr>
<tr><td colspan="3">Mitigation
NAMA
Nationally Appropriate Mitigation Action</td><td colspan="3">Adaptation
NAP
National Adaptation Plan</td><td colspan="3">Finance
NCFF
National Climate Finance Framework</td></tr>
<tr><td>Article 4

Mitigation</td><td>Article 5

Carbon Sink</td><td>Article 6

Carbon Credits</td><td>Article 7

Adaptation</td><td>Article 8

Loss & Damage</td><td>Article 6.6

Adaptation Financing from CDM and Carbon Credits</td><td>Article 9

Climate Finance</td><td>Article 2.1.0

Long Term Finance</td><td>Article 6.2, 6.4, 6.6 and 6.8</td></tr>
<tr><td colspan="3">• National GHG Inventory incl baseline
• National MRV system, Mechanisms and Projects
• Carbon Offset Projects
• Establish Carbon Finance Mechanism
• Just Energy Transition framework</td><td colspan="3">• Climate vulnerability Assessment
• Climate Risk and Vulnerability Index
• Loss and Damage assessment (8.3)
• Loss and Damage National Action Plan (8.4)
• National adaptation Financing Framework
• Local Adaptation Financing Framework
• Monitoring, Evaluating and Learning
• Establish REDD+ mechanism</td><td colspan="3">• Climate Expenditure Review
• Climate Fiscal Framework
• Climate Chang Budget Framework
• Climate Investment Plan
• Economics of Climate Change in Iraq
• Climate Risk Insurance
• Climate smart Public Private Partnership
• Climate Finance Tracking system</td></tr>
<tr><td colspan="9">→ TECHNOLOGY TRANSFER
→ Technology Needs Assessment
→ Technology Transfer Mechanisms and National Strategy
→ Framework for Acceleration, Encouragement and Enabling Innovation
→ CAPACITY BUILDING
→ National Capacity Needs Assessment
→ Capacity Building Strategy
→ National Institutional Framework for Implementing the NDC
⟶ TRANSPARENCY, STOCKTAKE, COMPLIANCE</td></tr>
</table>

Climate Adaptation and Disaster Risk Reduction

Adaptation to climate change is a significant focus of Iraq's strategies. The country is implementing measures to enhance its resilience to climate impacts, particularly in vulnerable sectors such as water, agriculture, and health. Disaster risk reduction initiatives are also being prioritized to mitigate the impacts of extreme weather events such as floods and sandstorms. These efforts include the development of early warning systems, infrastructure improvements, and community-based adaptation programs[17].

Institutional Framework and Capacity Building

Iraq recognizes the importance of strengthening its institutional framework to effectively address climate change. This includes the establishment of dedicated climate change units within government ministries and agencies, enhancing coordination among different sectors, and integrating climate considerations into national development plans. Capacity building is also a critical component, with efforts to train government officials, stakeholders, and communities on climate change mitigation and adaptation strategies.

17 UNDRR. (2018). Disaster Risk Reduction in Iraq. Retrieved from UNDRR

The transfer of technologies and the development of national technical capacities play a vital role in the climate resilience and low carbon transition and has a dedicated funding stream within the CIP

2.2.2.2. Iraqi International Climate Agenda

Iraq is particularly vulnerable to climate change. The country suffers already from the impacts of climate change through increases in temperatures, recurring droughts, water scarcity, and sand and dust storms (SDS). Climate change impacts can further trigger or amplify food and water insecurities, increase internal displacement, and undermine local and regional stability. Despite the recent conflictual situations that the country has undergone, Iraq is actively participating in global climate change initiatives.

Iraq's accession to the Paris Agreement was made under Law No. (31) of 2020 published in the Iraqi Gazette, Issue No. (4618), issued on 2/22/2021. The country subsequently submitted its Nationally Determined Contribution (NDC) on October 15, 2021[18], committing to significant greenhouse gas (GHG) emissions reductions. The country pledges to a conditional emissions reduction target of 15% by 2030 excluding 2% national contributions. The NDC focuses on reducing emissions in major energy-consuming sectors such as oil, electricity, gas, and transport, as well as in non-oil industries, agriculture, solid waste, and the residential sector. Besides mitigation targets, the NDC highlights the need for adaptation plans and measures in sectors most vulnerable to climate change, including water resources, agriculture, ecosystems and biodiversity protection, health, education and higher education and innovation, tourism, and cultural heritage conservation. This commitment marks a significant step up from its earlier target and reflects Iraq's dedication to reducing GHG emissions and transitioning to a resilient and sustainable development path.

Iraq has already started translating its international commitments into national policies. The country is currently preparing its National Adaptation Plan (NAP)[19] and a Nationally Appropriate Mitigation Actions (NAMA) Strategy. These key guiding documents, along with the Iraq Vision 2030 and the National Development Plan 2024-2028 recently released[20], are essential for Iraq´s development and national climate agenda, not only up to 2030 but also for the future development of its Long-Term Low Emission Development Strategy (LT-LEDS), which would outline the horizon for the country to transition to a low-carbon and resilient economy.

The NDC for Iraq requires the country to reduce its carbon footprint by 2 % with national efforts and a further 15% under conditional international support in the form of financial and technical support.

GHG emissions measurements and reduction rates are not yet monitored well in Iraq, the national GHG inventory is not fully operational. However, GHG reductions and avoidance projects have started being implemented.

To determine the required reductions necessary to reach up to 2030 for Iraq, the business-as-usual scenario (BAU) scenario without any investments in low-carbon technologies was estimated based on historical data from the Climate Watch[21] database that is widely used to record and monitor NDC achievements around the world. A trend analysis of the carbon footprint per capita for Iraqi citizens up to 2030 has

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18 https://unfccc.int/sites/default/files/NDC/2022-06/Iraq%20NDC%20Document.docx

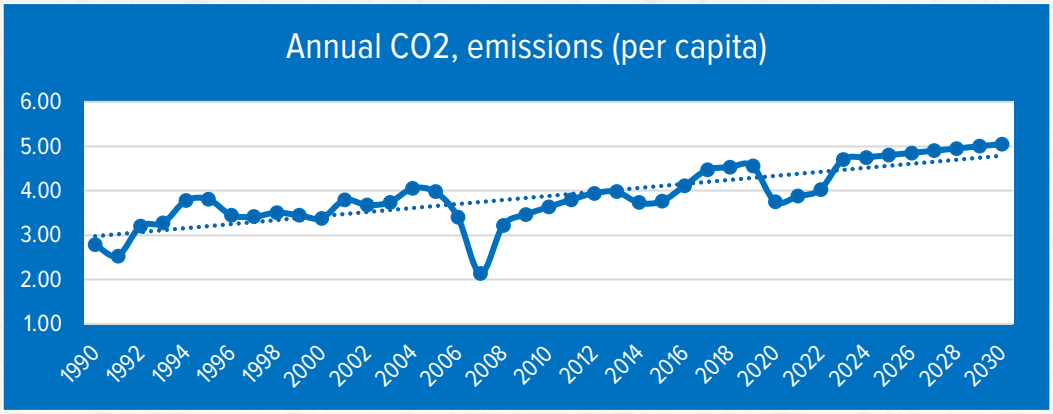
19 https://www.greenclimate.fund/document/adaptation-planning-support-iraq-through-unep

20 In April 2024, the Ministry of Planning launched the process to prepare the 2024-2028 National Development Plan, mobilizing also the private sector and the Central Statistical Organization (CSO), as well as UNDP, and various experts and academics. https://www.iraq-businessnews.com/2024/04/24/iraq-prepares-national-development-plan-for-2024-2028/

21https://www.climatewatchdata.org/countries/IRQ?calculation=PER_CAPITA&end_year=2021&start_year=1990

been carried out. The carbon footprint of Iraq will increase proportionally to the demographic growth and improved living conditions. An estimation of the carbon footprint is carried

Figure 1: Per Capita carbon emission per year in Iraq 22



Based on projected population growth and an increase in carbon footprint, an estimation of the future carbon emissions and the required reduction up to 2030 is calculated and presented in the table below:

Table 5: estimated GHG emissions and reductions by sector (authors calculation)

ESTIMATIONS		2024	2025	2026	2027	2028	2029	2030
Population		44,414,794	45,520,477	46,639,925	47,771,925	48,914,100	50,061,500	51,211,700
Per capita emissions (3.8 tons in 2021)		4.75	4.80	4.85	4.90	4.95	5.00	5.05
Total Estimated Country CO_{2e} emissions [ton/year]		**244,993,103**	**301,376,951**	**312,005,016**	**322,872,321**	**333,965,234**	**345,251,724**	**356,715,979**
Sectorial GHG Emission distribution [ton/year]								
Energy sector	**72.5%**	177,620,000	218,498,290	226,203,636	234,082,433	242,124,795	250,307,500	258,619,085
Transport	**12.2%**	29,889,159	36,767,988	38,064,612	39,390,423	40,743,759	42,120,710	43,519,349
Waste	**10.7%**	26,287,760	32,337,747	33,478,138	34,644,200	35,834,470	37,045,510	38,275,625
Agriculture	**3.18%**	7,790,781	9,583,787	9,921,759	10,267,340	10,620,094	10,979,005	11,343,568
IPPU	**1.36%**	3,331,906	4,098,727	4,243,268	4,391,064	4,541,927	4,695,423	4,851,337
Paris Agreement GHG Reduction commitments [ton/year]								
Unconditional reduction	**2%**	**4,899,862**	**6,027,539**	**6,240,100**	**6,457,446**	**6,679,305**	**6,905,034**	**7,134,320**
Conditional reduction	**15%**	**36,748,966**	**45,206,543**	**46,800,752**	**48,430,848**	**50,094,785**	**51,787,759**	**53,507,397**

The CIP intends to facilitate the implementation of climate projects, detailing Iraq's ongoing efforts and strategies to address climate change, emphasizing a broad range of GHG reductions, and representing the country's intention to enhance resilience across key sectors by mobilizing domestic and international, public, and private resources.

Table 6 below provides a succinct brief of the country's international commitments in fighting climate change.

22 Global Carbon Budget (2023); Population based on various sources (2023). Carbon dioxide (CO_2) emissions from fossil fuels and industry. Land-use change is not included.

Table 6: International Agreement, commitments of Iraq

International Agreement	Iraq's Commitments
Montreal Protocol (1987) Adopted on 16 September 1987, the Protocol is to date one of the rare treaties to achieve universal ratification to phase out the production of substances that deplete ozone (HFCs) → Iraq's date of signature: 25 Jun 2008	• The Parties reached an agreement at their 28th Meeting of the Parties on 15 October 2016 in Kigali, Rwanda to phase down HFCs. • Countries agreed to add HFCs to the list of controlled substances and approved a timeline for their gradual reduction by 80-85 % by the late 2040s. • The first reductions by developed countries are expected in 2019. • Iraq will freeze HFC consumption levels in 2028.
UNFCCC (1994) The UNFCCC entered into force on 21 March 1994. Today, it has near-universal membership. The 198 countries that have ratified to prevent "dangerous" human interference with the climate system → Iraq's date of signature: 28 Jul 2009	• The foundational treaty that provides a basis for international climate negotiations. • Iraq is currently preparing its Second National communication to the UNFCCC after submitting its initial national communication in 2016. Iraq is finalizing other essential documents like; the Nationally Appropriate Mitigation Action (NAMA), GCF Country Programme (CP), Technology Need Assessment (TNA), National Adaptation Plan (NAP)
Kyoto Protocol (1997) It entered into force on 16 February 2005. Currently, there are 192 Parties to the Kyoto Protocol. It sets binding emission reduction targets for 37 industrialized countries and economies in transition and the European Union. → Iraq's date of signature: 28 July 2009	• During the first commitment period, 37 industrialized countries and economies in transition and the European Community committed to reduce GHG emissions to an average of five percent against 1990 levels. • During the second commitment period, Parties committed to reduce GHG emissions by at least 18 % below 1990 levels in the eight years from 2013 to 2020. • No commitments for developing countries, only for developed countries.
Climate and Clean Air Coalition (CCAC 2012) Founded in 2012 and convened within UNEP. It is a voluntary partnership of more than 160 governments, intergovernmental organizations, and non-governmental organizations to reduce powerful but short-lived climate pollutants (SLCPs) – methane, black carbon, hydrofluorocarbons (HFCs), and tropospheric ozone – that drive both climate change and air pollution. → Iraq's date of signature: 2015	• Iraq joined the Global Methane Pledge and committed to reducing methane emissions by 30% by 2030 in comparison to 2020 levels. • Regarding clean air, Iraq committed in addition to preparing a plan for the zero-waste initiative declared at COP28.
Paris Agreement The Paris Agreement is a legally binding international treaty on climate change. It was adopted by 196 Parties at the UN Climate Change Conference (COP21) in Paris, France, on 12 December 2015. It entered into force on 4 November 2016. Its overarching goal is to hold "the increase in the global average temperature to well below 2°C above pre-industrial levels" and pursue efforts "to limit the temperature increase to 1.5°C above pre-industrial levels." To limit global warming to 1.5°C, greenhouse gas emissions must peak before 2025 at the latest and decline 43% by 2030. → Iraq's date of signature: 8 December 2016	• In 2015, Iraq submitted its INDC to reduce GHG emissions by 15 percent below business-as-usual emissions by 2035. • The NDC (2021) gives high priority to adaptation actions in key sectors including Water Resources, Agriculture, Health, Natural Systems and Forests, Coastal areas and sea-level rise, Waste Management, Education and Research, and Tourism. The NDC commits mitigation action to reduce emissions by 1-2% by 2030 and a conditional reduction of GHG emissions by 15 percent by 2030, equivalent to 90 million metric tons of carbon dioxide (MMtCO2) per year. • The NDC sets a goal to mobilize USD 100 billion of international finance towards both adaptation/resilience and mitigation actions in Iraq over the period 2021 to 2030.

"Zero Routine Flaring by 2030" Initiative by the World Bank Launched in 2015, the ZRF Initiative commits governments and oil companies to end routine flaring no later than 2030. The Initiative is not a legally binding document. → Iraq's date of signature: 2017	• Iraq committed not to flare associated gas in any new oil fields and to eliminate the practice in existing fields by 2030.
Global Methane Pledge It was launched to catalyze action to reduce methane emissions. Led by the United States and the European Union, the Pledge now has 111 country participants who together are responsible for 45% of global human-caused methane emissions. By joining the Pledge, countries commit to work together to collectively reduce methane emissions by at least 30% below 2020 levels by 2030. → Iraq's date of signature: COP 26 – November 2021	• Voluntary framework supporting nations to act to collectively reduce methane emissions by 30% from 2020 levels by 2030
Freshwater Challenge The Freshwater Challenge is a country-driven initiative that aims at leveraging the support needed to bring 300,000 km of rivers and 350 million hectares of wetlands under restoration by 2030 internationally. → Iraq's date of signature: COP28 – December 2023	• 45 countries and the European Union have joined the Freshwater Challenge so far. This is a country-led initiative to restore collectively 300,000 km of degraded rivers and 350 million hectares of degraded wetlands by 2030 as well as conserve intact freshwater ecosystems. • These figures equal 30 percent of degraded freshwater ecosystems.

2.3. Climate Change Context in Iraq

The climate in Iraq is mainly subtropical and semi-arid, except the sub-humid mountainous regions in the northeast, and a desert climate in the southwest. The country generally experiences winters that vary between cool and cold, and dry summers with variations between hot and extremely hot temperatures. The monthly mean maximum temperatures for July range from 38°C at Rutba to 43°C in Baghdad. The highest maxima in June, July, and August range between 43°C and 50°C. The monthly mean minima for January range between 1°C in the southwestern desert and the northeastern foothills to 8°C in the central part of the river plain. The lowest minimum is about -14.5°C in the northern desert, -11°C in the foothills, and -8°C in the central part of the river plain[23]. Precipitation is of great spatial and temporal variability. Iraq can be divided into five major agro-ecological zones (AEZ): Desert/Arid, Subtropics-Warm/SemiArid, Sub-Arid, Subtropics Moderately Cool/Sub-Humid and Land with Severe Soil/Terrain Limitations.

The observed changes in Iraq's climate are well established. During the 1950-2010 period, average temperatures increased at a rate of about 0.7°C, and average rainfall in the southeast part of the country decreased at a rate of about 0.88 mm/month per century while the number of rainy days also decreased. The frequency of dust and sandstorms is increasing across Iraq, with dry and dusty winds from the northwest occasionally reaching 108 km/hour at 300 meters above ground from April to early June and again from late September through November. While the maximum number of annual dust storms during 1951-1990 was about 24, within the next ten years Iraq could witness 300 sand dust storms per year due to climatic changes. Recurrent droughts are also common throughout Iraq. For example, the average number of drought episodes per decade in the southern region increased from 22 during 1990-2000 to 35 during 2000-2010.

Iraq has suffered from 15 types of disasters that have resulted in a loss of life, property, and significant displacements in the last three decades. For example, 2018 flooding events (flash floods and riverine floods) caused by heavy rainfall severely impacted the cities of Nineveh, Salah ad-Din, Maysan, Wasit, and Basra, affecting an estimated 273,000 people across several central and southern governorates.

Table 7: Extreme climate events in recent years in Iraq24

Year	Natural Disasters, Climatological, Drought, Affected Number	Natural Disasters, Hydrological, Flood, Affected Number	Natural Disasters, Meteorological, Storm, Total Affected Number
2018		25,000	
2019		5,865	
2020	7,000,000	1,500	
2021		10,703	
2022			5,000

23 oic countries in figures (oic-cif): iraq - sesric
24 oic countries in figures (oic-cif): iraq - sesric

2.3.1 Climate Change Future Scenarios

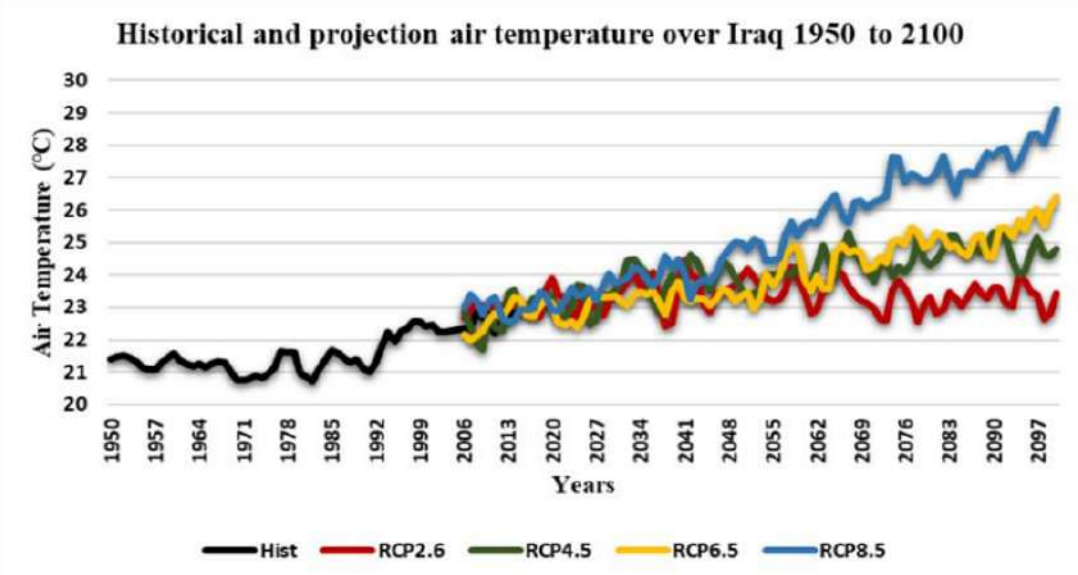
Projected climate changes relate to temperature, precipitation, and evapotranspiration. The impacts of climate change are categorized into direct and indirect or slow-on-setting impacts.

The main direct impacts in Iraq relate to heat waves, soil moisture and droughts, sandstorms, water scarcity of extreme flooding, sea level rise, and saline intrusion.

Due to the rising greenhouse gases (GHG), air temperature in Iraq will change due to its geographical location and global climate change trends.

Under the four RCPs scenarios with different levels (RCP2.6, RCP4.5, RCP6.0, and RCP8.5 of the CCSM4 model as part of CMIP5)[25], the air temperature will increase. The annual mean air temperature under RCP4.5 and RCP8.5 are expected to increase by 2.4°C and 3.8°C up to 2100 respectively.

Figure 2: Historical and projected (4 RCPs) air temperature over Iraq 1950 to 2100 [26]



Four sequencing years have been chosen: 2025, 2050, 2075 and 2100 to illustrate the changes through the 4 RCPs[27] in the country.

Extreme heatwaves and air temperatures are particularly prevalent close to the Gulf, in the South of Iraq. Onshore winds from the Gulf carry high levels of humidity to southern Iraq, causing some of the highest wet-bulb temperatures in the world during the Iraqi summer. The heat index 35 will increase on average by 24 days (Heat index 35 is the number of days per year when temperatures rise beyond 35°C)[28].

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25 Predicting long-term climate changes in Iraq by Mohammed Abdaki, Ahmed Al-Iraqiand Raid Mahmood Faisal- IOP Conf. Series: Earth and Environmental Science 779 (2021) 012053

26 Using www.knmi.nl

27 Using www.knmi.nl

28 Country Climate And Development Report- Iraq- World Bank Group- November 2022

Precipitation projections are much less certain than projections of temperature change. They are subject to high inter-annual variability. Compared to 2000, precipitation will decline by between 4 and 18 % by 2030, with relatively high variations across the country; the country will experience a decrease in the maximum amount of rain that falls in any 5-day period, but an overall increase in rainfall intensity (heavy precipitation events or HPE); which will result in a decrease in the run-off by 22%[29].

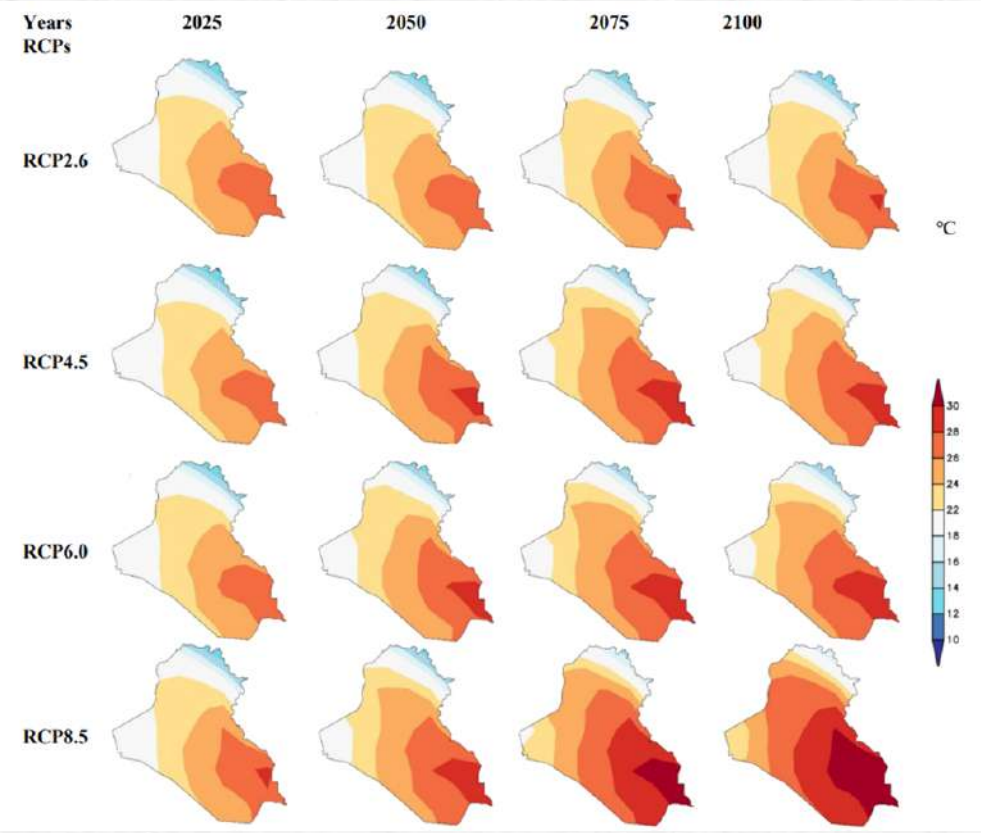
The geographically explicit projections show an increase in potential evapotranspiration throughout Iraq, potential evapotranspiration is projected to increase by between 1.9 to 4.6 % by 2030.

The sea level along the Iraqi coasts is projected to rise. Iraq borders the Gulf to the south with a coastline of only 58 km. Despite this relatively small shoreline length, future sea level rise will have serious impacts on the low-lying floodplains and deltas of Iraq's southern Governorate. Until 2050, projections of a sea level rise of 9.6 cm by 2030 and 17.9 cm by 2050 under RCP2.6, and of 9.1 cm until 2030, and 17.9 cm until 2050 under RCP6.0.

Soil moisture is an important indicator of drought conditions. In addition to soil parameters, soil moisture depends on both precipitation and evapotranspiration and, therefore, also on temperature, as higher temperatures translate to higher potential evapotranspiration. But no clear indication is yet available for Iraq.

Iraq is working with the UN agencies to complete specific regional and country-scale climate models with more accurate data. These are currently being finalized.

Figure 3: Projection of RCP2.6, RCP4.5, RCP6.0 and RCP8.5 air temperature in Iraq (2025, 2050, 2075 and 2100)[30]



[29] *USAID (2017); World Bank (2018); RICCAR (2017)*
[30] *Using www.knmi.nl*

The anticipated impacts of these changes include:

- Longer and more severe droughts.
- Increased desertification: 39% of Iraq's territory.
- The decrease in precipitation but most of all the change in precipitation pattern (more intense rainfall in shorter periods) will result in a decline of precipitation runoff.
- Increased storms and flood occurrences.
- Severe water shortages

Iraq is located downstream of the Tigris and Euphrates River Basin System and is severely dependent on upstream transboundary water imports (up to 85%). The anticipated loss of surface water imports from the Tigris and Euphrates Rivers could decrease in 2025 to only 50-80% of the water imports of 2009. According to Iraq's Ministry of Water Resources, the country could face a shortfall of as much as 10.8 billion m3 of water annually by 2035 due to climate change and the upstream countries' water allocation policies.

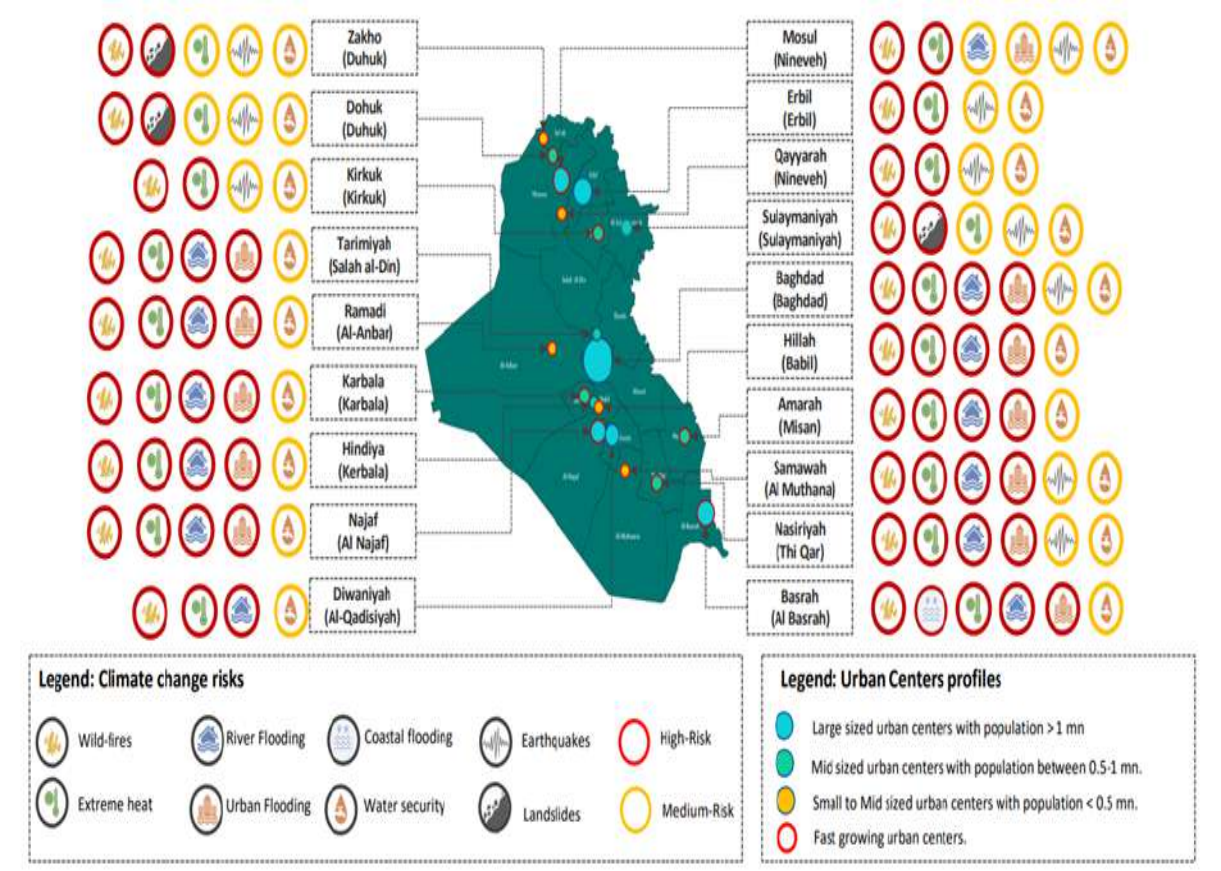
The anticipated impacts of these changes include:

- A decline in water levels in surface reservoirs, lakes, and streams.
- A decline in water levels in the groundwater, a resource that is already over-exploited in many areas.
- A decline in renewable water volumes stored underground will lead to the salinization of accessible groundwater reserves and a potential increase in landslides.

The rise in sea level in the southern flat areas of the country will facilitate seawater intrusion far inland and the salt contamination of fertile lands.

Climate change affects the whole country, however, 70% of the Iraqi population lives in urban areas, and the remaining population is scattered in rural and/or remote areas. Figure 4 depicts climate change and natural hazards risks the main cities in Iraq. However, rural areas already under harsh natural conditions and suffering from economic hardship will see their existing vulnerability exacerbated.

Figure 4: Potential climate and natural hazards in cities of Iraq[31]



2.3.2. The specific case of the Marshes

The Iraqi Marshlands, a nationally important and globally significant wetland (under UNESCO World Heritage partially) has a unique ecosystem formed by the Euphrates and Tigris rivers for millennia. These two major rivers join and flow through these marshes to the Gulf Coast. The Marshlands are one of the few areas in the MENA region where migratory birds can stop and rest before continuing their long journey. The significance of rest areas for the diminishing number and species of migratory birds and the subsequent dwindling biodiversity in the world cannot be overstated and has been neglected for decades due to the insecurity in Iraq. The Marshlands are being affected by a combination of climate impacts as well as human actions. In the past, considered a strategic border area, the Marshlands were subjected to drying and damage due to previous policies, resulting in environmental degradation and the loss of wildlife and biodiversity[32]. In the future, due to its location in the southern areas where temperature changes are the highest, and precipitation are the lowest, projections suggest that the Marshlands will be under increasing threat due to the rapid expansion of desertification, increased sand, and dust storms (SDS), prolonged drought conditions, and high temperatures (exceeding 50°C). The Marshlands will also experience increased salinity from the rise of sea levels through the Shatt al-Arab and into portions of Al-Hammar Marsh[33].

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31 Iraq Country Climate and Development Report
32 INC (2016)
33 M. El Raey (2014) Impact of Sea Level in the Arab Region
http://www.arabclimateinitiative.org/Countries/egypt/ElRaey_Impact_of_Sea_Level_Rise_on_the_Arab_Region.pdf

2.3.3. Climate Change Impacts by Adaptation Sector

ND-GAIN indicator measures the overall vulnerability of the country by considering six life-supporting sectors: food, water, health, ecosystem service, human habitat, and infrastructure.

The high vulnerability score and low readiness score of Iraq place it in the upper-left quadrant of the ND-GAIN Matrix. It has both a great need for investment and innovations to improve readiness to cope with climate change and a great urgency for action. Iraq is the 88th most vulnerable country and the 153rd least ready country out of 187 countries assessed.

Agriculture's adaptive capacity and quality of trade and transport infrastructure are among the highlighted areas for urgent action.

Iraq ranked 169 out of 180 countries for the year 2022 according to the Environmental Sustainability Index for Environmental Performance Evaluation (EPI), which[34] requires great efforts to improve the environmental reality in the country.

Table 8:Climate change impacts in Iraq, per adaptation sector

Water Resources
Increased evaporation: Higher temperatures and changes in the rainfall precipitation pattern are causing more water to evaporate from rivers, reservoirs, and other sources. This further reduces the amount of water available in the country. Decreased water flow in rivers: Rising temperatures and reduced precipitation are leading to less water flowing in the Tigris and Euphrates, Iraq's vital rivers. This translates to less water in the rivers and higher fluctuations of flows. Decreased water in groundwater: The reduced water flowing in the Tigris and Euphrates and higher evaporation leads to less water percolating and recharging groundwater reserves. This already over-exploited water resource that should be renewed regularly is no longer being renewed. Water levels in boreholes are diminishing with no prospect of improvement. Decreased water availability: decreased river flows or groundwater recharge lead to less reliable amounts of water available to cover needs for the population, agriculture, and industries. Salinization: Reduced water in rivers and creeks and the non-renewal of groundwater reserves due to a reduced natural water recharge increases the salinity of existing water reserves. Saltwater intrusion from the sea is increasing due to lower river flows and sea level rise. Changes in freshwater sources becoming brackish, sometimes even saltier than seawater impact irrigation, industrial water quality, and some industrial processes. Deteriorating water infrastructures: Aging dams, canals, and water treatment plants are not designed to sustain extreme temperatures, increased salt content in water, or extreme volume changes in addition to an increased water demand by a growing population. The water infrastructures in Iraq suffers from Maladaptation to projected climate changes. Reduced access to clean drinking water: Salinization and deteriorating infrastructure threaten the quality and availability of safe drinking water. The management of already scarce water resources is made even more difficult given the worsening of the water quality available and the diminishing quantities.
Agriculture
Increased temperatures: Changes in minimum and maximum daily and night temperatures impact the growth cycle of crops. Heat stress damages plants and reduces yields. The traditional crops used in Iraq can no longer produce the same amounts, putting the country that is already dependent on basic food imports even more at risk of food insecurity. Reduced rainfall and drought: Iraq is experiencing more frequent and severe droughts and less effective rainfall precipitation. The traditional farming in Iraq is rainfed and is already low-yielding. The decrease and change in rain and evaporation patterns is jeopardizing food production as well as income for already vulnerable farmers. Water scarcity: traditional farming in Iraq is based on flood irrigation, which is inefficient and heavily reliant on water availability. Water scarcity is making it difficult for farmers to irrigate their crops. Up to 60% of farmers report struggling with water shortages and reduced crop yields[35]. Salinization: As surface and groundwater reserves are declining, sea salt intrusion as well as salt contamination from over-fertilization or/ and maladapted fertilization, water quality is worsening making it even more difficult for agriculture use. This is leading to soil salinization, in a country already experiencing limited availability of arable land. Loss of arable land: fertile land is very limited. This precious land is under desertification threat and is diminishing every year by 1.7%. This will only get worse under the projected changes in climate change Loss of animals: the increased heat and sustained day and night high temperatures are life-threatening for animals that are not adapted to such extreme conditions. Many farmers cannot protect their animals from such heat, and or cannot feed or provide enough potable water for the animals. Loss of crops: Growing crops is becoming very difficult but crop storage and transport experience important losses as well, as the current value chain is not adapted to the extreme temperatures, heat, and drought conditions.

[34] *National Development Plan 2024-2028*
[35] *https://ur.gov.iq/index/*

Food insecurity: Iraq is not self-sufficient and imports already an important portion of its food basic food needs. This makes the country dependent and vulnerable to international food prices and hikes. The increased crop failures, the decline in production, decline in arable land, and water availability puts the country and especially income-vulnerable farmers under increased food price hikes and changes and increased food insecurity.

Biodiversity & Environment Protection

Reduced food and water availability: As droughts become more frequent and water resources dwindle, there's less water and food available for wildlife. This disrupts food webs and can lead to population declines.

Fauna and flora losses: Rising temperatures and long periods of heat can be detrimental to many species. This can lead to heatstroke, reduced reproduction, and changes in migration patterns.

Habitat loss: Decreasing surface and groundwater water in the Tigris and Euphrates basins, coupled with rising temperatures, is causing already limited forests and bushes, wetlands, and marshes to dry up. These ecosystems are crucial habitats for a diverse range of plants and animals. Increased saltwater intrusion into dwindling freshwater reserves[36] is already disrupting aquatic ecosystems, harming fish populations and plants that cannot tolerate saltier water and contributing to a change in native species and a dominance of introduced invasive species.

Disruption of breeding grounds: Drying wetlands and marshes are not only homes but also vital breeding grounds for many birds, fish, and insects. The loss of these areas disrupts reproduction cycles and impacts entire ecosystems. Deforestation practices and increased desertification combined are leading to the loss of many valuable key biodiversity areas

Aquatic populations: Declining water quality and salinization are harming fish and amphibia populations in rivers and wetlands, impacting the whole food chain in the ecosystems. This has immense consequences on communities solely dependent on these specific ecosystems for their livelihood.

Loss of endemic species: Species already facing challenges, like the critically endangered Asiatic Lion or the Mesopotamian Fallow Deer, the Iraqi Reed Warbler, and the endangered Marsh Otter are even more at risk due to habitat loss and reduced resources.

Loss of wetlands: The iconic Mesopotamian marshes are drying up due to reduced water flows. This is having a major impact on biodiversity and the livelihoods of people who depend on the marshes for fishing and grazing, threatening the habitat of several fish species, birds like the Iraqi Reed Warbler, and the endangered Marsh Otter.

Loss of key biodiversity areas (KBA): There are 23 KBA that are barely protected from human actions and that will be under increased threat of extinction with higher temperatures, reduced humidity, rainfall, and overall reduced water availability

Loss of important bird areas (IBA): There are 42 IBA that are barely protected from human actions and that will be under increased threat of extinction with higher temperatures, reduced humidity, rainfall, and overall reduced water availability.

Health[37]

Waterborne diseases: Water scarcity and deteriorating water quality increase the risk of waterborne diseases like cholera, diarrhea, and typhoid fever. Contamination from pollutants and sewage can become more concentrated as water quantity diminishes.

Foodborne diseases: Higher temperatures can accelerate food spoilage and create ideal conditions for the growth of bacteria that cause foodborne illnesses.

Respiratory illnesses: Dust storms, a growing problem due to desertification and reduced rainfall, can trigger respiratory problems like asthma and allergies. The increase in dust storm frequency and intensity will increase the spread of air pollutants and fine particulates and will worsen air quality.

Heat stress: Rising temperatures and an increase of days above 35 degrees lead to more frequent and intense heat waves. This causes heatstroke, and dehydration, and exacerbates existing health conditions, especially among vulnerable populations like children, pregnant women elderly, and people with a disability. Labor active population will be required to adapt to altered working conditions.

Mental health: The stresses of living with water scarcity, extreme weather events, and displacement due to climate change can take a toll on mental health, leading to anxiety, depression, and post-traumatic stress disorder (PTSD).

Malnutrition: Declining agricultural yields and disruptions to food supply chains can lead to malnutrition, especially among children, pregnant women elderly, and people with a disability.

Weakened healthcare system: The Iraqi healthcare system, still recovering from past conflicts is not set for such extremes: the infrastructure (design, construction, equipment, locations, etc.) is not ready to sustain such extremes, and a reduction in clean water availability. The health insurance system will have to cope with the increasing burden of climate-related illnesses.

Education[38]

Impact on student health: Rising temperatures can lead to heat exhaustion and dehydration, affecting student concentration and learning ability. Climate change can also worsen existing health problems like asthma, impacting attendance and participation.

School closures due to extreme weather: More frequent and intense heatwaves, sandstorms, and floods can force schools to close, interrupting learning and impacting student progress.

Reduced educational attainment: Extreme heat and temperatures increase absenteeism and disruptions during school time. This has a long-term impact on educational attainment, and learning gaps, hindering the development of the student and limiting future opportunities for young people.

Internal displacement: Climate change-induced droughts and water scarcity can lead to internal displacement, disrupting children's education as families are forced to move.

Unequal impacts: The impacts of climate change on education are likely to be felt more acutely by children and youth from disadvantaged backgrounds who may have limited access to coping resources and support.

Impact on school infrastructure: Current school infrastructures are not designed to cope with extreme weather events and protect students' well-being and learning environment.

[36] https://iraq.iom.int/stories/silent-enemy-how-climate-change-wreaking-havoc-iraq

[37] https://iris.who.int/bitstream/handle/10665/350909/WHO-HEP-ECH-CCH-21.01.10-eng.pdf?sequence=1#:~:text=Moreover%2C%20climate%20change%20exposes%20countries,diseases%20and%20malnutrition%20(1).

[38] https://www.unicef.org/iraq/media/3521/file/CLAC%20-Final%20Full%20Report-%20English.pdf.pdf

Water scarcity: Lack of access to clean water can affect hygiene in schools, impacting student health and attendance. Additionally, water scarcity can limit resources for sanitation facilities, making schools less conducive to learning.
Tourism[39]
Archeological and heritage sites: old archeological and heritage sites withstood hundreds of years however not in these extreme climate conditions. These sites are under increased weathering risks and would require specific tailored protection and rehabilitation. Decreased appeal: Rising temperatures and more frequent heatwaves make outdoor activities and sightseeing less enjoyable, deterring tourists who may seek cooler destinations. Water scarcity: Drying marshes, rivers, and lakes not only reduce natural beauty but also limit recreational activities like boating and swimming. Additionally, water scarcity can affect the quality and availability of water for hotels and tourist facilities. Increased dust storms: The growing frequency and intensity of dust storms can disrupt travel plans, reduce visibility at historical sites, and make outdoor activities unpleasant. Damage to infrastructure: Extreme weather events like floods and sandstorms can damage historical sites, transportation infrastructure (roads, airports), and tourist facilities, hindering tourism activity. Security concerns: Climate change can exacerbate competition for resources like water, potentially leading to social unrest and instability. This can make tourists feel less safe and discourage travel.
Infrastructures
Water infrastructures: Extreme weather events combined with reduced surface and groundwater flows contribute to premature aging of the water infrastructures that were not designed to withstand such variations (more water in a shorter time or prolonged droughts with no water influx and dry infrastructures): premature aging of dams, canals, reservoirs, and treatment plants are a serious threat to the provision of basic water needs to the population and industries for sustainable development. Increased strain on electricity grids: Rising temperatures lead to higher demand for electricity for cooling, putting a strain on the capacity of power grids. Additionally, dust storms, more frequent due to desertification, can damage power lines and disrupt electricity generation. Damage from extreme weather events: More frequent and intense heatwaves, droughts, floods, and sandstorms can damage infrastructure like roads, bridges, and buildings (intense heatwaves can damage roads and railways, causing buckling and warping of asphalt, while heavy rains and floods can wash away roads, bridges, and railway tracks). This disrupts transportation networks, damages communication systems, and increases the cost of repairs and maintenance. Sea level rise: While Iraq has a limited coastline, saltwater intrusion due to rising sea levels can damage coastal infrastructure and exacerbate salinization of groundwater resources in southern Iraq. Indirect impacts: Climate change can worsen existing infrastructure problems. For instance, water scarcity can lead to land subsidence, affecting the stability of buildings and foundations. Disruptions to essential services: Damage to water infrastructure can limit access to clean drinking water and sanitation. Power outages can disrupt healthcare services, communication networks, and economic activity. Increased vulnerability to disasters: Weakened infrastructure makes communities more vulnerable to the impacts of extreme weather events, leading to higher costs for recovery and reconstruction.

2.4. Economic context in Iraq

In the categorization of the UNFCCC, economic sectors were defined as the sectors most contributing to greenhouse gas emissions (broadly described as mitigation sectors) and the sectors suffering the most from climate change (adaptation sectors). For reference, Iraq's country profile is presented briefly in Chapter 2.1.

Iraq is classified as a middle-income country. Its main natural resources are oil and natural gas, with significant untapped agricultural and natural resources potential. Traditionally, Iraq's economy is driven by the oil and gas industry followed by the construction, agriculture, and industry sectors. Services are dominated by the public services through government entities.

Iraq is one of the most oil-dependent countries in the world (second after Libya in net government revenues from the oil industry (2021)[30]). This excessive dependence on oil exposes the country to macroeconomic volatility, while budget rigidities restrict fiscal space and any opportunity for countercyclical policy.

[39] *https://www.researchgate.net/profile/Malik-Abbood-Alkinani/publication/335321566_Tourism_Climate_Index_TCI_in_Iraq/links/5f267cf692851cd302d1985c/Tourism-Climate-Index-TCI-in-Iraq.pdf?_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uliwicGFnZSI6InB1YmxpY2F0aW9uIn19*

Figure 5: Iraq GDP, Per Capita, and Annual % change[40]

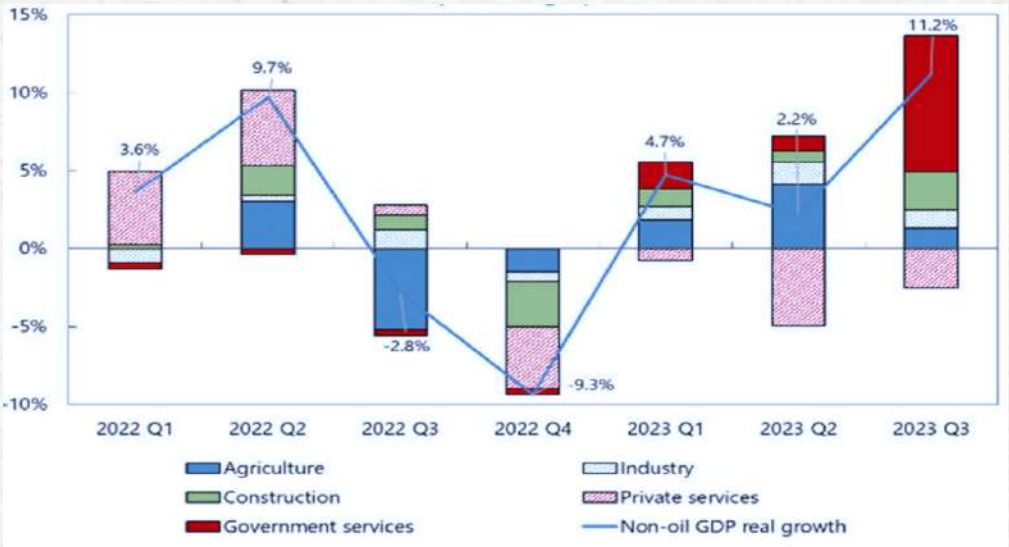
Oil and gas resources contribute to almost 60% of Iraq's GDP and represent 95 to 99% of the export earnings, the reminder sources of revenues stem mainly from agriculture, trade, construction, and taxes.

The Government of Iraq (GOI) steers Iraq's economy. The domestic retail sector is dominated by the public sector, especially food products. Iraq's Ministry of Trade (MOT), through the Public Food Distribution System (PFDS), continues to provide the Iraqis with five basic food commodities at subsidized prices. With agricultural production in decline, food imports have become critical. State-owned companies channeling imported foodstuffs to consumers have in the process become the major operators in the Iraqi food retail sector.

Iraq's gradually rebounding economy was severely hit by COVID-19, weighing on domestic demand and macroeconomic balances, as well as lower global oil prices and OPEC output quotas. GDP growth contracted to an estimated 12.04% in 2020 - by far the lowest performance since 2003 - but grew back to 7.02% in 2021 and 7% in 2022[41], a recovery to pre-pandemic levels. Buoyed by rises in public expenditure and robust agricultural output, real non-oil GDP is projected to have expanded by 6% in 2023 following a stagnant performance in 2022 (IMF). The momentum of non-oil growth is expected to persist into 2024, but substantial declines in oil prices or prolonged OPEC+ cuts could exert pressure on fiscal and external accounts. Looking ahead, over the medium term, non-oil growth is forecasted to stabilize around 2.5%. The IMF projects overall growth of 2.9% this year and 4% in 2025. (IMF). Non-oil revenues in Iraq remain persistently low compared to regional peers and other oil exporters states. From 2019 to 2023, non-oil revenues as a ratio to GDP have fluctuated between 1.9 and 4.5 percent, averaging 2.9 percent of GDP.

[40] https://www.macrotrends.net/global-metrics/countries/IRQ/iraq/gdp-gross-domestic-product
[41] https://www.macrotrends.net/global-metrics/countries/IRQ/iraq/gdp-gross-domestic-product

Figure 6: Sectoral contribution to non-oil GDP growth (in % points)[42]



Despite these economic gains, the country faces several challenges stemming from rapid development, such as rural depopulation, urban migration, environmental degradation from historically unsustainable resource exploitation, and pollution contamination of soil, air, and water from war and conflict remnants.

The 2023-2024 UNDP Human Development Report ranks Iraq 134th in the Human Development Index. The HDI is a summary composite measure of a country's average achievements in three basic aspects of human development: health, knowledge, and standard of living. HDI indicates social development rather than only focusing on the economic aspects of a country's development and links well with the overall sustainable development goals.

The country has an estimated population of 44.4 million (2024)[43]. Approximately 70% of its population lives in urban areas with youth unemployment in rural areas more prevalent. Job creation is not keeping up with demographic growth as indicated in the next figure with a sharp increase in unemployment since 2015.

Additionally, 8% of the employed population reported underemployment. Labor market conditions are particularly poor for the youth, who make up a substantial part of the population.

[42] *IMF monitoring report 2024-Q1*
[43] *https://worldpopulationreview.com/countries/iraq-population*
https://www.tradeclub.stanbicbank.com/portal/en/market-potential/iraq/economical-context

Figure 7: Unemployment Rate[44]

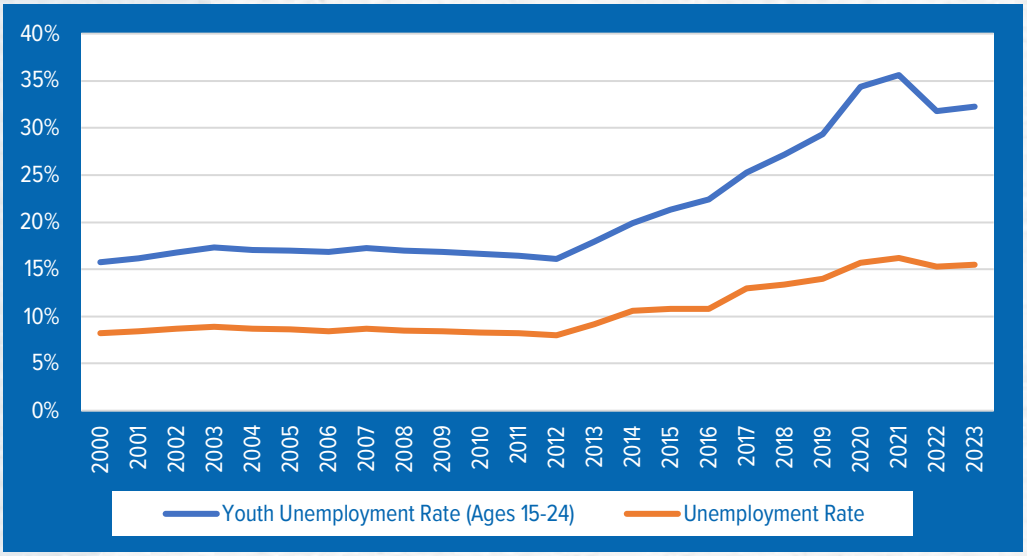


Table 9: Central Government Finances[45]

	2023	2024	2025
	Est.	Proj.	
Output			
Real GDP (% change)		1.4	5.3
Non-oil real GDP (% change)		3.5	3.3
Prices			
Inflation, end of period (%)		4	4
Central Government Finances			
Revenues and grants (% of GDP)		40.1	38.4
Oil revenue (% of GDP)		36.7	34.9
Expenditure and net lending (% of GDP)		47.7	47.2
Wages and pensions (% of GDP)		23.6	23.4
Fiscal balance (% of GDP)		-7.6	-8.8
Total government debt (% of GDP)		48.2	54.6

2.4.1 Macro-economic trends

Fiscal constraints limit the capacity to sustain development. Looking ahead, Iraq's economic outlook[46,47,48] remains positive, but deeper structural reforms are essential to mitigate vulnerabilities and promote sustainable growth. The economic outlook for Iraq is expected to benefit from persistently high oil prices, though weaker global demand may dampen these gains. Data on the specific growth rate for Iraq's oil GDP in 2024 is not yet available. However, the International Monetary Fund (IMF) projected a growth of 1.4% for real GDP in Iraq in 2024[49], with a significant portion likely coming from the oil sector. Similar to Oil GDP growth, the IMF's projection suggests Non-Oil GDP growth might be around 1.4% or slightly higher, considering the traditional role of oil

[44] https://www.sesric.org/oicstat.php
[45] https://www.imf.org/en/Countries/IRQ
[46] https://www.imf.org/en/Countries/IRQ
[47] https://www.worldbank.org/en/country/iraq
[48] https://www.cbiraq.org/
[49] https://www.imf.org/external/datamapper/NGDP_RPCH@WEO/IRQ/JOR

as a major contributor to Iraq's GDP. There is constrained oil production capacity because OPEC+ production quotas and limitations in Iraq's oil infrastructure could limit oil production growth. Also, a slowdown in the global economy could reduce demand for Iraqi oil, impacting oil revenue and overall growth.

Raising non-oil revenues should be a key priority because of the expected decline in oil prices, as well as the need to ensure long-term fiscal sustainability and meet sizeable spending needs.

IMF's latest report on Iraq (IMF Country Report No. 24/128 - May 2024) reiterates the role that the private sector can play in economic diversification and the increase of non-oil exports to counteract external vulnerability and ensure long-term fiscal stability while increasing job creation.

The development of low-carbon energies and industries provides an opportunity for economic diversification with an increased participation of the domestic and international private sectors. It is therefore crucial to attract and steer investors to the concerned sectors and prioritize 'clean' opportunities while reinforcing fiscal sustainability. Addressing climate change shocks is crucial for long-term stability socially, financially, economically, and in the region.

Figure 8: Macroeconomic trends

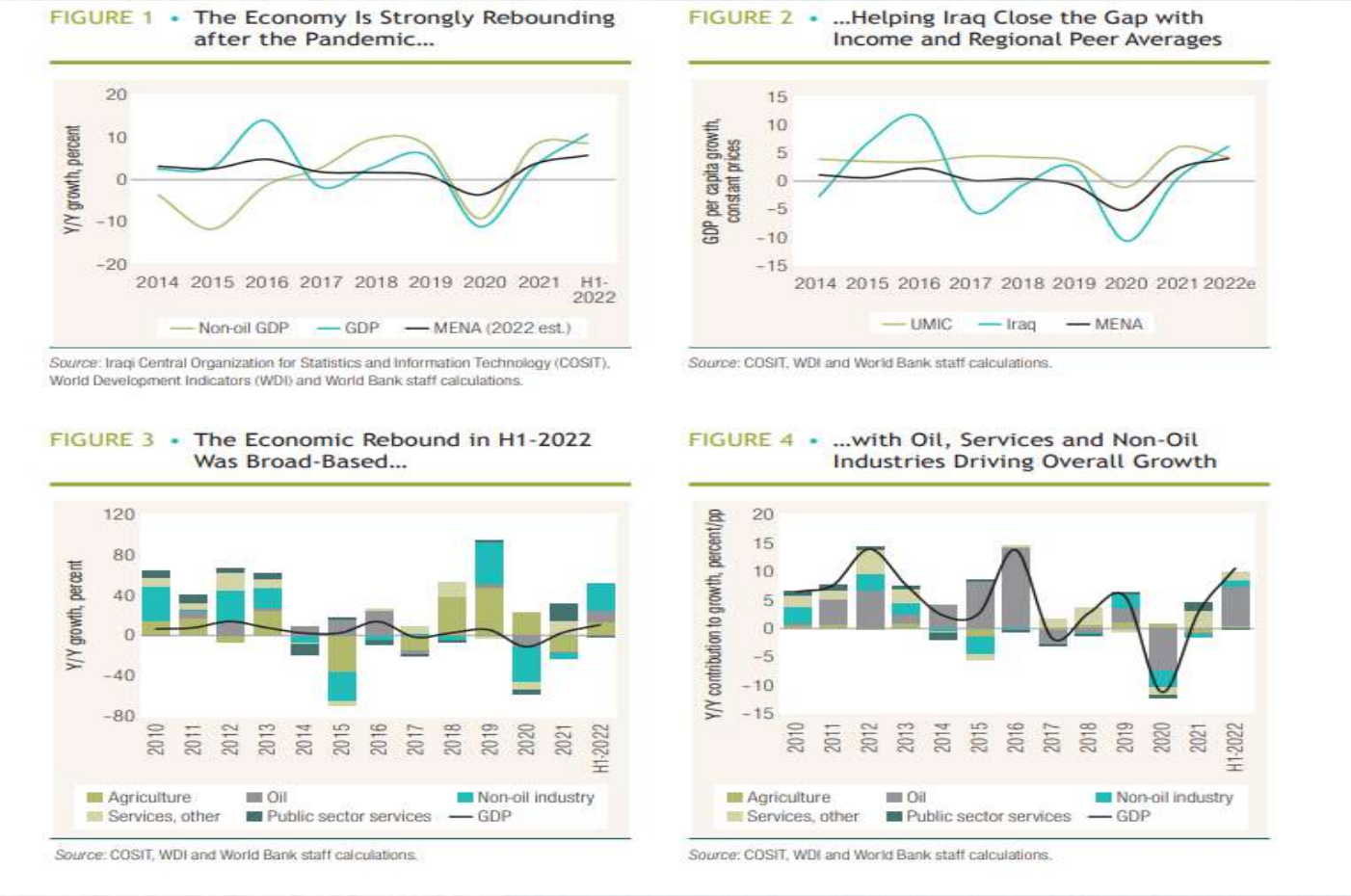
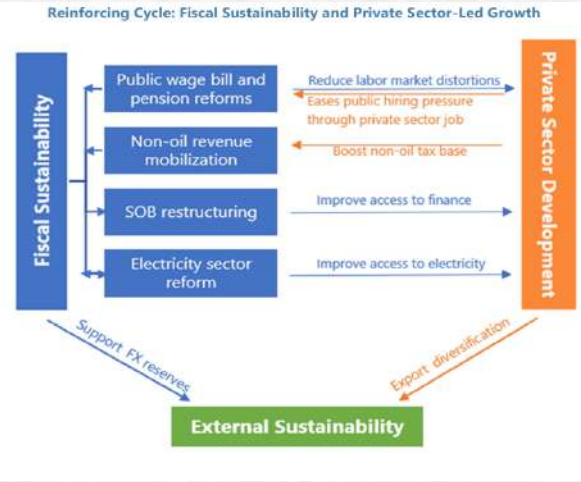


Figure 9: Fiscal sustainability for Iraq (IMF Country Report No. 24/128 - May 2024)

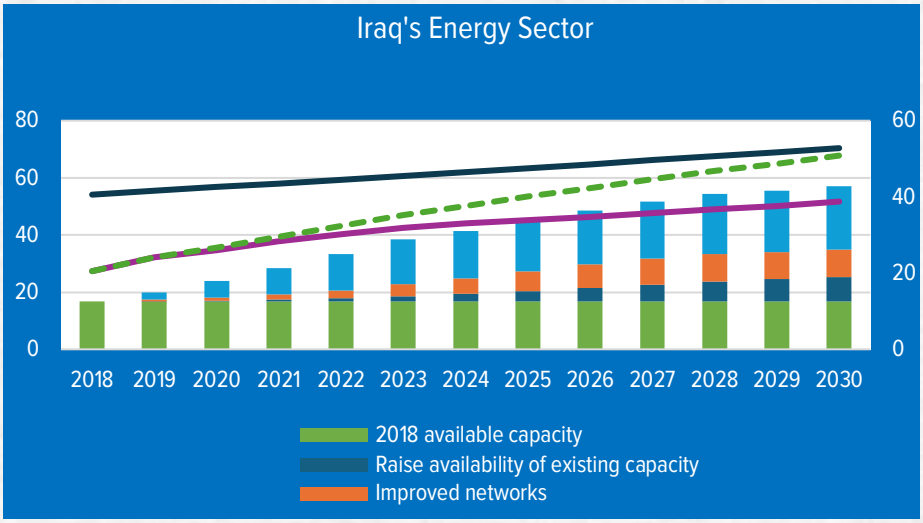


2.4.2. Essential Country Infrastructures

Given the high dependency of the country on macroeconomic trends and external price fluctuations, it is important to analyze the required investments in essential infrastructures that would improve the population needs domestically and attract international investors. Water, food, energy, and transportation networks are among the most important infrastructures to fulfill both needs. These services are primarily offered by government entities.

Electricity supply and distribution:

The electricity sector struggles to provide adequate reliable electricity. In 2022, Iraq's electrical energy production reached 15,483 megawatts, marking a 28% increase from the 12,086 megawatts produced in 2018, the Per capita consumption also increased from 2,742 kilowatt-hours in 2018 to 3,347 kilowatt-hours in 2022. Frequent power outages disrupt commercial operations and affect the population, especially given Iraq's extreme temperatures in summer. Rising temperatures have also reduced hydroelectric generation capacity from 1,846 MW to 400 MW[50].



The lack of reliable electricity has led to the widespread use of diesel generators, which emit significant carbon oxides.

Figure 10: Peak Demand projection based on 2018 capacity[51]

50 https://www.greenclimate.fund/sites/default/files/document/readiness-proposals-iraq-unido-ctcn-strategic-frameworks.pdf
51 Source: IEA. License: CC BY 4.0

The electricity sector faces several critical challenges:

1) High load growth rates and increased demand for electrical energy. Fuel shortages for production stations lead to outages so that supply does not meet the demands in power and electricity consistently.
2) A flawed collection system and a disparity between the selling price and production cost of electrical energy impacts maintenance and repairs leading to increased costs for repairs, rehabilitation, or replacements.
3) The lack of adequate operations and maintenance leads to high losses in transmission and distribution.
4) Weak project and contractual management and weak coordination between relevant ministries.
5) Inadequate management of end-user consumption (use of inefficient electrical appliances, excessive use of cold or heating, etc.).

The NDP 2024-2028 has set up several objectives to overcome these challenges:

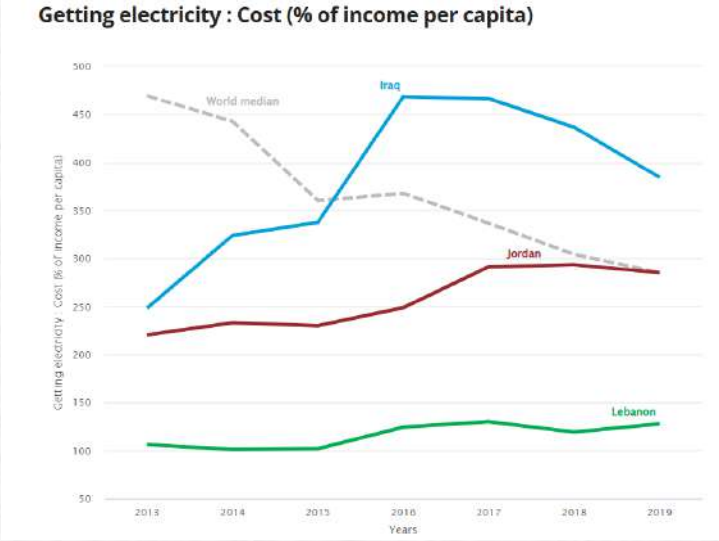
1) achieve integrated management of the energy sector by updating the energy strategy to cover oil, gas, electricity, and renewable energy and enhance coordination through the different sectors
2) increase the generated capacity to meet the projected peak load of 47,358 megawatts by 2028 and expand renewable energy projects. This will involve establishing new generation projects, converting gas plants to combined cycles, supporting private investment in the production and storage of renewable energy, and completing electrical interconnection projects with neighboring countries.
3) enhance the capacity of transmission networks to handle the added energy produced and ensure its transfer to distribution networks. Key measures include extending transmission lines, constructing new secondary stations, and rehabilitating existing infrastructure.
4) boost the capacity of distribution networks to effectively deliver energy from transmission networks to consumers and increase the supply hours to 24 hours per day by 2028. This will involve establishing new secondary stations and feeders and rehabilitating existing infrastructure.
5) reduce technical and non-technical losses, improve the percentage of readable energy, and increase collection rates. Strategies include addressing network encroachments, expanding service and collection contracts with the private sector, and implementing smart meter systems and electronic billing.

The government has already started increasing the efficiency of energy production by rolling out a program of conversion of simple to combined gas cycle energy production that will increase the supply of electricity by 33% with no additional gas consumption. This programme is however limited by the constrained capacity of producing and delivering dry gas to the stations.

The ministry also started the introduction of renewable energy in the energy mix by introducing solar farms in each governorate according to decree Number 64/year 2021 requiring that 20% of the energy mix is produced from solar energy. The technical requirements to enable feeding back the renewable energy produced to the local grid must be managed effectively. The financial tariff model setup will have to be implemented and monitored effectively to allow for a positive return on investment and incentivize and scale up further investments.

Given the fiscal constraints, efforts focusing on reducing technical and non-technical losses seem most suitable for this transitional period 2025-2030. Increased energy efficiency will lead to improved air quality and reduced carbon footprint, better energy distribution while introducing diversified energy. Finally, it will also improve the investment environment by reducing the cost of getting electricity in the country compared to neighboring countries, increasing the competitiveness of Iraq at an international level.

Figure 11: Cost of getting electricity (% of income per capita)[52]



Climate change will impact heavily above ground networks (Increase in frequency of extreme events such as sand and rainstorms, heat, and prolonged extreme temperatures).

New investments that could be tackled by the private sector could focus on increasing and improving the transmission lines and network and converting distribution to underground lines, increasing the reliability of electricity reaching homes and businesses.

Technical assistance from the international community to improve network load flow analysis would further improve current unbalanced networks and provide thorough results in phasing and sequencing of voltage levels, power flows, current distribution, and unbalanced electrical systems while providing financial operational savings and tariff recovery improvements.

Food Security and Agriculture

The agricultural sector in recent years has shown fluctuating contributions to GDP, with its share ranging from 2.5% in 2018 to 4.8% in 2020, before settling at 3.2% in 2022. The sector is also a significant source of employment, engaging about 20% to 25% of the workforce, particularly in rural areas where agriculture is the primary livelihood.

The sector is facing many challenges from climate change to water scarcity and desertification. Despite these issues, the cultivated area increased notably from 4,436 million dunums in 2018 to 15,141 million dunums in 2020, although it later decreased to 11,224 million dunums in 2022. Agricultural crop production reached 6,863 thousand tons in 2022, with a 39% increase in grain production compared to 2018. Wheat, a critical crop, saw its production reach 2.6 million tons in 2022. Most animal product

[52] *Getting electricity : Cost (% of income per capita) | Indicator Profile | Prosperity Data360 (worldbank.org)*

outputs, including red meat, white meat, milk, wool, and eggs, increased in 2022 relative to 2018, although river fish production did not follow this trend.

Yet the contribution of the sector to the overall economy remains very low and food production is heavily reliant on imports that have volatile prices.

Revitalizing agriculture and investment in the whole food value chain, away from focusing only on production but also ensuring storage and processing equipment and capabilities are provided in each governorate is a national priority and will contribute to economic diversification, food security, and reducing dependency on oil revenues.

The economic outlook for Iraq's agriculture sector hinges on several key factors. Effective water management, including efficient user practices, is crucial for sustaining agricultural production. Continued investment in modernizing infrastructure will boost productivity and improve market access. Diversifying into high-value crops and developing agro-processing industries can enhance profitability and expand export potential. Additionally, addressing climate challenges through the adoption of resilient farming practices and crops is essential for mitigating the adverse effects of climate change on agriculture.

Performance indicators in the NDP for 2024-2028 include maintaining arable land areas, enhancing irrigation efficiency, and improving water transmission and distribution. Agricultural targets include increasing the production of table eggs, meat, milk, and various crops, reflecting a commitment to both food security and efficient resource management.

Climate change impacts on the agriculture sector are related to the loss of fertile soils (due to salinization or desertification), inadequate water availability and use, and low productivity (inadequate fertilization, inefficient water use, or crop species). It is expected that wheat yield will slightly increase in optimal conditions while maize and rice are rather negatively impacted by climate change putting an additional strain on food security and import dependency.

Priority investment in the production in the agriculture sector in the coming years should focus on soil management, soil conditioning, and sustainable fertilization., smart drip irrigation and diversified crop uses instead of concentrating on monoculture agriculture. This opens avenues for small and medium-sized enterprises to grow and play a pivotal role by raising community and farmers' awareness on climate change-adapted new technologies and practices such as agroforestry and agroecology that have the co-benefit of protecting the environment and improving water and soil quality, slowing down desertification of precious arable land.

However, during consultations with many stakeholders, the remainder of agriculture value chain weaknesses were highlighted, especially adequate local processing, and storage and transportation to valuable markets.

Cool food transportation and storage and increased efficiency during the processing of essential cereals will reduce losses and dependency on external market factors.

Figure 12: Projected food supply reduction from climate change impacts[53]

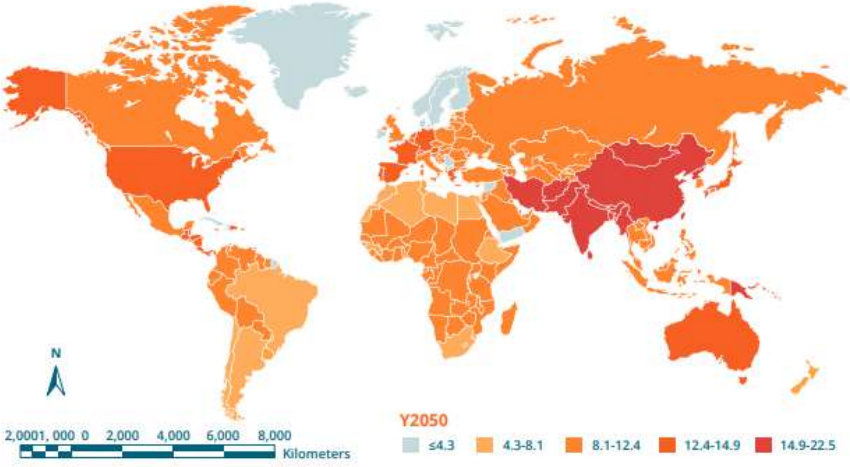


FIGURE 3.6 Percentage reduction in food supply by country from water stress and heat stress for RCP 8.5-SSP3 in 2050
SOURCE: Kompas et al., 2023

The recent recurrent droughts and water scarcity besides increasing security risks due to the reduced livelihood in remote areas have led to an increased displacement of rural population to urban centers. This internal migration is increasing the pressure on urban settlements and peri-urban areas. The Ministry of Agriculture has developed a programme of sustainable cities for each governorate that would combine farming activities with improved living standards around key agricultural areas to decrease urban migration and enhance local livelihood conditions while retaining production and jobs in the agriculture sector.

Sustainable cities involve efficient energy use and resilient building and infrastructure construction while reducing the burden on major cities such as Baghdad, Basra, or Erbil that are already suffering from air, soil, and water pollution and regular disruptions in the water and power supplies.

The Ministry of Agriculture has also started projects of afforestation in six governorates (Baghdad, Wassit, Al-Anbar, Ninewa, Kirkuk, Diyala) with eucalyptus trees, a fast-growing drought-resistant tree. This is a positive step towards resilient climate change adaptation that will have to be assessed and monitored in conjunction with the Ministry of Environment for potential scale-up.

Water resources management and supply

Water resources in Iraq are dominated by water imports from upstream neighboring countries making the country vulnerable to climate change but also to allocation and use policies that are beyond national control.

Water from Turkey, Iran, and Syria not only replenishes rivers and surface reservoirs but also plays a crucial role in groundwater recharge and the renewable of underground reservoirs. Changes in water resource allocations have a direct impact on domestic water supply to the population as well as to the industries and impact the overall economic development. However efficient water management can alleviate immensely the induced water stress. Long-term goals include establishing international

[53] *https://watercommission.org/wp-content/uploads/2023/03/Kompas.pdf*

agreements on water sharing, investing in non-traditional water sources, and enacting laws to preserve water resources. Additionally, adapting to climate change involves rehabilitating storage facilities, managing small dams, utilizing rainwater and purified drainage water, and developing drought-tolerant crop varieties and smart irrigation.

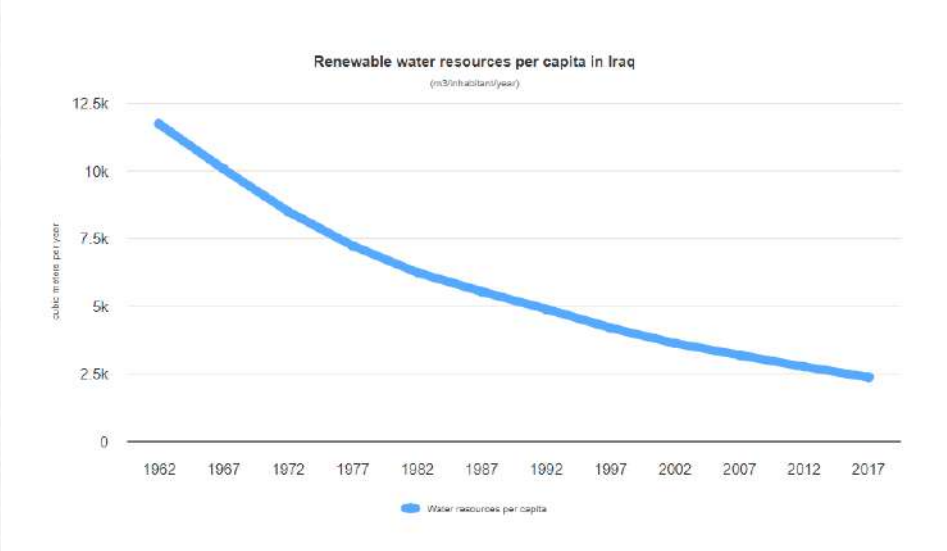
Besides the previously described climate change impacts on water resources, urbanization and the displacement of the population looking for a better life exacerbate the existing water imbalance. Water supply needs in urban settlements are exponentially increasing while water availability in rural areas becomes difficult to fulfill encouraging even more internal migration.

There is an urgent need to develop a comprehensive planning of land-use changes to better forecast and use scarce water resources.

Through the reduced water availability, water quality is worsening. Water treatments are constantly in need of extension or upgrade and suffer from unreliable power provision impacting water treatment quality. This is particularly worrying given the projected increase in waterborne diseases.

The combined effect of reduced water provision from upstream countries, the reduced precipitation runoff, the diminishing groundwater recharge, and the maladapted water resources uses are particularly worrying.

Figure 13: Decrease in renewable water resources in Iraq[54]



There is an urgent need for efficient resource management and a scale-up of investment for local closed storages and reservoirs to avoid evaporation, and reuse of any drop of water in the country at all costs. For instance, improvement in the local community closed water storages and adequate groundwater infiltration by adequate reuse of drainage water. The reuse of agricultural and industrial water after adequate treatment is a necessity nowadays.

54 https://www.iwmi.cgiar.org/news/middle-easts-groundwater-shortage-will-it-soon-run-out/

Finally, a program to reduce non-revenue waters and losses in the transmission and network distributions is urgently needed. The current state of Iraq's irrigation infrastructure further highlights technological deficiencies, with over 70% of the country's irrigation canals suffering from significant water loss due to outdated and inadequate infrastructure[55].

The expected increase in extreme flood events requires a strengthening of existing infrastructure to cope with the sudden increase in volumes. To this purpose, establishing a flood forecasting and early warning system has the dual benefit of helping save lives and costs but also planning stormwater storage and reuse to reduce the dependency from external water allocations.

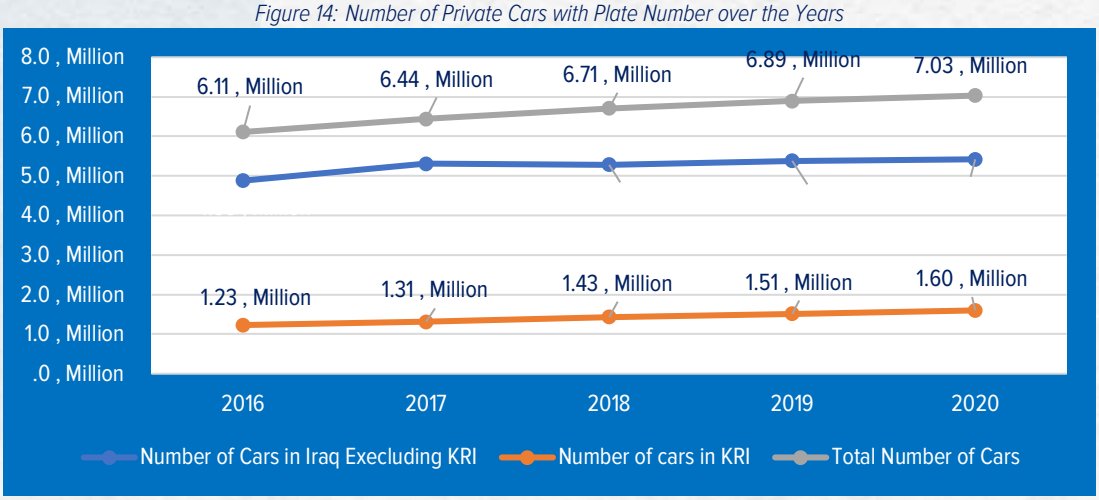
Transportation

The transportation sector in Iraq faces significant challenges. It is vital for facilitating trade, supporting economic diversification, and improving connectivity within Iraq and with neighboring countries. Investment in roads, railways, and ports is essential to boost economic activity, reduce transportation costs, and enhance access to markets. However, challenges such as outdated infrastructure, limited funding, and security concerns continue to pose risks to the sector's growth and development.

Iraq's road transportation network spans approximately 48,000 kilometers, but only about 40% of these roads are paved, leading to significant logistical challenges and high transportation costs, which hinder economic efficiency and growth.

Iraq's car market has grown significantly, with an estimated 7 million vehicles, contributing to increasing urban congestion and air pollution, particularly in major cities like Baghdad or Erbil. The increase in individual vehicles will undoubtedly increase GHG emissions unless clean technologies are introduced (forecasted additional 1 million vehicles until 2030)

Figure 14: Number of Private Cars with Plate Number over the Years



The main challenges described in the NDP are a lack of effective governance and a blurred distinction between public and private sector roles. Furthermore, comprehensive transportation projects, such as metro systems and rapid transit lines, have been delayed.

55 https://www.iwmi.cgiar.org/news/middle-easts-groundwater-shortage-will-it-soon-run-out/

To address these challenges, several objectives have been set in the national Iraqi plan:

- enhance the efficiency of passenger transport and increase the private sector's role. This involves governing the sector effectively and encouraging the establishment of joint-stock companies for urban and intercity transport.
- Improve the efficiency and organization of private transportation institutions
- joining international transport agreements and low-carbon transportation institutions.
- bolster public transportation by forming administrative and operational partnerships with economic efficiency. This involves operating 100 new transport lines in Baghdad in collaboration with the private sector and updating the passenger transport fleet with modern, environmentally friendly buses.
- implement comprehensive transportation projects and secure necessary investments. This includes updating the comprehensive transportation plan, advancing the Baghdad Metro project through investment, and initiating rapid transit projects between and within governorates, starting with the Najaf-Karbala route. These two public-private partnerships have been recently tendered through NIC for international companies' projects under design, build, operate, maintain, finance, and transfer ownership (DBOMFT) with IFC funding the government portion.

These two projects are a step forward in the GHG reduction commitments of the country and an improvement from the use of traditional fuel-powered vehicles.

Land Transport Activity of Goods by Truck

The number of private sector trucks increased significantly, from 920,844 in 2018 to 1,129,847 in 2022. The state-owned company General Land Transport Company transported 447 thousand tons of goods, while non-company trucks transported 667 thousand tons. Additionally, the total weight of imported goods transported by rail and road amounted to 19.8 million tons.

The sector is projected to grow for domestic purposes but also as a future international path connecting neighboring countries. The development road project is crucial for establishing Iraq as a global trade hub. It will link the Arabian Gulf with Turkey, facilitating a flow of goods between southern Iraq and European markets. The project, estimated at $17 billion, is set to commence in 2024, with the first phase expected to be completed by 2028 and the second phase a decade later.

Railway Activity

Iraq's railway network spans about 2,552 kilometers, primarily focusing on freight transport. However, much of the infrastructure is outdated, with limited coverage and efficiency. Efforts to modernize the rail system, including plans for new lines and the rehabilitation of existing ones, are crucial for enhancing connectivity, reducing road congestion, and boosting economic activity across the country[56].

Passenger numbers dropped significantly from 529,000 in 2018 to just 143,000 in 2022. Similarly, the volume of goods transported fell from 425,000 tons in 2019 to 238,000 tons in 2020.

[56] *https://data.worldbank.org/indicator/IS.RRS.GOOD.MT.K6?locations=IQ*

The railway sector faces several significant challenges:

- outdated routes that do not align with modern speed and capacity requirements.
- weak administrative and technical systems and weakening operational efficiency
- aging equipment, including locomotives and carriages, and a shortage of spare parts for maintenance compound the problem.
- the collapse of the signaling system

These areas provide an excellent opportunity for investment to modernize, enhance operational capabilities, and develop further the railway system. Investing in railway construction as part of the development of road projects is essential for the low-carbon development of the country. This includes the upcoming period connecting current lines to the Al-Faw Port and Fishkhabour. Additionally, establishing rapid transportation lines for passengers in the main urban settlements is essential to reduce carbon emissions and improve health and environmental conditions in high-density areas. The later project was awarded recently.

The transport sector provides an ideal investment opportunity to involve the private sector, especially in railway operation and asset management. The government intends to reform the state-owned company to improve economic efficiency and modernize service standards by developing the skills of engineering and technical personnel.

Maritime Transport Activity

Iraq's maritime sector is centered around key ports like Umm Qasr and Basra, which handle most of the country's imports and exports. The sector is crucial for Iraq's economy, as about 80% of goods are transported through these ports. However, challenges such as outdated infrastructure, limited port capacity, and the need for modernization hamper efficiency.

Investment in expanding and upgrading maritime facilities is vital for improving trade flow and supporting Iraq's economic growth. Strategic investments, including public-private partnerships and international cooperation, are essential to overcome these challenges and realize the sector's full potential in contributing to Iraq's economic recovery and growth.

Air Transport Activity

Iraq's air transport sector includes seven international airports and a total of 43 aircraft, of which 19 are currently out of service and 24 are operational. The number of passengers transported by Iraqi Airways, including both arrivals and departures, was 2,043,878 in 2022, a significant decrease from 3,968,020 passengers in 2018[57].

The sector faces several substantial challenges. National institutions struggle with limited material and financial resources, along with a lack of expertise required for effective management and operation in line with international standards. To overcome these obstacles, Iraq is working on adhering to international standards and passing the audits of ICAO and EASA.

National training institutions will be upgraded to meet international benchmarks and modernize air transport infrastructures. In conjunction with IFC, the modernization of Baghdad International Airport has just been awarded and is expected to be

[57] *National Development Plan 2024-2028*

operational in 2028. This modernization will be undertaken with regional and international private entities to rehabilitate and develop airport buildings, air freight operations, and purchase and maintain the national fleet of transport and cargo aircraft.

Airlines committed to net-zero carbon dioxide (CO2) emissions by 2050 at the 77th International Air Transport Association (IATA) Annual General Meeting in 2021, and member states of the International Civil Aviation Organization (ICAO) agreed to a long-term aspirational goal (LTAG) of net-zero CO2 emissions from aviation by 2050 in 2022. These commitments spring from the industry's conviction that it, and all forms of connectivity, are necessary for economic development. To achieve net-zero emissions, 65% of the total emissions reductions will in all probability need to be achieved using Sustainable Aviation Fuel, or SAF. Iraq's aviation sector should start introducing SAF gradually

Wastewater and waste:

Wastewater

Despite palpable improvement in sewage collection and treatment around main cities, the sewage system faces significant challenges, including a substantial deficit in treatment units and networks, particularly in city centers and districts with high population density, where current structures are struggling to cope with loads exceeding their design capacities. The main and sub-stations, sewage networks, and maintenance practices are outdated and inefficient, leading to leaks and impacting the water networks. Additionally, there are widespread violations of network connections by citizens, particularly concerning rainwater networks. Stormwater and wastewater flows are quite often not separated, and network planning is missing.

Baghdad city and surrounding areas host over 9 million inhabitants and is by far the largest city in the country. The harmful impacts of untreated wastewater discharged in the natural river systems have profound consequences in the Southern governorates. These negative impacts are only exacerbated by the consequences of climate change (water scarcity, prolonged droughts, and extreme temperatures). There is an urgent need to address the under-investment in this sector, not only around Baghdad but in each governorate. This will involve the rehabilitation and expansion of existing sewage stations, completion of ongoing projects, and implementation of new ones.

The government has started the implementation of a wastewater program in each governorate. The completion of these projects with a discharge water quality complying with international standards for irrigation reuse would have the dual benefit of improving and reducing environmental pollution and providing much-needed water for irrigation in times of drought.

The Mayoralty of Baghdad is tackling the issue seriously. Eight wastewater projects are already approved and are included in the CIP. Stormwater drainage is already separated from wastewater and would be a good source of water source diversification for water reuse projects. Moreover, the municipality is extending wastewater network to the neighboring suburbs under an additional 53 equipment and water lifting projects.

Additionally, factories and hospitals will be mandated to install their treatment units to process waste before discharging it into the sewage networks.

Investment priorities are wastewater treatment plants that combine with nature-based solutions and or closed storages and the effective management of industrial flows in high-density and peri-urban areas. The treatment technologies in this sector are

evolving rapidly and constantly so there is a need to strengthen the technical and operational capacity of the public institutions. This could be achieved by building strong partnerships with international private companies under design, build, and operate commercial arrangements that would enable a transfer of technology and capacity building during the commissioning phase before transferring assets.

Municipal waste

Effective waste management practices, including efficient collection, recycling, and disposal, are essential for improving environmental health and sustainability.

Continued investment in modernizing waste infrastructure in Iraq will enhance the sector's efficiency and capacity to handle growing waste volumes. Diversifying into waste-to-energy technologies and recycling industries can increase profitability and contribute to a circular economy. Additionally, addressing challenges related to regulatory enforcement and public awareness is crucial for mitigating the environmental and health impacts of inadequate waste management practices.

Iraq's waste management sector faces significant challenges, with waste generation estimated between 23 and 31,000 tons per day in urban areas, translating to over 11 million tons per year[58]. However, only about 20-30% of this waste is properly collected and disposed of, leaving large portions uncollected or improperly managed, leading to environmental and public health issues. Statistics further indicate that Iraq produces nearly 4 million tons of solid waste annually from residential sources alone or 1.4 kg per inhabitant per day[59], underscoring the pressing need for improved waste management practices in the country. These figures highlight the strain on existing infrastructure and the urgency for adopting more sustainable and efficient waste disposal methods . Recycling rates are extremely low, estimated at less than 5%, with most waste ending up in open dumpsites. The sector suffers from outdated infrastructure, insufficient funding, and a lack of comprehensive waste management policies, contributing to the inefficiencies and environmental degradation observed in many parts of the country.

The country has recognized the urgency to act in this matter, the projects presented under the CIP highlight the program of landfill closures and conversion of landfill gases to energy contributing to the reduction of harmful GHG emissions concurrently. Iraq is currently preparing a national waste management plan and an integrated waste database (quantity of waste, landfill sites, transfer stations, sorting and recycling plant) The law for the management of solid waste is currently being drafted.

For instance, NIC in collaboration with the Mayoralty of Baghdad has just awarded a waste-to-energy project for 3000 t to an Asian company making sure that 30% of Baghdad waste is safely recycled while also contributing to the diversification of energy sources and reducing GHG. Baghdad is currently working on a project of waste transfer to the existing Al Buaitha landfill to increase its capacity by 3000 tons. Al Buaitha Landfill is the only methane capture landfill currently working in Iraq.

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58 https://www.undp.org/iraq/stories/solid-waste-iraq-towards-clean-environment

59https://www.iasj.net/iasj/pdf/e454ae156ea47da4#:~:text=Statistics%20indicate%20that%20Iraq%20produces,and%20Others%20%5B16%5D.%E2%80%9D&text=population%20in%20Iraq.

2.4.3. Iraq's main economic sectors

This section will briefly analyze the oil and gas sector and the industrial sector, the two main economic actors of Iraq's economy.

Oil and Gas Sector

In terms of economic contribution to GDP, the oil and gas industry is the backbone of Iraq's economy. It accounts for approximately 60% of Iraq's GDP[60]. Furthermore, oil exports generate over 90% of government revenue and about 95% of the country's foreign exchange earnings. This heavy reliance on oil means that fluctuations in global oil prices can have a profound impact on Iraq's economic sustainability.

Looking ahead, Iraq possesses some of the largest proven oil reserves in the world, estimated at 145 billion barrels, making it the fifth-largest globally[61]. The country is also rich in natural gas, with proven reserves of around 3.5 trillion cubic meters.

In 2022, Iraq's oil sector produced an average of approximately 4.612 million barrels per day, with 81% of this production allocated for export, 15% for refineries, and 4% for power stations. In the gas sector, the production rate reached 3,012 Million standard Cubic feet per day, of which, 46% was burned, 53% was invested, and 41% was dry gas. During 2023, the gas reprocessed and captured increased to 62% and the gas burning proportion decreased to 38% according to the latest MoO communication. The total refining capacity of Iraqi refineries in 2022 was about 704 thousand barrels per day, compared to a design capacity of 1,028 thousand barrels per day. The average annual import value for key petroleum products was around $5.299 billion, with gasoline accounting for $3.874 billion, white oil for $159.3 million, and gas oil for $1.267 billion.

The sector faces the following challenges:

- **Infrastructure and Investment Needs:** Iraq's oil and gas infrastructure is outdated and in need of overdue substantial investments that were not performed during previous crises times. The country requires significant upgrades to its pipelines, refineries, and export terminals to sustain production and reduce environmental impacts. These investments are, however, beyond the national budgetary capacity of the country.

- **OPEC Compliance:** Iraq is a member of the OPEC and is subject to production quotas. These quotas are designed to stabilize global oil prices, but they can limit Iraq's ability to maximize its oil revenues, particularly during times of financial need.

- **Natural Gas Development:** Iraq has been making efforts to develop its natural gas sector, particularly by capturing associated gas that is currently flared during oil production. This would not only help in reducing environmental impacts but also meet domestic energy needs and potentially increase gas exports.

60 *https://www.opec.org/opec_web/en/about_us/164.htm*
61 *Ibidem*

- **Energy Transition:** Globally, there is a shift towards renewable energy sources, which poses a long-term challenge for Iraq's oil-dependent economy. A Just Transition is the optimal path for the country. The country needs to diversify its economy to reduce reliance on oil and gas, but this transition requires gradual steps given the recent stability of the country.

The future of Iraq's oil and gas industry is heavily tied to global oil prices, political stability, and the ability to attract foreign investments.

While the oil and gas industry will continue to be a dominant economic force in Iraq's economy, the country faces the dual challenge of modernizing its oil and gas infrastructure and diversifying its economy to ensure long-term economic stability while transitioning to low-carbon energy sources.

Addressing infrastructure needs, improving governance, and gradually shifting towards a more diversified economic base will be essential for Iraq's long-term economic sustainability.

The transition to low-carbon energies requires a considerable investment in new technologies, the decommissioning of outdated infrastructures, and the supply of reliable energy to its domestic needs with diminishing revenues.

The sector plans to rehabilitate and develop pipeline networks for dry and liquid gas to support the anticipated increase in production during this period. Furthermore, achieving self-sufficiency and expanding refining capacity to 1,250 thousand barrels per day will involve modernizing refineries, activating private investment, and building new refineries. Enhancing the storage capacity of petroleum products to 10.27 million barrels and addressing environmental impacts from oil and gas activities are key objectives during this transitional period. This includes adhering to international environmental standards, raising awareness, and developing comprehensive environmental monitoring systems.

Performance targets for 2024-2028 include increasing crude oil production while adhering to international environment standards, expanding export capacities to 5.25 million barrels per day, and raising crude oil storage capacities to 40.1 million barrels. Natural gas production targets are set at 4,250 million cubic meters per day, with increased refining capacities and improved storage for petroleum derivatives.

The sector has already started to implement gas capture in Basra and Halfalyia. This is a considerable amount of GHG emissions captured, that are no longer flared to the atmosphere but reprocessed to be used for national electricity generation. This allows the production of electricity from a low-carbon source instead of the use of crude oil. The projects have the dual benefit of energy efficiency and emissions avoidance and are an appropriate energy transition for the country.

Industrial Sector

The industrial sector in Iraq is dominated by the cement, steel, mining, and manufacturing industries.

Iraq has 22 cement factories with a total production capacity of almost 30 million tons per year[62]. For example, the Iraqi Ministry of Industry and Minerals has called for a significant increase in cement production to 52 million tons per year to meet the rising demand of the country's construction industry. IFC is providing a financing package of USD 130 Million in long-term debt to Al-Douh, a major Iraqi cement manufacturer, which will enable the company to expand its cement production capacity to three million tons by the end of 2025.[63]

Crude steel production in Iraq is relatively small, with only a few operational factories. The primary producer is the State Company for Iron and Steel, which has been working on modernizing its facilities. Iraq's steel production capacity is limited, with production estimated at around 3400 tons per year.

The sector faces numerous challenges. Among the most important ones is a difficult trading environment, burdened by high costs, complex administrative procedures, and numerous regulatory approvals that hinder industrial activities and a lack of transparency. Public companies are dominant and require reform to improve economic performance, modernize equipment, and improve productivity. The protection of Iraqi products is inadequate, under harmful trade practices. Additionally, numerous laws and regulations obstruct industrial development, and the Consumer Protection Law and Competition and Anti-Monopoly Law are not enforced effectively. Small and medium enterprises (SMEs) face significant obstacles, including reduced government support, a deteriorating business environment, bureaucratic delays, and difficulties accessing finances.

The lack of specialized training centers and incubators for business development further hampers progress. The industrial cities and zones project suffers from weak funding and oversight. There is also insufficient industrial financing, with the banking sector unable to meet investment needs, leading to a reluctance among investors to commit to private industrial projects. The current institutional framework managing the industrial sector is also problematic, with market distortions, weak competitiveness, and insufficient integration with global value chains.

To address these challenges, several objectives have been outlined in the Iraqi National Plan 2024-2028:

- promote sustainable manufacturing practices and address climate change by supporting manufacturing and industrial activities aligned with sustainable development goals, strengthening environmental governance, adapting to climate change, reducing greenhouse gas emissions, and increasing the number of green jobs in the industrial sector.
- enhance the role of the private sector in industrial production fostering public-private partnerships by supporting economic policies to transition to a market economy, gradually removing obstacles related to finance and legal issues, implementing development plans and strategies, and supporting the creation of effective professional organizations within the industrial sector.
- create an attractive environment for foreign investment in the manufacturing and mining industries, excluding oil. This involves establishing major industrial projects with public-private partnerships, investing in high-value industries such

62 *Global Ideal Intelligence Research and Consulting (http://giirac.com/)*
63 *https://www.agbi.com/manufacturing/2024/01/iraq-cement-company-gets-130m-to-double-production/*

as petrochemicals and metals, encouraging strategic partnerships with competent investors, and fostering economic partnerships between national and foreign industrial companies.

- reduce the number of workers in the public sector and shift the surplus to the private sector. This goal includes restructuring loss-making industrial establishments, providing opportunities for public-private partnerships in viable projects, and offering incentives for early retirement in underperforming industrial establishments.

Land Use Management and Forestry

Iraq has experienced a significant transformation from rural to urban areas, with urbanization accelerating over the past decades. The urban population increased from around 50% in the 1980s to over 70% today, driven by internal migration, economic opportunities in cities, and insecurity-related displacement. This rapid urbanization has led to the conversion of rural and forested lands into urban areas, exacerbating deforestation and land degradation. Iraq's forest cover is minimal, estimated at less than 2%[64] of the total land area, primarily concentrated in the northern mountainous regions. The conversion of forests to agricultural land and urban areas has significantly reduced the country's natural forest resources, contributing to increased soil erosion, loss of biodiversity, and challenges in carbon sequestration.

The economic outlook for Iraq's land use change and forestry sector is challenging but holds potential for improvement through sustainable management practices and reforestation or afforestation initiatives. Rehabilitating degraded lands, restoring forests, and implementing sustainable land management practices are essential for enhancing the sector's contribution to the economy. These efforts can create jobs, promote rural development, and improve food security by increasing agricultural productivity on reclaimed lands.

These efforts would be facilitated by the preparation of a land-use planning that would ensure vital key wetlands and forests are not encroached on through intensive agriculture or uncontrolled urbanization Additionally, Iraq's participation in international carbon markets through afforestation and reforestation projects could provide new revenue streams, supporting the country's broader economic diversification goals.

2.4.4. Long Term Climate change impacts on the economy of Iraq

Recent years have seen temperatures soar above 55°C, a 50% decrease in precipitation, higher evaporation rates, and more frequent extreme weather events like dust storms and droughts. These extreme events have increased rural displacement and socio-ecological vulnerability, accelerated land degradation and salinity of agricultural lands, and fragile ecosystems.

The long-term impacts of climate change on the economy and development of the country will need to be analyzed and modeled more specifically for the country. However, international studies are flourishing to try to better capture the impacts of the energy transition. particularly affecting agriculture, which consumes 60-80% of Iraq's water[65]. This increasing water scarcity threatens the economy and population, leading to loss of livelihoods, rising poverty, and increased social vulnerability[66].

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64 Iraq's sixth national report to the Convention on Biological Diversity

65https://www.actioncontrelafaim.org/en/headline/farmers-in-southern-iraq-hit-by-water-crisis/#:~:text=alone%20accounts%20for-,60%2D80%25,-of%20total%20use

66 https://unfccc.int/sites/default/files/NDC/2022-06/Iraq%20NDC%20Document.docx

The table below summarizes an important econometric study using regression analysis. Cross-section data for the hot and least developed countries including Iraq was utilized to estimate the impact of temperature increase on important macroeconomic variables including real per capita income, Agriculture, manufacturing, services, crop production, Investment, imports, labor input, HDI, and labor productivity (none-exposed to heat and exposed to heat). The summarized regression results show that the negative effect of temperature on output in countries with hot climates like Iraq runs through reduced investment, depressed labor productivity, poorer human health, and lower agricultural and industrial output. These results show that hot low-income countries suffer the largest costs. In a median, aggregate output is about 2 percent lower, and investment is about 10 percent lower seven years after a 1 degree increase in average annual temperature.

Table 10: Estimates of the Impact of a 1°C Increase in Temperature on Productivity, Capital, and Labor[67]

Macroeconomics Variables	% change short and medium-term
Real per capita output	-1.2
Agriculture	–1.747
Manufacturing	–3.889
Services	0.031
Crop Production	–0.935
Capital Input (Investment)	–10.158
Imports	–7.180
Labor Input (Infant Mortality)	2.027
HDI	–0.792
Labor Productivity (Non-Heat Exposed)	–1.008
Labor Productivity (Heat Exposed)	–3.675

In Iraq specifically, the exposure of GDP to heatwaves will substantially rise. All models project an increase in GDP exposure to heatwaves, though the magnitude of the increase is subject to high modeling uncertainty and rises the further one looks into the future. By 2030, models project between 15.4 and 35.1 % of the national GDP to be exposed to heatwaves under RCP2.6, and between 12.5 and 27.4 % under RCP6.0. By 2050, exposure of GDP to heat waves is very likely to increase to between 20.1 and 45.2% under RCP2.6 and between 21.7 and 43.3% under RCP6.0 (very likely range). Under the low-emissions scenario, the multi-model median stabilizes after 2050 but with a wide very likely range from 20.1 to 49.8 % between 2050 and 2080. In contrast, under RCP6.0, GDP exposure to heatwaves will drastically increase to between 28 and 54.1 % by 2080.

[67] *Sebastian Acevedo, Mico Mrkaic, Natalija Novta∗, Evgenia Pugacheva, Petia Topalova , 2020 The Effects of Weather Shocks on Economic Activity: What are the Channels of Impact? Journal of Macroeconomics*
https://weatheringrisk.org/sites/default/files/document/Climate_Risk_Profile_Iraq_8.pdf

This will increase the fragility of an economy already under politico-social constraints and very narrow fiscal conditions. The table in Annex 2 summarizes the main economic implications of climate change listed in the national policies.

SUMMARY:

Iraq is vulnerable to Climate Change: temperature and heat are already impacting everyday life with temperatures frequently exceeding 50 degrees, prolonged droughts, and a worrying reduction in renewable water quantities. Sand and dust storms are only worsening a difficult natural environment jeopardizing water and food security.

The economy of the country is relying heavily on mitigation sectors such as oil and gas, and industries and services while adaptation and non-oil sectors do not generate sufficiently revenues.

The country's economy is highly vulnerable to external market fluctuations while current fiscal space is limited. The energy transition for the period 2025 – 2030 requiring high upfront investments costs while revenues are reducing can only be linked to a stepwise economic diversification to be fair and just.

In this context, the fair and just energy transition can only occur through the modernization of the mitigation sectors to be energy efficient and introduce cleaner low-carbon with diversified renewable energies sources while strengthening the water and agriculture sectors so they become climate resilient and generate revenue.

2.5. Challenges and Opportunities in Climate Change Governance in Iraq

Climate change governance in Iraq faces significant challenges in addition to the obstacles the country is currently facing. Awareness and lack of funding for mitigation and adaptation efforts combined with a heavy reliance on fossil fuels for revenue generation impedes a smooth transition. However, opportunities also abound in Iraq as well: the human capital with a young generation and the diversity of natural resources are valuable assets the country can rely on. Technological advancements in energy efficiency, carbon capture, and renewable energies offer solutions for reducing emissions while diversifying the economy. Collaboration between governments, NGOs, and the private sector can overcome financial constraints and accelerate the transition to a low carbon economy and consolidate social stability and environmental benefits. By harnessing innovation and strengthening international cooperation, effective climate governance can turn the tide on this global challenge.

2.5.1. Economic & Social Challenges

The road to addressing climate change is not without its obstacles. Political and economic challenges can significantly hinder the implementation of effective climate policies. Understanding these challenges is crucial for developing strategies to overcome them and build a more sustainable future.

Economic Challenges

The country is heavily reliant on fossil fuel-based industries that are facing economic challenges in transitioning to renewable energy and reducing carbon emissions. Economic restructuring and diversification strategies to minimize the economic impacts of climate policies on mitigation sectors require a different timescale to put in place without harming vulnerable communities

The integration of climate risk in oil and gas companies (the most dominant revenue-generating sector), requires a thorough risk analysis including physical, market, operational, regulatory, reputational, subsidy, and resource depletion risks. Studies undertaken in Norway, a similar oil and gas-based country have shown that the transition in this sector requires stronger efforts, and a longer implementation period compared to other sectors (pharmaceutical, food, fertilizers, transportation, etc.). [68]

Moreover, outdated industries but also agriculture and water infrastructures required for the development of the economy require all high capital investments in addition to the energy transition of the mitigation sectors.

Climate policies address social equity concerns and ensure that vulnerable populations, such as low-income communities and marginalized groups, are not disproportionately affected by climate impacts or policy measures. Balancing economic growth with social inclusivity is a complex challenge in climate governance.

Additionally, addressing economic challenges involves leveraging innovative financing mechanisms, such as green bonds, climate funds, and public-private partnerships, to mobilize investments in renewable energy, energy efficiency, and climate-resilient infrastructure. These financial instruments not only attract private sector capital but also incentivize sustainable investments and technological innovations that drive economic growth and competitiveness.

Furthermore, strategic planning and long-term vision are crucial for navigating political and economic complexities in climate governance. Developing robust climate action plans, setting ambitious targets, and implementing transparent monitoring and reporting mechanisms build trust, accountability, and credibility among stakeholders. Integrating climate considerations into national development strategies, sectoral policies, and investment frameworks ensures coherence and alignment with broader socio-economic objectives.

Moreover, international cooperation and collaboration play a vital role in overcoming political and economic challenges. Engaging in global climate negotiations, participating in international partnerships, and sharing best practices facilitate knowledge exchange, capacity building, and resource mobilization. By leveraging collective action and learning from global experiences, countries can address common challenges, accelerate climate action, and achieve sustainable development goals.

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68 The Norwegian state's direct ownership of companies' climate-related risks, June 2017, Truscot's research

Social Challenges

Iraq is still dealing with the consequences of the aftermath of the Islamic State's violence that is leaving over 1 million people internally displaced[69] (Aug 2024), straining natural resources and exacerbating housing shortages in areas hosting the displaced populations but also the returning populations. This internal displacement contributes to social tensions and complicates efforts to reintegrate these individuals into the diverse cultural - ethnic communities, especially among communities in challenging climatic and socio - economic conditions. Indeed, livelihood and the decrease of revenues due to displacements or a return in climate affected areas impacts primarily vulnerable populations such as youth, women, elderly and population with disabilities. The contribution of these vulnerable populations to the economic growth of the country is improving slowly but much needed scale up in agricultural productivity, modernization of industries and innovation is required among all areas of the country to provide a continuous improvement of living standards.

2.5.2. Implementation challenges

Technical Barriers

Sector-specific technical barriers were described in detail in the previous chapters.

Iraq faces chronic data gaps related to climate monitoring and analysis. The Iraqi Meteorological Organization[70] is making progress in collecting and analyzing comprehensive climate data, but it is still not sufficient to provide a detailed and clear monitoring tool for informed decision-making and planning. There are gaps in historical precipitation and temperature data across Iraq, which are essential for accurately assessing climate trends and forecasting future impacts. The result is a reduced number of viable and bankable climate projects and inadequate technical capabilities in project design and implementation.

One of the objectives of the transitional CIP is to strengthen technical expertise, bridge technological gaps, and improve data collection and analysis capabilities which are imperative steps toward building a sustainable and climate-resilient future for Iraq.

Iraq has already started adjusting its economy to reduce its carbon footprint. Yet monitoring of GHG is crucially lacking, including lab equipment for analyses on the GHG producer side as well as on the authority side.

Furthermore, the transition to low carbon consumption requires adopting new technologies, new techniques and equipment, designing new processes, or rehabilitating and modernizing existing ones. This is crucially lacking in Iraq and is an excellent opportunity for international investors and economic diversification.

Implementing technological innovations for climate change mitigation and adaptation faces several challenges that need to be addressed for effective deployment and impact:

Cost and Affordability: One of the primary hurdles is the high cost associated with many clean technologies. For example, renewable energy systems like solar panels and wind turbines often require substantial upfront investments, making them

69 *IOM DTM – Aug 31.2024*
70 *https://www.agromet.gov.iq/*

financially inaccessible for some countries or sectors. This cost barrier limits the widespread adoption of these technologies without adequate financial support or incentives.

Technology Transfer: Access to advanced climate-friendly technologies can be limited, particularly for developing countries. Challenges in technology transfer, including issues related to intellectual property rights, knowledge sharing, and capacity building, hinder the equitable distribution and adoption of innovative solutions. Bridging this technology gap is crucial for ensuring global progress in climate action.

Scaling Up: While numerous innovative solutions exist, scaling them up to a level where they can have a meaningful impact on global emissions remains a significant challenge. This scaling-up process requires substantial investments, supportive policies, and collaboration among stakeholders, including governments, businesses, and research institutions. Overcoming barriers to scalability is essential for maximizing the benefits of climate technologies.

Integration and Compatibility: Integrating different technological solutions and ensuring their compatibility with existing infrastructure and systems pose technical challenges. Issues such as interoperability, technical standards, and regulatory frameworks need to be addressed to facilitate the seamless deployment and operation of climate technologies. Ensuring smooth integration is critical for optimizing the effectiveness and efficiency of these solutions.

Regulatory Barriers

Regulatory inconsistencies may complicate the implementation of the CIP. Climate change framework is fragmented, lacking cohesion across ministries and agencies. This disjointed approach hampers the integration of climate considerations across national policies and strategies.

Additionally, Iraq contends with inconsistent policies among government bodies, resulting in conflicting priorities regarding climate action. These discrepancies undermine efforts to streamline initiatives and allocate resources effectively, contributing to inefficiencies in addressing climate challenges. Moreover, substantial challenges in policies enforcement due to weak mechanisms and inadequate capacity are existing, further impeding the effective implementation of climate-related measures and initiatives.

Governance Barriers

Governance barriers hinder cohesive climate action and equitable resource allocation. Climate change is an overarching issue that requires effective coordination and cooperation between ministerial entities despite the perceived opposing interests and mandates. Cohesive climate action and equitable resource allocation are certainly a benefit that can be achieved with improved climate governance.

Policy Coordination: One of the significant challenges in climate change governance is the coordination of policies across different government ministries and agencies. Ensuring coherence and alignment of climate policies with broader national development goals can be challenging, especially in countries with complex governance structures. Climate considerations often also take a secondary importance to other national priorities like economic development and security, resulting in limited funding

and policy support for climate initiatives. Overcoming these challenges requires enhanced inter-ministerial collaboration and a concerted effort to elevate climate priorities within Iraq's broader national agenda.

Policy Consistency: Political transitions and changes in government can lead to inconsistencies in climate policies and strategies, affecting long-term planning and investment decisions. Maintaining policy consistency and continuity over time is essential for achieving meaningful progress in climate governance.

Complex Application Processes: Accessing funds from international climate finance institutions often involves intricate and time-consuming application processes. These processes typically require detailed project proposals, feasibility studies, and compliance with various environmental and social safeguards.

Policy Implementation: The overarching nature of climate change impacts and the slow onset when policies are implemented require a consistent political will and long-term commitment for the effective implementation climate policies. Political stability, long tern planning and alignment of priorities would enhance a smooth implementation of climate initiatives and accelerate progress toward climate goals.

International Cooperation: Climate change is a global issue that requires coordinated action at the international level. Political tensions, diplomatic challenges, and varying priorities among countries can impede effective international cooperation on climate issues, including financing, technology transfer, and capacity building.

Finally, decentralization issues could lead to disparities in climate adaptation and mitigation efforts between governorates that are following up on project implementation on the ground. These potential variations not only reflect differing capacities but also underscore unequal budget allocations dedicated to climate initiatives.

Financial Barriers

Budget constraints severely limit the country's ability to allocate resources toward specific environmental and climate change initiatives. The national budget does not earmark funds for environmental projects, nor does it specify climate challenges.

Financial Resources: One of the foremost economic challenges is the availability of adequate financial resources for climate action. Developing countries, including Iraq, often face budget constraints and limited access to climate finance, which hinders their ability to implement ambitious climate mitigation and adaptation projects.

Investment Barriers: The transition to a low-carbon economy requires significant investments in renewable energy, clean technologies, and climate-resilient infrastructure. However, barriers such as high upfront costs, lack of access to capital, and investment risks can deter private sector investment in climate projects.

The urgent implementation of financial sector reforms and modernization of Iraq's banking architecture are crucial steps to facilitate economic diversification and stimulate job creation. Currently, these reforms are hindered by significant barriers, including low financial access with only 19% of adults owning a bank account, highlighting an underutilized source of financing.

Figure 15: Key Constraints in the Iraqi Financial Sector[71]

Source: World Bank Staff.

A major challenge lies in the banking sector's structure dominated by undercapitalized state-owned banks, which primarily fund public entities and state-owned enterprises, while the private commercial banking sector is limited in capacity and focuses on foreign exchange revenues. The nascent non-banking financial sector further complicates matters, with underdeveloped capital markets, unregulated Micro Finance Institutions, and a fledgling insurance sector. Addressing these issues through institutional reforms in state-owned banks and promoting digital financial services is essential to enhance financial intermediation, boost financial inclusion, and regain public trust in Iraq's financial sector. These reforms are critical to mobilize Iraq's economic potential and address pressing development challenges effectively.

Figure 16: Social Gaps in Financial Access[72]

[71] https://documents1.worldbank.org/curated/en/099453507282342287/pdf/IDU0b9f5dc440cf2f047f9098e202d3dab0861c7.pdf
[72] Ibidem

Also, Iraq struggles with access to climate finance despite international pledges. The country has received less than 10% of the promised funds from the Green Climate Fund (GCF), citing difficulties related to the quality of project proposals and the complexity of application processes. These financial challenges underscore the urgent need for enhanced capacity building and streamlined processes to secure necessary funds and effectively implement climate-resilient projects across Iraq. With the regulatory barriers, the complexities involved in navigating bureaucratic processes and securing funding escalate transaction costs associated with climate initiatives.

Hence, the financial barriers can be explained by the perceived limited returns from climate investments, dissuading potential investors and stakeholders from committing resources. The focus on short-term financial outcomes often outweighs considerations of long-term environmental benefits, creating a reluctance to allocate funds toward climate initiatives. Foreign direct investment (FDI) refers to direct investment equity flows in the economy, encompassing the sum of equity capital, reinvestment of earnings, and other capital, involving cross-border investment.

Figure 17: FDI and External Financial Resources - Iraq[73]

The negative impact of FDI on the country's GDP is slowly improving. This demonstrates an increasing confidence in Iraq's economic prospects. Despite ongoing challenges such as heavy dependence on oil revenues, energy shortages, and bureaucratic complexities, international companies have recognized positive developments, illustrated by sustained foreign engagement in Iraq's power infrastructure[74].

Gaining more regional competitiveness, improving on unemployment, trade, and corruption indicators would improve the overall 'doing business' environment and help improve the mid and short-term prospects rating of Iraq by country rating agencies.

The Government of Iraq's agenda aims to bolster energy security, diversify the economy, increase the private sector's involvement in sectors like natural gas and manufacturing, and tackle corruption head-on. Internationally, Iraq is actively re-engaging with the global community by pursuing membership in the World Trade Organization (WTO) and joining the European

73 https://unctadstat.unctad.org/CountryProfile/GeneralProfile/en-GB/368/index.html
74 https://www.siemens-energy.com/global/en/home/stories/reconstruction-of-iraqs-energy-infrastructure.html

Bank for Reconstruction and Development (EBRD). Regionally, Iraq is enhancing its connections, exemplified by collaborations such as an electricity grid project with the Gulf Cooperation Council (GCC). Furthermore, ambitious infrastructure initiatives like the Development Road, which will connect Iraq to Turkey and Europe, underscore Iraq's strategic ambitions for development.

In addressing these financial barriers, the country intends with the CIP to incentivize investment, mitigate risks, and foster a conducive environment, for example for Public-Private Partnerships (PPPs) in renewable energy waste or transportation projects. By enhancing financial mechanisms, improving risk management frameworks, and promoting supportive policies, Iraq's CIP will help unlock greater financial resources and accelerate progress towards achieving its climate goals for a secure and sustainable future.

2.5.3. Climate Change Governance Opportunities

Opportunities in Technological Innovations

Despite the challenges, technological innovations offer promising opportunities for addressing climate change and driving sustainable development:

Energy Efficiency: Improving energy efficiency across sectors, including buildings, transportation, and industry, offers cost-effective opportunities for reducing greenhouse gas emissions. Technologies such as energy-efficient appliances, smart meters, building automation systems, and sustainable urban planning can lead to substantial energy savings and environmental benefits.

Digital Technologies: The integration of digital technologies, including data analytics, artificial intelligence, and Internet of Things (IoT) devices, can optimize resource management, improve decision-making processes, and enhance climate monitoring and early warning systems. Leveraging digital technologies can lead to more efficient and effective climate actions, enabling real-time data-driven solutions and adaptive strategies. These technologies can contribute more specifically to improved efficiency and productivity in the agriculture and water sectors (smart metering, digitized monitoring, digitized fertilizer or water supply etc.)

Nature-Based Solutions: Nature-based solutions, such as afforestation, reforestation, and ecosystem restoration, harness the power of nature to sequester carbon, enhance biodiversity, and build climate resilience. Promoting nature-based solutions through policies, incentives, and community engagement can create multiple co-benefits for ecosystems and local communities while contributing to climate goals.

Circular Economy: Transitioning to a circular economy model, where resources are used more efficiently, waste is minimized, and products are designed for longevity and recyclability, presents opportunities for reducing emissions and resource depletion. Innovative business models, technologies, and policy frameworks that support circularity can drive sustainable consumption and production patterns, contributing to a more resilient and resource-efficient economy.

Renewable Energy: The rapid advancement of renewable energy technologies, such as solar photovoltaics, wind turbines, and hydroelectric power, presents significant opportunities for decarbonizing the energy sector. Investments in renewable energy

infrastructure, grid modernization, and energy storage solutions can reduce reliance on fossil fuels and contribute to achieving climate mitigation goals.

Carbon Capture and Storage (CCS): CCS technologies, which capture carbon dioxide emissions from power plants and industrial processes and store them underground, have the potential to significantly reduce emissions from fossil fuel sources. Continued investments in CCS research, development, and deployment can play a crucial role in achieving emission reduction targets and transitioning to a low-carbon economy.

Climate Change Governance Opportunities in Iraq

Iraq faces numerous challenges in its climate change governance efforts. Additionally, Iraq's reliance on oil revenues, while economically advantageous so far, presents challenges in transitioning to a low-carbon economy. Moreover, Iraq faces socio-economic challenges, including poverty, unemployment, and infrastructure deficits, which intersect with climate impacts, such as water scarcity and extreme weather events, amplifying vulnerabilities, especially among marginalized communities.

Despite these challenges, Iraq also possesses significant opportunities for climate change governance. The country's rich renewable energy potential, particularly in solar and wind resources, presents opportunities for diversifying the energy mix and reducing greenhouse gas emissions. Investments in low-carbon energy infrastructure, coupled with policies that incentivize energy efficiency measures and renewable energy deployment, can enhance energy security, create job opportunities, and mitigate climate risks for the near future. Furthermore, Iraq's strategic geographical location, with access to international waterways and regional cooperation frameworks, positions the country to engage in transboundary water management and climate adaptation strategies. Collaborative efforts with neighboring countries can foster knowledge sharing, joint initiatives, and resource mobilization for climate resilience building.

Moreover, Iraq's vibrant civil society and non-governmental organizations (NGOs) play a crucial role in climate governance by advocating for environmental protection, community engagement, and policy reforms. NGOs contribute to raising public awareness, conducting research on climate impacts, and implementing grassroots projects that promote sustainable practices and resilience-building measures. Their involvement strengthens participatory governance, fosters innovation, and facilitates multi-stakeholder partnerships, essential for addressing complex climate challenges. Additionally, Iraq's engagement in international climate forums, such as the United Nations Framework Convention on Climate Change (UNFCCC), provides avenues for accessing climate finance, technology transfer, and capacity-building support from the global community.

Furthermore, digital technologies offer opportunities for enhancing climate monitoring, early warning systems, and data-driven decision-making. Investments in climate data infrastructure, remote sensing technologies, and digital platforms can improve climate resilience, facilitate adaptive planning, and enhance disaster risk management. Leveraging digital innovations, such as blockchain for transparent climate finance mechanisms or artificial intelligence for climate modeling and prediction, can unlock new avenues for climate governance effectiveness. Additionally, fostering climate entrepreneurship, innovation hubs, and green

financing mechanisms can mobilize private sector investments, promote green growth, and stimulate green job creation, contributing to sustainable economic development.

Financial Instruments Opportunities

Given the many challenges facing the country in its economic diversification, energy transition, and sustainable development ambitions, there is a clear need to also diversify finance sources and instruments.

Blended Finance: Combining public and private finance through blended finance mechanisms can leverage additional resources and share risks. This approach is particularly effective in attracting private sector investment in climate-related projects.

Impact investing Impact investing involves making investments to help create beneficial social or environmental effects while also generating financial gains. This investment strategy can involve varying types of asset classes such as stocks, bonds, mutual funds, or microloans. The point of impact investing is to use money and investment capital for positive social results.

Innovative Financing Mechanisms: New and innovative financing mechanisms, such as green bonds, carbon pricing, and climate risk insurance, provide additional avenues for mobilizing climate finance. Green bonds, for example, have seen significant growth, with global issuances surpassing USD 250 billion annually.

Emphasize Transparency and Accountability:

Ensuring transparency and accountability in these financial mechanisms is crucial. This means tracking how funds are used, measuring the impact of projects, and guaranteeing resources reach their intended beneficiaries. Only through transparent and accountable management can we ensure these funds deliver on their vital climate goals for Iraq. The Climate Public Expenditure and Institutional Review (CPEIR) of Iraq[75] provides already an analysis of the baseline and trends of adaptation-relevant expenditures for the Iraqi federal budget along key sectors that can be used to inform budgeting and spending decisions to address climate change in the future. The CPEIR recommends implementing a Medium-Term Expenditure Framework (MTEF) within national budgeting and planning processes. As previously identified in the Public Financial Management (PFM) review in Iraq, adopting an MTEF will lead to a specific emphasis on extending it to encompass expenditures related to climate adaptation.

For the successful implementation of the CIP, it is crucial to overcome a range of barriers that span technical, regulatory, governance, and financial dimensions. These challenges include limited expertise in climate change adaptation, significant gaps in renewable energy infrastructure, fragmented regulatory frameworks, coordination difficulties among government ministries, and insufficient financial resources for environmental initiatives. Addressing these issues is vital not only to fulfill Iraq's climate commitments but also to protect its natural resources and promote inclusive, resilient economic growth nationwide. Furthermore, technical and financial barriers emerged as a key concern during stakeholder consultations and technical committee discussions. This limited technical capacity hampers the development and execution of policies critical for both mitigating climate risks and adapting to evolving climate and environmental challenges.

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75 Climate Public Expenditure and Institutional Review (CPEIR) Iraq. A Report Developed Collaboratively between UNEP and the Ministry of Environment (Climate Change Center) funded by the Green Climate Fund (GCF) under the Iraq National Adaptation Plan (NAP), 2023.

2.5.4. Sustainable Development Goals and Economic Diversification Opportunities

Iraq faces the complex challenge of achieving economic prosperity while navigating the harsh realities of climate change and resource scarcity, a country that is just recovering from decades of conflicts and fragilities. The UN's Sustainable Development Goals (SDGs) offer a valuable framework for addressing these interconnected issues[76]. By aligning economic reforms with SDG achievements and climate change requirements, Iraq will build a more resilient, low-carbon sustainable future.

Aligning SDGs achievements can catalyze development: Economic reform goes beyond diversification. Integrating sustainable practices across all industries is crucial. By fostering innovation and a green economy, Iraq can achieve long-term economic growth that doesn't come at the expense of the environment or future generations, aligning with the UN's vision for sustainable development in Iraq.

The NDP 2024-2028 recently published considers the interactions between SDG indicators and the country's social and economic development. The SDG latest report (2024) highlights for each indicator the progress achieved in the last three years and provides additional information on opportunities to be seized in the upcoming years for investment and project implementation.

Diversifying the economy spreads the risk and fosters long-term stability. To bolster economic growth and diversification, building a more shock-resilient economy and society, the diversification of energy sources is required.

The UNDP Stimulus 2023 as shown in the graph above represents the area that can be bolstered in the upcoming years to scale up economic diversification while protecting recent hardly earned social cohesion and inhibit environmental degradation.

The overall SDG performance of a country might have a spillover effect on neighboring countries. The geographic position of Iraq and current performance show a trend towards a positive impact overall.

Figure 18: SDG dashboards and trends (2023)[77]

[76] https://sdgs.un.org/topics/climate-action-synergies
[77] https://sdgtransformationcenter.org/reports/sustainable-development-report-2023

A detailed description of the performance for each sub-indicator within the 17 SDG is in Annex 1.

Key SDG indicators related to adaptation and mitigation sectors that can be bolstered through the CIP are:

SDG2	Sustainable nitrogen management in the agriculture sector
	Death rate attributable to household air pollution and ambient air pollution
	Death rate due to cardiovascular disease, cancer, diabetes, or chronic respiratory disease
SDG6	Anthropogenic wastewater receiving treatment
SDG7	CO2 emission from fuel combustion per total electricity output
	Renewable energy share in total final consumption
SDG9	Expenditure on research and development
SDG11	Proportion of urban population living in slums
	Annual mean concentration of pm 2,5 (ug/m3)
	Access to improved water source, piped
	Population with convenient access to public transport in cities
SDG13	Climate Action
SDG14	Fish caught by trawling or dredging
SDG15	Mean area that is protected in terrestrial sites important to biodiversity
	Mean area that is protected in freshwater sites important to biodiversity
	Red List index of species survival

Embracing the SDGs as a guiding principle and seeking international cooperation and public-private partnerships will create momentum for Iraq's Economic Reform and facilitate resources and expertise mobilization. For instance, the Iraq Economic Contact Group, comprising G7 nations, the EU, and the World Bank, commits to supporting Iraq's comprehensive and ambitious reform agenda for sustainable and inclusive economic development[78].

As highlighted in the NDP 2024-2028, key to the economic diversification is the mobilization of the private sector.

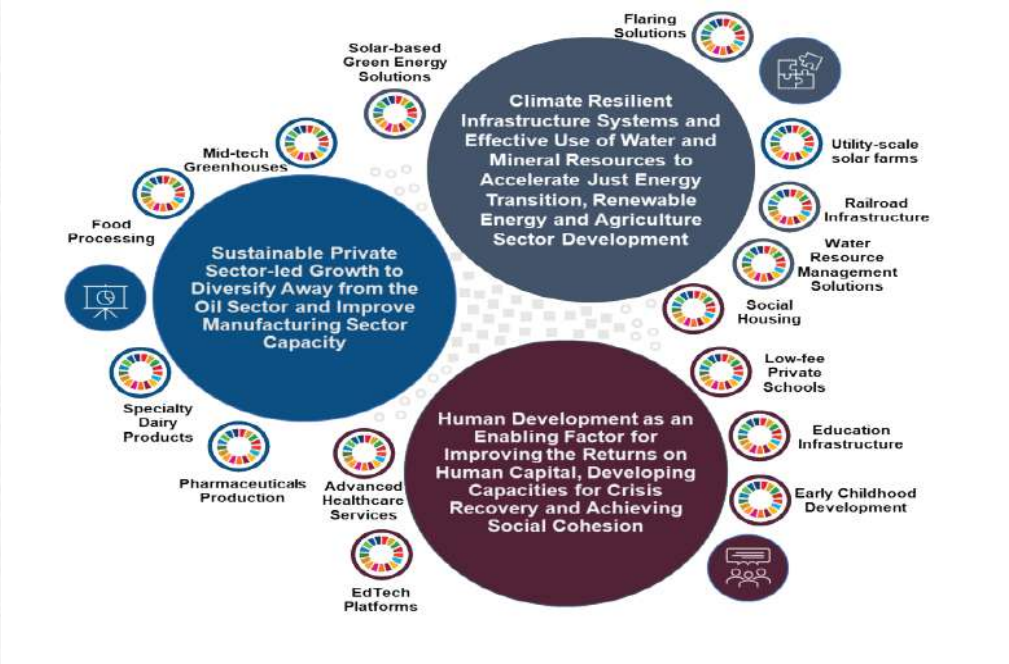
The SDG Investor Map (2024) is a unified methodology prepared by UNDP Iraq in collaboration with UNDP's Istanbul International Centre for Private Sector Development (IICPSD) and the Ministry of Planning (MoP). The map reviewed the intersection of sustainable development needs and public policy priorities, to select the sector as well as its importance to provide critical impact-driven intervention areas for the private sector. The Iraq SDG Investor Map identifies ten Investment Opportunity Areas (IOAs) with business and impact qualifications aligned with the four business criteria (fundamentally marketable, specific, broad or broad enough, and significant market position) and impact management criteria (do no harm, stakeholder relevance, and

78 https://ambbaghdad.esteri.it/en/news/dall_ambasciata/2023/12/statement-of-the-iraq-economic-contact-group-of-the-g7-european-union-and-world-bank-december-2023/
https://www.worldbank.org/en/country/iraq/overview

contribute to development solutions). In addition to these vital private sector investment areas, it also looks at emerging investment opportunity areas that are distinguished from investment opportunities (IOAs) due to the absence of a standard or proven business model policy. The Iraq SDG Investor Map identifies three emerging agreements that speak to a strong national development need, are part of public policy but still need to be proven in the market.

Figure 19 illustrates the concept of emerging IOAs in terms of classifying different influential business models in the country.

Figure 19: Investment Opportunities Areas in Iraq[79]



More specifically identified investment opportunities necessary for upscaling of sustainable development in conjunction with the private sector are:

- Food processing
- Mid-tech greenhouses
- Specialty dairy products
- EdTech platforms
- Low-fee private schools
- Education Infrastructure
- Utility-scale solar farms
- Solar-based green energy solutions
- Railroad infrastructure
- Pharmaceuticals production

Emerging investment opportunities are:

- Social Housing
- Water resources management solutions
- Flaring solutions
- Early childhood development
- Advanced healthcare services

79 Iraq | Private Finance for the SDGs

2.6. Economic Costs and Benefits of Transformative Actions

The Iraq CIP aims to prepare the country for the impacts of climate change on the economy, by investing in adaptation practices and climate-proof infrastructure. This is expected to bring significant co-benefits in the different sectors of the Iraqi economy.

The economic costs and benefits listed in the following sections are estimates and may vary depending on the specific project and implementation details. The estimates are based on information gathered from national official publications such as the National Development Plans (NDP), The SDG Investor Map (2024), Nationally Determined Contribution (NDC), National Adaptation Plan (NAP), Nationally Appropriate Mitigation Actions (NAMA) Strategy and Iraq Vision 2030. However, projections data for climate measures not yet implemented in Iraq rely on international data and scenario projections in similar economies or countries facing similar challenges.

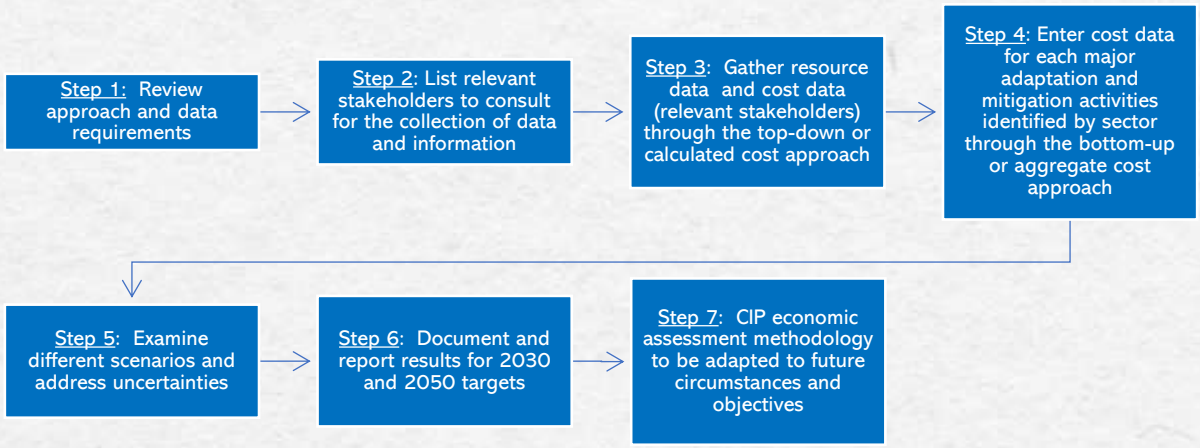
The expected economic benefits were calculated based on the ongoing rate of return on investment which ranges between 10% and 20% for the life span of the project. This dynamic was strengthened by clearly identifying the actors and establishing communication channels between the different stakeholders.

As indicated above, the implementation of the CIP will require the appropriate allocation and mobilization of resources, based on sustainable and flexible CIP costing. This mapping of necessary expenditures is a process that must be addressed through two complementary approaches:

- A top-down approach, which consists in estimating the cost of each one of the activities of the CIP to identify the cost associated with each mitigation and adaptation activities. This approach allows for a mid-to-long-term estimation of the CIP costs.
- A bottom-up approach, based on the input of sectoral actors who estimate their financing needs to achieve the CIP's objectives for climate change mitigation and adaptation. They were based on case studies, examples of best practices or simply on an agency's annual budget. This approach allowed for a short-term estimation of the CIP costing.

A combination of these two approaches allowed for better coordination and coherence between policy decisions and budget allocation while facilitating the monitoring of expenditure. This combined methodology is summarized by the following figure:

Figure 20: Overview of the methodology steps (Authors flowchart)



The section presents the methodology for CIP economic assessment, with regards to the implementation of the targeted adaptation and mitigation activities.

2.6.1. Water management

To address the challenges posed by climate change on Iraq's water resources, a series of adaptation actions have been proposed, each with its own set of expected economic costs and benefits.

Table 11:Water Resource Adaptation Actions in Iraq: Costs and Benefits over 5 years[80]

Adaptation Action	Expected Economic Costs	Expected Economic Benefits
Improved Water Management:		
Implementing precision irrigation techniques (e.g., drip irrigation) to reduce water waste in agriculture (highest water user). Modernizing water delivery systems to minimize leakage and evaporation losses in canals. Promoting water conservation practices in households and industries.	High upfront costs for infrastructure upgrades and technology adoption. Training for farmers on new techniques. Infrastructure investment: USD 500 million to USD 1 billion. Training and implementation: USD 100 million. Resettlement programs: USD 500 million. Community support services: USD 100 million annually.	Increased water availability for all sectors (agriculture, industry, domestic). Reduced pumping costs for farmers. Improved agricultural productivity (potential for higher crop yields). Potential for job creation in water management and conservation sectors. Reduced social tensions and conflicts: Social stability. Economic productivity of resettled communities: USD 300 million annually. Enhanced social cohesion and resilience
Investing in Water Storage:		
Building new small and deep dams and reservoirs to capture and store excess water during wet seasons for use during dry periods. Restoring and rehabilitating existing dams and canals to improve efficiency and storage capacity Building closed reservoirs at community levels[81]	Very high upfront costs for dam construction and rehabilitation. Ongoing maintenance costs. Infrastructure upgrades: USD 1.5 billion. Maintenance: USD 100 million annually. Reservoir and wetland projects: USD 800 million. Rainwater harvesting systems: USD 150 million. Stormwater Capture small <1.5 thousands Acre Foot. the cost is $1061/AF Stormwater Capture large 6.5-8.1 thousand-Acre Foot. The cost is $626/AF Infrastructure and development at community levels: $ 200 million. Maintenance: $ 20 million annually.	Increased water security, especially during droughts. Reduced water scarcity and salinization risks. Potential for generating renewable hydropower. Increased water availability: USD 1 billion annually. Improved agricultural yields: USD 800 million annually. Enhanced flood control and groundwater recharge. Improved water delivery and quality: USD 1 billion in economic savings. Enhanced reliability of water supply for 5 million people. Prevention of infrastructure failure costs: USD 500 million annually. Improved water storage and access, reduced vulnerability to droughts, enhanced agricultural productivity, and community resilience: USD 150 million annually.
Desalination Plants		
Constructing desalination plants along the coast to treat seawater and provide a new source of freshwater.	Extremely high upfront and operational costs for desalination plants and energy consumption. Environmental concerns regarding brine disposal. Desalination plants: USD 2 billion.	Increased water availability for drinking, irrigation, and industry, especially in southern Iraq. Preservation of agricultural lands: USD 1.2 billion annually. Increased availability of potable water: USD 500 million annually. Protection of ecosystems and biodiversity: Invaluable ecological benefits.

[80] The economic costs and benefits listed are estimates and may vary depending on the specific project and implementation details. Some adaptation actions, like improved water management, can offer both economic and social benefits (e.g., improved public health from access to clean water). International cooperation and public-private partnerships can help finance these adaptation actions and share the financial burden.

[81] https://sitesproject.org/wp-content/uploads/2024/05/Sites-Overview-English.pdf

Protecting Wetlands:		
Implementing restoration projects to improve water flow and management in the Mesopotamian marshes. Promoting sustainable practices for communities living in and around the marshes to ensure their long-term conservation.	High costs for marsh restoration projects and ongoing management efforts. Restoration projects: USD 300 million. Ongoing conservation efforts: USD 50 million annually.	Preserved biodiversity and ecosystem services provided by the marshes (habitat for fish and birds, flood control, water filtration). Sustained livelihoods for communities dependent on the marshes for fishing and grazing. Potential for eco-tourism development. Preservation of biodiversity: Invaluable ecological and cultural benefits. Support for local livelihoods: USD 200 million annually from fishing and tourism. Enhanced natural water filtration and flood mitigation.
Freshwater Management		
Implement measures to prevent saltwater intrusion and manage freshwater resources.	Infrastructure and management costs: USD 500 million. Maintenance costs: USD 50 million annually. These costs reflect the investments needed for infrastructure to manage freshwater resources and prevent saltwater intrusion, along with the ongoing operational and maintenance expenses required to ensure long-term sustainability[82].	Improved water quality and access, reduced vulnerability, and to prevent saltwater intrusions, enhanced agricultural productivity, and community resilience: USD 300 million

The total expected economic costs for implementing these adaptation actions are approximately USD 7.15 billion. Implementing these adaptation actions will result in significant economic benefits for Iraq, totaling approximately USD 39.7 billion over 5 years. Improved water management and efficiency can enhance agricultural productivity and reduce water bills while upgrading and maintaining water infrastructure will ensure reliable water delivery and prevent costly infrastructure failures. Combating salinization and enhancing water storage capacity will preserve agricultural lands, increase potable water availability, and improve agricultural yields. Drought-resilient agricultural practices will stabilize crop yields and boost food security. Improving water quality will lead to substantial healthcare savings and environmental benefits. Restoring wetlands will support biodiversity, local livelihoods, and natural water filtration. Addressing displacement and social tensions will enhance social stability and economic productivity. Collectively, these measures will secure Iraq's water resources, promote sustainable development, and bolster economic resilience against the impacts of climate change.

More specific projects to consider in the upcoming years that could increase the country's resilience against water scarcity are suggested below:

- Artificially increasing the recharge rate of groundwater aquifers
- Promoting community-based water management
- Developing underground water storage options
- Deploying nature-based solutions to improve water replenishment and storage

[82] *https://academic.oup.com/bioscience/article/69/5/368/5487218?login=false; https://link.springer.com/article/10.1007/s10040-022-02575-5*

2.6.2. Agriculture, Forestry, and Other Land Use (AFOLU)

The AFOLU sector is pivotal to Iraq's economy and environmental sustainability. This sector encompasses agriculture, forestry, and land use changes, all of which are critical for food security, livelihoods, and climate resilience. However, challenges such as deforestation, land degradation, and inefficient agricultural practices hinder the sector's potential. Strategic investments in sustainable practices, reforestation, and modern agricultural technologies are essential to improve productivity, mitigate environmental impacts, and enhance the economic resilience of the AFOLU sector.

Agriculture

The following table outlines a series of agricultural adaptation actions for Iraq, detailing the expected economic costs and benefits over 5 years.

Table 12: Agriculture Adaptation Actions in Iraq: Costs and Benefits over 5 years[83]

Adaptation Action	Expected Economic Costs	Expected Economic Benefits
Improved Irrigation Techniques		
→ Actions: Implement advanced irrigation methods (e.g., drip irrigation), promote efficient water use practices among farmers.	Infrastructure investment: USD 400 million. Training and implementation: USD 100 million.	Increased crop yields: USD 1 billion annually. Reduced water consumption: 25% savings on water bills. Enhanced agricultural productivity and resilience.
Heat-Resistant Crop Varieties		
→ Actions: Research and develop crop varieties that can withstand higher temperatures and water scarcity.	Research and development: USD 150 million. Farmer training and adoption: USD 50 million.	Stabilized crop yields despite heat stress: USD 800 million annually. Reduced economic losses from heat-related crop damage. Improved food security.
Promoting Drought-Resistant Crops:		
→ Researching and developing crop varieties that require less water or are more tolerant of drought conditions. → Encouraging farmers to adopt drought-resistant crops and diversify their agricultural practices.	Investment in research and development of drought-resistant crops. Potential need for farmer training and education. Research and development: USD 100 million. Farmer subsidies and support: USD 200 million.	Reduced water consumption in agriculture. Improved agricultural resilience to droughts and climate change. Potential for maintaining or even increasing crop yields. Stabilized crop yields during droughts: USD 1 billion annually. Reduced economic losses from crop failures: USD 500 million annually. Increased food security and rural livelihoods. Increased agricultural productivity: USD 1.5 billion annually. Reduced water consumption: 20% savings on water bills. Long-term sustainability and resilience
Water Harvesting and Storage		
→ Actions: Construct rainwater harvesting systems, build small-scale reservoirs and storage tanks for irrigation.	Infrastructure and installation: USD 300 million. Maintenance: USD 50 million annually.	Increased water availability for irrigation: USD 700 million annually. Enhanced drought resilience and crop production.
Soil Salinity Management		
→ Actions: Implement soil management practices to prevent and reduce salinization, and use of salt-tolerant crops.	Soil management programs: USD 200 million. Farmer education: USD 50 million.	Preservation of arable land: USD 500 million annually. Improved soil productivity and crop yields.

[83] *The economic costs and benefits listed are estimates and may vary depending on the specific project and implementation details. Some adaptation actions, like improved water management, can offer both economic and social benefits (e.g., improved public health from access to clean water). International cooperation and public-private partnerships can help finance these adaptation actions and share the financial burden.*

Diversified Agricultural Practices		
→ Actions: Promote crop diversification, agroforestry, and sustainable farming practices.	Investment in diversification programs: USD 250 million. Farmer support and subsidies: USD 100 million.	Increased agricultural resilience: USD 600 million annually. Reduced risk of crop failure and economic losses. Enhanced food security and rural livelihoods.
Agricultural Infrastructure Upgrades		
→ Actions: Upgrade existing agricultural infrastructure, including irrigation systems and storage facilities.	Infrastructure upgrades: USD 500 million. Maintenance: USD 100 million annually.	Improved efficiency and productivity: USD 700 million annually. Reduced post-harvest losses and increased market access for farmers.
Support for Small-Scale Farmers		
→ Actions: Provide financial support, training, and resources to small-scale farmers to improve their resilience.	Financial support programs: USD 200 million. Training and resources: USD 100 million.	Enhanced productivity of small-scale farms: USD 500 million annually. Increased food security and rural economic stability.
Sustainable Agriculture:		
→ Implementing modern irrigation systems, crop rotation, and organic farming practices.	High initial investment in technology and training: USD 1.2 billion. Annual operational costs: USD 200 million.	Improved crop yields and soil health: USD 1.5 billion annually. Reduced water usage and environmental impact: USD 500 million in savings. Enhanced food security and rural livelihoods.
Livestock Management:		
→ Improving grazing practices and investing in sustainable livestock management systems.	Investment in sustainable livestock systems: USD 500 million. Ongoing operational costs: USD 100 million annually.	Increased meat and dairy productivity: USD 400 million annually. Reduced greenhouse gas emissions: USD 200 million in potential carbon credits. Improved rural livelihoods and food security.
Promoting Agroforestry:		
→ Integrating trees and shrubs into agricultural landscapes to enhance productivity and environmental health.	Costs for establishing agroforestry systems: USD 600 million. Training and support for farmers: USD 100 million annually.	Improved crop diversity and yields: USD 500 million annually. Increased resilience to climate extremes: USD 300 million annually. Enhanced carbon storage and biodiversity conservation.
Combatting Land Degradation:		
→ Implementing soil conservation techniques and sustainable land management practices.	Investment in soil restoration and management: USD 800 million. Training for farmers: USD 150 million.	Reduced soil erosion and increased agricultural productivity: USD 700 million annually. Enhanced resilience to climate change impacts. Long-term sustainability of arable land.

Examples of identified projects that would enhance the food security in Iraq are:

- Mapping of soil natural value to identify Agri-investment.
- Promote the use of mulching and compost and zero-tillage techniques and environmentally friendly fertilizers
- Integrating climate aspects into crop-specific mapping and planning, including adapting agricultural calendars and sowing dates

The CIP is expected to foster resilience in agriculture and for food security purposes. It may promote climate-smart agricultural techniques such as the use of drought-resistant crops, soil conservation, and efficient water management. Nitrogen management and adapted fertilization is particularly important for Iraq.

By adopting these practices, Iraq will enhance food security and ensure its agricultural sector can adapt to changing weather patterns. Additionally, the strategy encourages crop diversification, reducing vulnerability to extreme weather events, pests, and diseases, contributing to both climate resilience and reduced emissions from the agriculture and fishing sectors. This will ensure food security for its population and promote sustainable agricultural development.

The total estimated costs for the proposed agricultural adaptation actions over 5 years are USD 5.1 billion, while the total estimated economic benefits amount to USD 41 billion.

Furthermore, the CIP is expected to focus on enhancing livelihoods through initiatives like tree planting and improved forestry management. These efforts are also designed to support rural communities dependent on agriculture.

Biodiversity and Ecosystem Protection

The following table presents a range of biodiversity conservation actions for Iraq, highlighting the expected economic costs and benefits per action.

The following table presents a range of biodiversity conservation actions for Iraq, highlighting the expected economic costs and benefits per action.

Table 13: Biodiversity Conservation Actions in Iraq: Costs and Benefits over 5 years

Adaptation Action	Expected Economic Costs	Expected Economic Benefits
Wetland and Marsh Restoration		
Rehabilitate and restore wetlands and marshes to preserve habitats. Protection from sea level rise and seawater intrusion via mangrove plantation	Rehabilitate and Restore Wetlands and Marshes: -Site Assessment and Planning: $1,000 to $5,000 per hectare. -Land Acquisition (if needed): Highly variable, $5,000 to $100,000+ per hectare. -Vegetation Restoration: $10,000 to $25,000 per hectare. -Hydrological Restoration (e.g., creating or restoring water flow): $5,000 to $30,000 per hectare. -Long-Term Maintenance and Monitoring: $1,000 to $2,000 per hectare per year. Total Estimated Cost for Wetland Restoration: Small scale: $20,000 to $60,000 per hectare. Large scale: $50,000 to $150,000+ per hectare. Protection from Sea Level Rise and Seawater Intrusion via Mangrove Plantation: -Site Preparation (e.g., removal of debris, soil preparation): $1,000 to $3,000 per hectare. -Seedling and Sapling Costs: $2,000 to $10,000 per hectare. Depending on seedling sourcing, species, and transport costs. -Planting Labor: $1,000 to $5,000 per hectare. Costs depend on the availability of local labor and any specialized skills required. -Erosion Control (if needed): $2,000 to $10,000 per hectare. -Long-Term Monitoring and Maintenance: $500 to $2,000 per hectare per year. - Total Estimated Cost for Mangrove Plantation: Small scale: $5,000 to $15,000 per hectare. Large scale: $10,000 to $30,000+ per hectare. Infrastructure investment: USD 500 million. Maintenance: USD 50 million annually.	Positive impact on the country's environment and livelihood of marginalized native communities living there for 5000 years
Wildlife Conservation Programs		
Develop programs to protect vulnerable species, including habitat protection and anti-poaching efforts in key biodiversity areas	Program implementation: USD 200 million. Ongoing support: USD 20 million annually.	Protect and boost vulnerable biodiversity

Habitat Corridors		
Create and maintain wildlife corridors to connect fragmented habitats.	Infrastructure and land acquisition: USD 250 million. Maintenance: USD 25 million annually.	Improve the wildlife which has a positive impact on society
Climate-Resilient Ecosystems		
Implement measures to increase the resilience of ecosystems to climate change.	Research and development: USD 100 million. Implementation: USD 50 million annually.	Increase the resilience of the ecosystem to climate changes
Reforestation and Afforestation:		
Planting trees and restoring degraded forests to combat desertification.	Significant costs for planting and maintenance: USD 1 billion. Ongoing conservation efforts: USD 100 million annually.	Increased carbon sequestration: USD 800 million in potential carbon credits. Enhanced biodiversity and ecosystem services. Improved livelihoods through sustainable forestry: USD 300 million annually.

Examples of identified projects that would further develop the ecosystem protection in Iraq are:

- Mapping of soil natural value to identify Agri-investment.
- Introducing drought-resistant forest species and rehabilitating wetlands
- Develop vegetation corridors with green areas and key biodiversity hotspots for fauna mobility.

The AFOLU sector in Iraq is a cornerstone of the nation's economy, providing essential resources and livelihoods. By investing in sustainable practices, reforestation, and modern agricultural technologies, Iraq can enhance the productivity and resilience of this sector. These actions will not only contribute to economic growth but also play a critical role in mitigating environmental challenges and supporting sustainable development in the long term.

It is also important that the CIP recognizes the role of natural resources in climate adaptation. Forest conservation and reforestation efforts not only sequester carbon but also regulate water flow and provide vital habitat for biodiversity. Similarly, wetland restoration and sustainable use are prioritized, as wetlands act as natural buffers against floods and droughts. By protecting Iraq's unique ecosystems goods, services, and endangered species, biodiversity conservation further strengthens the nation's resilience to climate change impacts. By financing these biodiversity conservation strategies, Iraq's CIP can protect its ecosystems, enhance resilience to climate change, and support the livelihoods of communities dependent on natural resources. A rough cost estimation cost for the proposed biodiversity conservation actions over 5 years are USD 2.15 billion, while the total estimated economic benefits amount to USD 5.5 billion.

2.6.3. Health

By promoting cleaner production processes and potentially reducing environmental pollutants, the CIP could lead to improved public health outcomes among local communities. Cleaner production practices reduce emissions and minimize the release of harmful substances into the air, soil, and water, thereby lowering the incidence of respiratory diseases and other health issues associated with pollution. This will not only enhance the overall well-being of Iraqi men and women but also contribute to a healthier environment conducive to SDGs.

Table 14: Health Adaptation Actions in Iraq: Costs and Benefits over 5 years

Adaptation Action	Expected Economic Costs	Expected Economic Benefits
Heatwave Preparedness		
Develop and implement heatwave early warning systems, establish cooling centers, and distribute water.	Heatwave Early Warning Systems: Cost: $50,000 to $250,000 for the initial setup. Maintenance: $10,000 to $50,000 annually for system updates and operations. Example: heat warnings could help reduce heat-related health issues. Establish Cooling Centers: Cost: $10,000 to $30,000 per center (including basic equipment like air conditioning, seating, and water). Ongoing Expenses: $2,000 to $5,000 per center annually for utilities and staffing. Water Distribution: Cost: $5,000 to $20,000 for setting up distribution points in high-risk areas. Ongoing Costs: $2,000 to $10,000 annually for resupply and distribution during heatwaves. Infrastructure and implementation: USD 200 million. Ongoing support: USD 20 million annually	Improve people's health and avoiding sun burnings. Reduce heat shocks and heat risks on health
Water Quality Improvement		
Upgrade primary health centers with water storages and disinfectant adapted devices	Infrastructure upgrades: USD 300 million. Maintenance: USD 30 million annually	Improve the people health and reduce the spread of diseases
Food Safety Programs		
Implement food safety regulations, promote proper food storage, and conduct public health campaigns	Program implementation: USD 150 million. Education and enforcement: USD 20 million annually.	This will reduce food poisoning and improve the health
Respiratory Health Initiatives		
Develop programs to reduce air pollution, manage dust storms, and provide respiratory health services.	Program costs: USD 250 million. Ongoing support: USD 25 million annually	It is very essential during dust storms; it improve the people health
Mental Health Support		
Provide mental health services, establish support networks, and raise awareness about climate-related stress.	Program implementation: USD 100 million. Ongoing support: USD 10 million annually.	Reduce the climate-related stress
Nutrition Programs		
Develop nutrition support programs, distribute supplements, and promote sustainable food practices	Program costs: USD 200 million. Ongoing support: USD 20 million annually.	It improves the population health and increase workers productivity
Strengthening Healthcare Systems		
Enhance healthcare infrastructure, train healthcare workers, and improve emergency response systems.	Infrastructure investment: USD 500 million. Training and maintenance: USD 50 million annually.	Increase people welfare which has positive impact on productivity
Climate Health Awareness		
Conduct public health campaigns to raise awareness about the health risks of climate change and promote preventative measures.	Campaign costs: USD 100 million. Ongoing support: USD 10 million annually.	Help to reduce the health risks due to climate-change events

Iraq can mitigate the adverse health impacts of climate change, enhance public health resilience, and support the well-being of its population. The total estimated costs for the proposed health adaptation actions over 5 years are USD 2.5 billion, while the total estimated economic benefits amount to USD 7.7 billion.

2.6.4. Infrastructure

Below is a table outlining infrastructure adaptation initiatives for Iraq, detailing projected economic costs and benefits.

Table 15: Infrastructure Adaptation Actions in Iraq: Costs and Benefits over 5 years

Adaptation Action	Expected Economic Costs	Expected Economic Benefits
Water Infrastructure Upgrades		
Upgrade dams, canals, and water treatment plants to enhance resilience to changing climate conditions	Infrastructure investment: USD 600 million. Maintenance: USD 60 million annually	Infrastructure investment: USD 600 million. Maintenance: USD 60 million annually
Electricity Grid Resilience		
Strengthen electricity grids, invest in renewable energy, and develop strategies to manage increased demand and extreme weather impacts.	Grid enhancements: USD 10-15 Billions	Grid enhancements: USD 400 million. Renewable energy investments: USD 100 million.
Infrastructure Resilience		
Retrofit infrastructure to withstand extreme weather events, including heatwaves, floods, and sandstorms	Infrastructure upgrades: USD 700 million. Repair and maintenance: USD 70 million annually.	Infrastructure upgrades: USD 700 million. Repair and maintenance: USD 70 million annually.
Coastal Infrastructure Protection		
Implement measures to protect coastal infrastructure from sea level rise and saltwater intrusion.	Coastal protection projects: USD 300 million. Monitoring and maintenance: USD 30 million annually.	Coastal protection projects: USD 300 million. Monitoring and maintenance: USD 30 million annually.
Land Subsidence Mitigation		
Address land subsidence issues through infrastructure reinforcement and groundwater management.	Subsidence mitigation projects: USD 200 million. Monitoring and mitigation: USD 20 million annually.	Subsidence mitigation projects: USD 200 million. Monitoring and mitigation: USD 20 million annually.
Essential Services Restoration		
Improve access to clean water and sanitation during and after climate-related disruptions and enhance emergency response capabilities.	Emergency infrastructure: USD 250 million. Recovery and restoration: USD 25 million annually	Emergency infrastructure: USD 250 million. Recovery and restoration: USD 25 million annually
Disaster Preparedness and Recovery		
Strengthen disaster preparedness measures, including early warning systems and community resilience programs	Preparedness investments: USD 150 million. Recovery and reconstruction: USD 15 million annually	Preparedness investments: USD 150 million. Recovery and reconstruction: USD 15 million annually

By implementing these infrastructure adaptation strategies, Iraq can enhance resilience to climate impacts, improve infrastructure reliability, and reduce the economic costs associated with climate-related disruptions. The total estimated costs for the proposed infrastructure adaptation actions over 10 years are USD 2.7 billion, while the total estimated economic benefits amount to USD 9.3 billion.

2.6.5. Education

Investing in a climate-resilient education system can yield significant economic benefits for Iraq. This table explores various education adaptation actions, outlining their expected economic advantages and costs over 5 years.

Table 16: Education Adaptation Actions in Iraq: Costs and Benefits over 5 years

Adaptation Action	Expected Economic Costs	Expected Economic Benefits
Education Infrastructure Resilience		
Retrofit education buildings to withstand extreme weather events and improve resilience.	Infrastructure upgrades: USD 300 million. Maintenance: USD 30 million annually	Infrastructure upgrades: USD 300 million. Maintenance: USD 30 million annually
Water and Sanitation Improvements		
Ensure access to clean water and sanitation facilities in schools, particularly in areas prone to water scarcity.	Infrastructure investment: USD 200 million. Ongoing maintenance: USD 20 million annually.	Infrastructure investment: USD 200 million. Ongoing maintenance: USD 20 million annually.
Heatwave Preparedness in Schools		
Implement cooling systems, heatwave preparedness plans, and education programs on heat-related health risks	Implementation costs: USD 150 million. Educational programs: USD 15 million annually.	Implementation costs: USD 150 million. Educational programs: USD 15 million annually.
Education Continuity Programs		
Develop distance learning programs, provide support for displaced students, and ensure continuity during climate-related disruptions.	Program development: USD 100 million. Operational support: USD 10 million annually.	Program development: USD 100 million. Operational support: USD 10 million annually.
Community and Parent Engagement		
Engage communities and parents in climate education and resilience-building initiatives for schools	Engagement programs: USD 50 million. Outreach and support: USD 5 million annually.	Engagement programs: USD 50 million. Outreach and support: USD 5 million annually.
Early Warning Systems for Education		
Implement early warning systems for extreme weather events to minimize school closures and disruptions.	System implementation: USD 50 million. Maintenance and upgrades: USD 5 million annually.	System implementation: USD 50 million. Maintenance and upgrades: USD 5 million annually.

Investing in these education adaptation strategies presents a compelling opportunity for Iraq. By implementing these actions, the country can not only mitigate the impacts of climate change on schools and ensure educational continuity, but also significantly improve learning outcomes for students. With a projected cost of USD 850 million, these strategies have the potential to generate a substantial return on investment, with estimated economic benefits reaching USD 3 billion.

2.6.6. Tourism

The following table presents adaptation strategies aimed at mitigating the impacts of climate change on tourism in Iraq. These actions address challenges such as decreased appeal due to rising temperatures, water scarcity affecting recreational activities, increased dust storms disrupting travel, infrastructure damage from extreme weather events, and security concerns affecting tourist safety and confidence.

Table 17: Economic Costs and Benefits of Tourism Adaptation Actions in Iraq

Adaptation Action	Expected Economic Costs	Expected Economic Benefits
Heatwave Resilience Measures		
Develop cooling shelters, promote indoor attractions, and implement heatwave warning systems.	Infrastructure investment: USD 150 million. Operational costs: USD 15 million annually.	Infrastructure investment: USD 150 million. Operational costs: USD 15 million annually.
Water Management and Conservation		
Improve water efficiency in tourist facilities, promote water-saving practices, and invest in water recycling systems.	Infrastructure upgrades: USD 100 million. Savings on water costs: USD 10 million annually.	Infrastructure upgrades: USD 100 million. Savings on water costs: USD 10 million annually.
Dust Storm Preparedness		
Develop dust storm early warning systems, implement dust-resistant infrastructure, and provide alternative indoor activities during storms.	Preparation and infrastructure: USD 80 million. Operational readiness: USD 8 million annually.	Preparation and infrastructure: USD 80 million. Operational readiness: USD 8 million annually.
Infrastructure Resilience		
Retrofit historical sites, airports, and roads to withstand floods and sandstorms.	Infrastructure upgrades: USD 200 million. Maintenance and repairs: USD 20 million annually.	Infrastructure upgrades: USD 200 million. Maintenance and repairs: USD 20 million annually.

Implementing these adaptation strategies is essential for Iraq to mitigate the adverse impacts of climate change on its tourism sector. The estimated total costs for these measures over 5 years amount to USD 550 million, while the expected economic benefits are projected to reach USD 2 billion, underscoring the significant potential returns on investment in safeguarding and enhancing tourism resilience.

To thrive in the face of climate change, proactive adaptation is essential for Iraq's tourism sector. By tackling challenges like heatwaves, water scarcity, dust storms, and infrastructure vulnerability, Iraq can not only protect its cultural and natural treasures but also ensure visitor satisfaction and continued economic stability in tourism. These measures go beyond safeguarding tourism revenue; they contribute to broader climate resilience, benefiting both local communities and the national economy.

2.6.7. Energy oil and gas

The energy sector, particularly oil and gas, is the cornerstone of Iraq's economy, providing most of the government revenue and export income. However, this sector faces significant challenges, including aging infrastructure, environmental concerns, and the need for diversification. Addressing these issues requires substantial investments in modernizing facilities, integrating renewable energy sources, and improving efficiency. By implementing these adaptation actions, Iraq can enhance its energy security, reduce environmental impacts, and sustain long-term economic growth in a rapidly changing global energy landscape. The following table outlines the expected economic costs and benefits associated with key adaptation actions in Iraq's oil and gas sector.

Table 18: Adaptation Actions and Economic Impact on Iraq's Oil and Gas Sector

Adaptation Action	Expected Economic Costs	Expected Economic Benefits
Modernizing Gas Infrastructure:		
Upgrading pipelines, refineries, and storage facilities to improve efficiency and reduce environmental impact.	High upfront costs for infrastructure upgrades: USD 5 billion. Maintenance costs: USD 200 million annually.	Increased production efficiency and reduced losses: USD 3 billion annually. Improved export capacity: USD 2 billion annually. Reduced environmental damage and associated costs: USD 500 million annually.
Investing in Renewable Energy:		
Integrating renewable energy sources (e.g., solar, wind) into the energy mix to diversify away from oil dependency.	Significant investment required for renewable projects: USD 3 billion. Integration and grid upgrades: USD 500 million.	Long-term energy security: USD 1.5 billion annually. Reduced dependency on oil exports. Creation of green jobs and economic diversification. Carbon credits and environmental benefits: USD 500 million annually.
Reducing Gas Flaring:		
Implementing technologies to capture and utilize associated gas from oil production, reducing flaring.	Infrastructure investment: USD 1 billion. Training and implementation: USD 150 million.	Increased gas availability for domestic use and export: USD 2 billion annually. Reduced environmental fines and improved air quality: USD 500 million annually. Enhanced energy security.
Improving Energy Efficiency:		
Implementing energy-saving technologies in oil and gas operations, reducing overall energy consumption.	Investment in technology and training: USD 800 million.	Reduced operational costs: USD 1.2 billion annually. Enhanced competitiveness of Iraq's energy sector. Lower emissions and environmental impact: USD 400 million annually.
Gas Leakage and Recovery Techniques:		
Using advanced technologies to reduce leakages and maximize gas recovery from existing fields.	High costs for technology adoption and implementation: USD 2 billion.	Increased oil output: USD 5 billion annually. Extended lifespan of existing oil fields. Improved revenue from exports and domestic use.

This table summarizes the expected economic costs and benefits of various adaptation actions within Iraq's oil and gas sector.

It highlights the substantial investments needed to modernize infrastructure and reduce environmental impacts, alongside the potential economic gains in efficiency, production, and sustainability.

Potential projects to consider for the oil and gas sector that have GHG emission reduction methodologies approved by UNFCCC are:

AM0064 Capture and utilization or destruction of mine methane (excluding coal mines) or non-mine methane

AM0077 Recovery of gas from oil wells that would otherwise be vented or flared and its delivery to specific end-users

AM0043 Leak reduction from a natural gas distribution grid by replacing old cast iron pipes or steel pipes without cathodic protection with polyethylene pipes

AM0122 Recovery of methane-rich vapors from hydrocarbon storage tanks

AMS-III.W. Methane capture and destruction in non-hydrocarbon mining activities

2.6.8. Electricity and power generation

Iraq's electricity and power generation sector faces significant challenges, including aging infrastructure, frequent power outages, and a growing demand that outpaces supply. To address these issues, Iraq must invest in modernizing its power generation facilities, integrating renewable energy sources, and improving grid efficiency. These actions will not only enhance energy reliability but also reduce environmental impacts and support the country's broader economic and social development goals.

Table 19: Adaptation Actions and Economic Impact for Iraq's Electricity and Power Generation Sector

Adaptation Action	Expected Economic Costs	Expected Economic Benefits
Modernizing Power Plants:		
Upgrading existing power plants to improve efficiency and reduce emissions.	High upfront costs for technology upgrades: USD 3 billion. Maintenance costs: USD 200 million annually.	Increased power generation capacity: USD 2 billion annually. Reduced operational costs and emissions: USD 500 million annually. Enhanced reliability and lifespan of power plants.
Expanding Renewable Energy:		
Investing in solar, wind, and other renewable energy sources to diversify the energy mix.	Significant investment required for renewable energy projects: USD 4 billion. Grid integration and storage systems: USD 800 million.	Long-term energy cost savings: USD 1.5 billion annually. Reduction in dependency on fossil fuels. Creation of green jobs and economic diversification. Carbon credits and environmental benefits: USD 600 million annually.
Improving Grid Infrastructure		
Upgrading the national grid to reduce transmission losses and enhance distribution efficiency.	Infrastructure investment: USD 2 billion. Ongoing maintenance and upgrades: USD 300 million annually.	Reduced transmission losses: USD 1 billion in savings annually. Increased electricity access and reliability for rural and urban areas. Support for economic growth and industrial development.
Smart Grid Technology:		
Implementing smart grid systems to optimize energy distribution and reduce outages.	High initial costs for smart grid implementation: USD 1 billion. Training and technology adoption: USD 150 million.	Improved grid reliability and reduced outages: USD 800 million annually. Enhanced energy efficiency and demand management. Potential savings in maintenance and operational costs: USD 300 million annually.
Investing in Energy Storage:		
Developing large-scale battery storage to stabilize the grid and integrate more renewables.	High costs for battery storage systems: USD 2 billion. Maintenance and operation: USD 100 million annually.	Stabilized power supply: USD 1.2 billion annually. Enhanced integration of renewable energy: USD 800 million annually. Reduced need for peaking power plants and lower emissions.
Investing in Transmission lines and transformers[84]:		
Around 30-50 percent of electricity gets lost due to poor transmission and distribution (T&D) systems, according to the Iraq Energy Institute. The country's transmission network is ramshackle and inadequate and needs urgent upgrade and expansion[85].	$10 billion is needed to execute a phased rehabilitation and reconstruction of the electricity infrastructure.[86]	upgrading Iraq's energy infrastructure, enabling better energy transfers, reducing loads, and stabilizing power supply, which will, in turn, support development across other sectors.

[84] https://www.iraq-businessnews.com/2024/09/20/iraq-launches-new-projects-to-improve-electricity-transmission/
[85] https://gjia.georgetown.edu/2020/01/13/iraqs-power-sector-problems-and-prospects/#:~:text=Around%2030-50%20percent%20of%20electricity%20gets%20lost%20due,was%20rendered%20inoperable%20in%20the%20war%20against%20ISIS.
[86] Under the "Roadmap for the Electrification of the New Iraq," Siemens and the government agreed to a three-phase overhaul plan that includes efforts to reduce energy losses, introduction of smart grids, strengthening of the transmission grid, rehabilitation of existing power plants, addition of new generation capacities, and connecting Iraq to the Arab Gulf region.

This table highlights the key adaptation actions required in Iraq's electricity and power generation sector, along with their associated economic costs and benefits. By focusing on modernization, renewable energy integration, and grid improvements, Iraq can enhance its energy security, reduce environmental impacts, and support sustainable economic growth.

Potential projects to consider for the electricity sector that have GHG emission reduction methodologies approved by UNFCCC are:

AM0103 Renewable Energy Power Generation in Isolated Grids

AM0067 Installation of energy-efficient transformers in a power grid

AM0100 Integrated Solar Combined Cycle (ISCC) Projects

AM0035 SF6 emission reductions in electrical grids

2.6.9. Transportation

The transportation sector in Iraq is a crucial driver of economic activity, enabling the movement of goods and people across the country. However, the sector faces significant challenges, including outdated infrastructure, congestion, and environmental degradation. To meet growing demand and support economic development, Iraq must invest in modernizing its transportation systems, expanding public transit, and promoting sustainable practices. These efforts are essential for improving efficiency, reducing environmental impact, and enhancing connectivity, ultimately contributing to Iraq's broader economic growth and stability. The following table outlines the expected economic costs and benefits of key adaptation actions in this sector.

Table 20: Adaptation Actions and Economic Impact for Iraq's Transportation Sector

Adaptation Action	Expected Economic Costs	Expected Economic Benefits
Upgrading Road Infrastructure:		
Improving and expanding the road network to reduce congestion and enhance safety and use nature-based solutions to reduce air and soil pollution	High costs for road construction and maintenance: USD 5 billion. Annual maintenance: USD 500 million.	Reduced travel times and vehicle operating costs: USD 2 billion annually. Improved safety and reduced accident rates: USD 500 million annually. Enhanced economic connectivity and trade facilitation.
Investing in Public Transportation:		
Expanding and modernizing public transit systems, including buses and railways.	Significant investment in public transit infrastructure: USD 3 billion. Operation and maintenance: USD 300 million annually.	Reduced traffic congestion and pollution: USD 1.5 billion annually. Increased access to affordable transportation: USD 1 billion annually. Job creation in public transit sector.
Promoting Electric Vehicles (EVs):		
Encouraging the adoption of EVs through incentives and building charging infrastructure.	Investment in EV infrastructure: USD 1 billion. Incentives for EV adoption: USD 500 million.	Reduced fuel consumption and emissions: USD 1 billion annually. Long-term savings on vehicle maintenance and fuel: USD 600 million annually. Support for local manufacturing and green technology sectors.
Improving Freight and Logistics:		
Enhancing the efficiency of freight transportation through better logistics and infrastructure upgrades.	High costs for logistics hubs and infrastructure improvements: USD 2 billion. Ongoing operational costs: USD 200 million annually.	Increased efficiency in goods transportation: USD 1.5 billion annually. Reduced shipping costs and delivery times: USD 800 million annually. Enhanced competitiveness in regional and global trade.
Developing Smart Transportation Systems:		
Implementing intelligent transportation systems (ITS) to optimize traffic flow and improve safety.	High initial investment in ITS technology: USD 800 million. Training and implementation: USD 100 million.	Improved traffic management and reduced congestion: USD 500 million annually. Enhanced road safety and reduced accident-related costs: USD 400 million annually. Potential for data-driven planning and further cost savings.

This table summarizes the adaptation actions required in Iraq's transportation sector, highlighting the associated economic costs and benefits. By focusing on infrastructure upgrades, sustainable practices, and smart technologies, Iraq can significantly improve the efficiency, safety, and environmental sustainability of its transportation networks, thereby supporting overall economic growth.

Potential projects to consider for the transport sector that have GHG emission reduction methodologies approved by UNFCCC are:

AM0090 Model Shift in Transportation of Cargo from Road Transportation to Water or Rail Transportation

AM0110 Modal shift in transportation of liquid fuels

AM0031 Bus Rapid Transit Projects

2.6.10. Industrial Processes and Product Use (IPPU)

The Industrial Processes and Product Use (IPPU) sector in Iraq is a strategic component of the country's economy, encompassing a wide range of industries, including cement production, petrochemicals, and metal processing. This sector is a significant source of greenhouse gas emissions and environmental pollution. To address these challenges, Iraq must invest in modernization, efficiency improvements, and cleaner technologies. These actions will help reduce the sector's environmental footprint while enhancing productivity and economic resilience.

Table 21: Adaptation Actions and Economic Impact for Iraq's IPPU Sector

Adaptation Action	Expected Economic Costs	Expected Economic Benefits
Modernizing Cement Production:		
Upgrading to energy-efficient technologies and reducing clinker content in cement.	High upfront costs for technology upgrades: USD 2 billion. Ongoing maintenance: USD 100 million annually.	Reduced energy consumption: USD 500 million annually. Lower carbon emissions: USD 300 million in potential carbon credits. Enhanced competitiveness and productivity in the cement industry.
Implementing Cleaner Technologies in Petrochemicals:		
Adopting advanced processes to reduce emissions and waste in petrochemical production (more energy efficient processes or switching to low carbon energy source) .	Significant investment in cleaner technologies: USD 1.5 billion. Training and implementation: USD 200 million.	Reduced emissions and waste management costs: USD 600 million annually. Increased efficiency and product quality: USD 500 million annually. Enhanced marketability of petrochemical products.
Energy Efficiency in Metal Processing:		
Introducing energy-saving measures and upgrading equipment in metal processing industries.	Investment in energy-efficient equipment: USD 800 million. Training and operational costs: USD 100 million annually.	Reduced energy costs: USD 400 million annually. Improved production efficiency and reduced waste: USD 300 million annually. Extended lifespan of industrial equipment.
Promoting Recycling and Material Recovery:		
Developing infrastructure for recycling and reusing materials in industrial processes.	Infrastructure development costs: USD 500 million. Ongoing operational costs: USD 100 million annually.	Reduced raw material costs: USD 300 million annually. Lower waste management costs: USD 200 million annually. Enhanced sustainability and compliance with environmental regulations.
Carbon Capture and Storage (CCS):		
Implementing CCS technologies in high-emission industries to reduce greenhouse gas emissions.	Extremely high costs for CCS technology: USD 2.5 billion. Ongoing operational costs: USD 150 million annually.	Significant reduction in greenhouse gas emissions: Potential for USD 1 billion in carbon credits annually. Enhanced environmental compliance and potential for international funding.

Sustainable Construction and Building[87]		
Implementing green building standards and retrofitting existing structures for energy efficiency (e.g., insulation, energy-efficient windows, and HVAC systems).	High initial investment in retrofitting and new standards: USD 1.5 billion. Training for architects and builders: USD 50 million.	Reduced energy consumption in buildings: USD 500 million annually. Lower utility costs for households and businesses. Decreased GHG emissions: environmental benefits worth USD 200 million annually.
Energy Efficient Building Material		
Promoting the use of insulated walls, energy-efficient windows, and reflective roofing materials.	Financial Savings: Reduced energy consumption for heating and cooling leads to lower energy bills for households and businesses. This could save up to USD 300 million annually.	Reduced GHG Emissions: Improved insulation and efficient materials reduce overall energy demand, leading to a decrease in GHG emissions from the building sector. Job Creation: New job opportunities in manufacturing, installation, and maintenance of energy-efficient materials. Skills Development: Training workers and contractors in the use of advanced materials is crucial for proper installation and maintenance.

Potential projects to consider for the industry sector that have GHG emission reduction methodologies approved by UNFCCC are:

AM00049 Gas-based energy generation in an industrial facility

AM00066 GHG reduction through waste heat utilization for pre-heating of raw materials in sponge iron manufacturing

AM00059 GHG reduction from aluminum smelters

The IPPU sector in Iraq holds substantial potential for economic growth, but it also faces significant environmental challenges. By investing in modernization, cleaner technologies, and energy efficiency, Iraq can reduce the sector's environmental impact while enhancing its economic resilience and productivity. These adaptation actions will not only support sustainable industrial growth but also position Iraq as a competitive player in the global market.

Sustainable buildings and the construction of sustainable cities are a strong movement driven by the private sector in Iraq. To this purpose, many standards are currently being revised and improved to facilitate the adoption of environmental standards and requirements through the Iraqi Building Codes Project, and many of them contribute to reducing environmental impacts and follow-up (Green Architecture Code, Thermal Insulation Code, Natural Lighting Code, City Beauty Code, Waste Code, Earthquake-Resistant Buildings Code, etc.).

[87] *Sources: https://www.peeb.build/, https://cfpgreenbuildings.com/news-and-cases/financial-review/, https://www.cstb.fr/, https://www.researchgate.net/publication/340957597_Transitioning_to_high_efficiency_air_conditioning_in_Saudi_Arabia_A_benefit_cost_analysis_for_residential_buildings, https://www.ief.org/_resources/files/events/2nd-ief-eu-energy-day/naif-al-ragass---saudi-energy-efficiency-center.pdf, https://www.kapsarc.org/wp-content/uploads/2023/12/KS-2023-WB04-Energy-efficiency-Policy-in-The-Built-Environment-From-Formulation-to-Implementation.pdf*

2.6.11. Wastewater and waste

The waste sector in Iraq needs a rapid scale-up despite the government's already-implemented efforts. The country's natural assets are already under threat from climate change. The projected climate changes will only worsen an already fragile environment. The demographic growth combined with the increased fragility requires interventions to reduce or avoid contamination not only of the air but most importantly of fertile soils and scarce water resources.

Table 22: Adaptation Actions and Economic Impact on Iraq's Waste Sector

Adaptation Action	Expected Economic Costs	Expected Economic Benefits
Waste to Energy solutions:		
minimize the need for landfills, reduce pollution, and renewable energy generation.	High upfront costs for technology upgrades: USD 2 billion. Ongoing maintenance: USD 100 million annually.	Reduced energy consumption: USD 500 million annually. Lower carbon emissions: USD 300 million in potential carbon credits. Enhanced competitiveness and productivity in the cement industry.
Gas capture from landfills:		
Reduce pollution and renewable energy generation.	Significant investment in cleaner technologies: USD 1.5 billion. Training and implementation: USD 200 million.	Reduced emissions and waste management costs: USD 600 million annually. Increased efficiency and product quality: USD 500 million annually. Enhanced marketability of petrochemical products.
Promoting Recycling and Material Recovery:		
Developing infrastructure for recycling and reusing materials in industrial processes.	Infrastructure development costs: USD 500 million. Ongoing operational costs: USD 100 million annually.	Reduced raw material costs: USD 300 million annually. Lower waste management costs: USD 200 million annually. Enhanced sustainability and compliance with environmental regulations.
Wastewater treatment and reuse:		
combat water scarcity and reduce pollution, improve irrigation water quality and soil quality.	Extremely high costs for CCS technology: USD 2.5 billion. Ongoing operational costs: USD 150 million annually.	Significant reduction in greenhouse gas emissions: Potential for USD 1 billion in carbon credits annually. Enhanced environmental compliance and potential for international funding.

In conclusion, below are the key priority sectors highlighted in the national documents such as the NDC, the NAP, the NAMA Strategy, the GCF Country Programme,, and the current situation of each one in the presence of climate finance change with the CIP goals[88,89].

In conclusion, the CIP shall go beyond the NDC and consider emissions reductions and adaptation until 2035 if not long-term. By integrating climate adaptation strategies across agriculture, natural resource management, and energy infrastructure development, it has the potential to create major co-benefits for people and nature, while enabling a low-carbon and more resilient economy.

[88] *Iraq – Technology Needs Assessment report for mitigation and adaptation 2022*
[89] *NDC of Iraq, 2021*

SUMMARY:

The transition to low low-carbon economy for Iraq has substantial implications and requires huge amounts of upfront costs that cannot be sustained with its national budget only.

Sectorial estimation	Investment Required (USD)	Expected Annual Economic Benefits (USD)
Water Resources Management	7.5 billion	7.95 billion
Agriculture	5.1 billion	8.3 billion
Biodiversity and Ecosystem protection	2.15 billion	1.1 billion
Health sector	600 million	2.5 billion
Infrastructures	2.87 billion	2.5 billion
Education	0.85 billion	0.85 billion
Tourism	0.53 billion	0.53 billion
Oil and Gas Transition	11.8 billion	14.6 billion
Electricity	23.25 billion	8.7 billion
Transportation	13.4 billion	9.8 billion
Industries	7.95 billion	4.1 billion
Waste and Wastewater Circular Economy	7.05 billion	3.4 billion

A careful and stepwise approach to the transition would require an active role from direct and indirect foreign investment directed in the specific areas that will pave the long-term transition. The successful implementation of these programs and projects requires an enhanced participation of the private sector.

3. Global Climate Finance Landscape

The operational definition of Climate Finance by the UNFCCC Standing Committee on Finance (see UNFCCC SCF, 2014, 2016, 2018, 2020) states: "Climate finance aims at reducing emissions, and enhancing sinks of greenhouse gases and aims at reducing the vulnerability of, and maintaining and increasing the resilience of, human and ecological systems to negative climate change impacts"[90]

The Climate Finance Landscape encapsulates the intricate network of financial mechanisms and stakeholders dedicated to combating climate change. It encompasses a spectrum of funding sources ranging from domestic budgets and international aid to private sector investments and climate-focused funds[91]. At its core, this landscape involves governments, multilateral organizations, private investors, NGOs, and development banks, all playing crucial roles in mobilizing and allocating resources towards climate-resilient and low-carbon initiatives. This dynamic ecosystem reflects evolving investment trends, regulatory frameworks, and technological innovations aimed at addressing the challenges posed by climate change while capitalizing on opportunities for sustainable development. Collaboration and partnerships across sectors and borders are integral, fostering innovation, knowledge exchange, and collective action to accelerate progress towards a climate-resilient future.

3.1. International Climate Finance Context

In response to the need to take climate action, the country, recognizing the urgency of addressing these challenges, has decided to develop the CIP, with a key element of success hinging on securing international climate finance. This refers to financial resources from developed countries to support developing countries in their efforts to mitigate climate change (reducing greenhouse gas emissions) and adapt to its impacts. It encompasses the financial flows aimed at supporting climate change mitigation and adaptation activities across the globe. The landscape of global climate finance is diverse, involving multiple sources and channels, ranging from public and private funds to domestic and international investments.

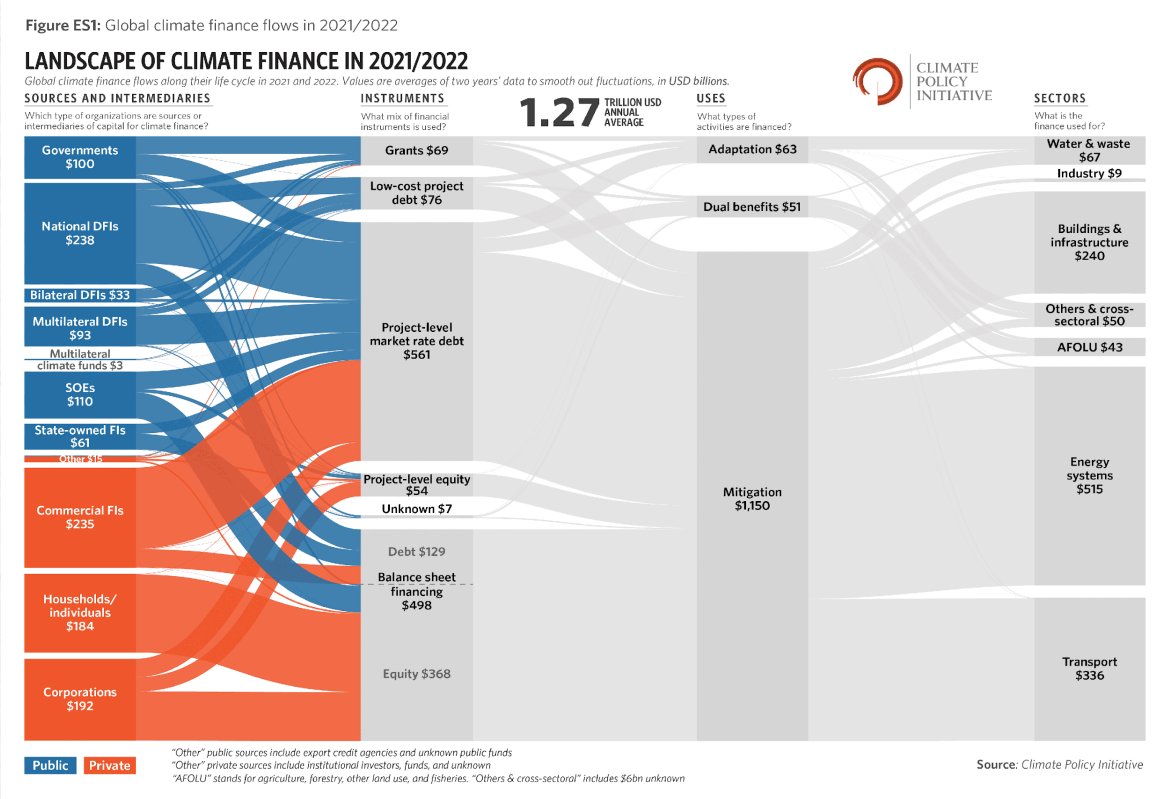
This section will delve into the international climate finance landscape and explore how it can contribute to the successful implementation of the Iraq CIP.

3.1.1. Global Climate Finance Flows

According to the Climate Policy Initiative (CPI), global climate finance flows have seen significant growth, reaching USD 1.27 trillion on annual average in 2021-2022[92] compared to USD 653 billion in 2019-2020. Most of this growth is due to an increase in mitigation finance, with the largest growth in the renewable energy and transport sectors.

[90] *Climate Change Policy, Global Landscape of Climate Finance 2023 Methodology*
[91] *2010 Th e International Bank for Reconstruction and Development/The World Bank, Economics of Adaptation to Climate Change, SYNTHESIS REPORT*
[92] *https://www.climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-a-decade-of-data/*

Figure 21: Landscape of climate finance in 2021/2022[93]



The figure demonstrates that the role played by the private sector in climate finance is as important as that of national or bilateral public entities. It also shows that although project-level debt is an important portion of the instruments used for financing climate initiatives, it is by far not the only type of instrument that can be used, balance sheet financing in debts and equity could become an important tool in the future for Iraq for instance.

In the climate negotiations during the yearly UNFCC conference of the party (COP), there are challenges for many years associated with mobilizing sufficient climate finance: the USD 100 billion annual goal set for international public climate finance [94] For instance has never been reached yet. Moreover, funding is mostly directed to industrial countries, not necessarily to the countries most affected by climate change such as Iraq.

The multi-faceted approach to climate finance offers a valuable toolkit to support Iraq's CIP. By strategically leveraging different funding sources, Iraq intends to address both mitigation and adaptation needs outlined in the CIP. In the National Budget Allocation, a portion of Iraq's national budget could be tagged towards priorities identified in the CIP. These funds will support initiatives like upgrading water infrastructure (canals, dams) to improve water management and reduce evaporation losses (adaptation to decreased water flow and increased evaporation), developing and implementing drought-resistant agricultural practices to enhance food security (adaptation to droughts) or restoring degraded ecosystems like the Mesopotamian marshes (adaptation to salinization and water scarcity).

[93] *Ibidem*
[94] *https://www.oecd.org/climate-change/finance-usd-100-billion-goal*

In parallel, financial aid from developed nations and loans from Multilateral Development Banks (MDBs) will play a vital role in larger-scale CIP projects. Priorities for requesting Official Development Assistance (ODA) will include building new water storage facilities to capture excess water and stormwater during wet seasons for use during dry periods (adaptation to decreased water flow and droughts) or investing in desalination plants to provide a new source of freshwater, particularly in southern Iraq (adaptation to salinization) giving priority to the most vulnerable communities.

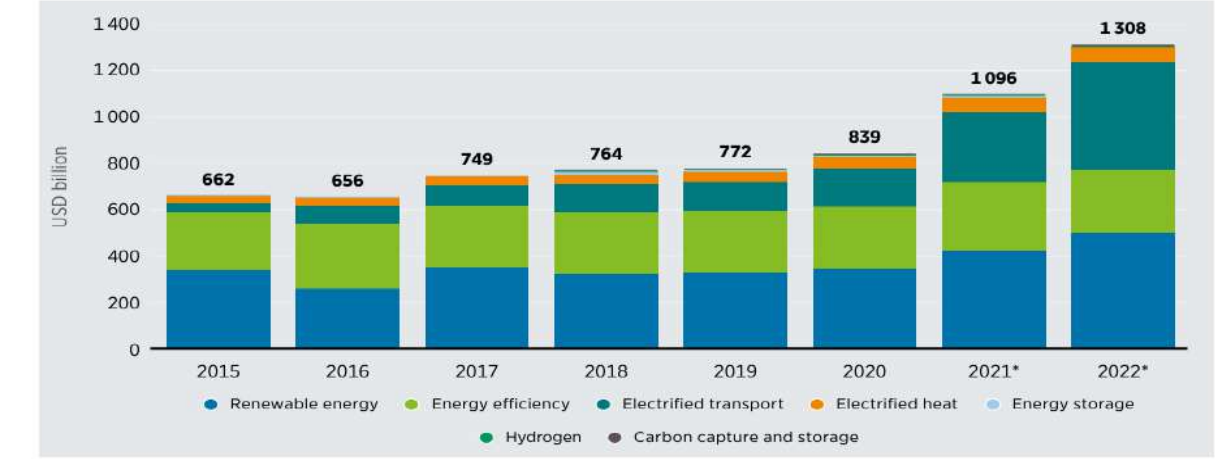
It is also important, as part of the CIP, to consider private sector investment, mainly for mitigation strategies and projects. Encouraged by the CIP, private sector investment will be a major driver for Renewable Energy Infrastructure: Private companies will be incentivized to invest in solar, wind, and other renewable energy projects. This will help reduce Iraq's reliance on fossil fuels and contribute to its mitigation goals. The country intends to combine forces through Public-Private Partnerships (PPPs), which are particularly beneficial for large-scale infrastructure projects within the CIP.

By strategically utilizing these diverse funding sources, Iraq expects to ensure a steady flow of resources to implement the CIP and build a more climate-resilient future. It's important to note that ensuring transparency and accountability in how these funds are used is crucial for maximizing their effectiveness.

3.1.2. Global Trends in Climate Finance

Increase in Energy System Investments: A significant portion of climate finance is directed towards renewable energy projects. For instance, investments in renewable energy reached USD 515 billion in 2022, marking a substantial increase from previous years.

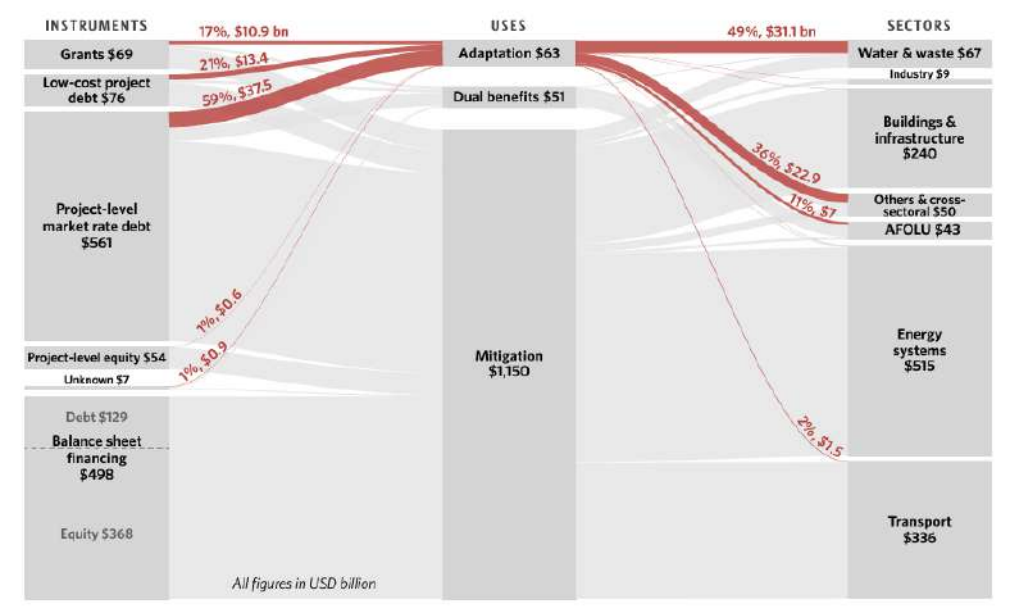
Figure 22: Climate Finance Landscape per mitigation activities (CPI)[95]



Focus on Adaptation: While mitigation projects (e.g., renewable energy, energy efficiency) traditionally received more funding, there is a growing recognition of the need to finance adaptation projects. Adaptation finance, which includes investments in resilient infrastructure and climate-smart agriculture, accounted for approximately USD 63 billion in recent flows.

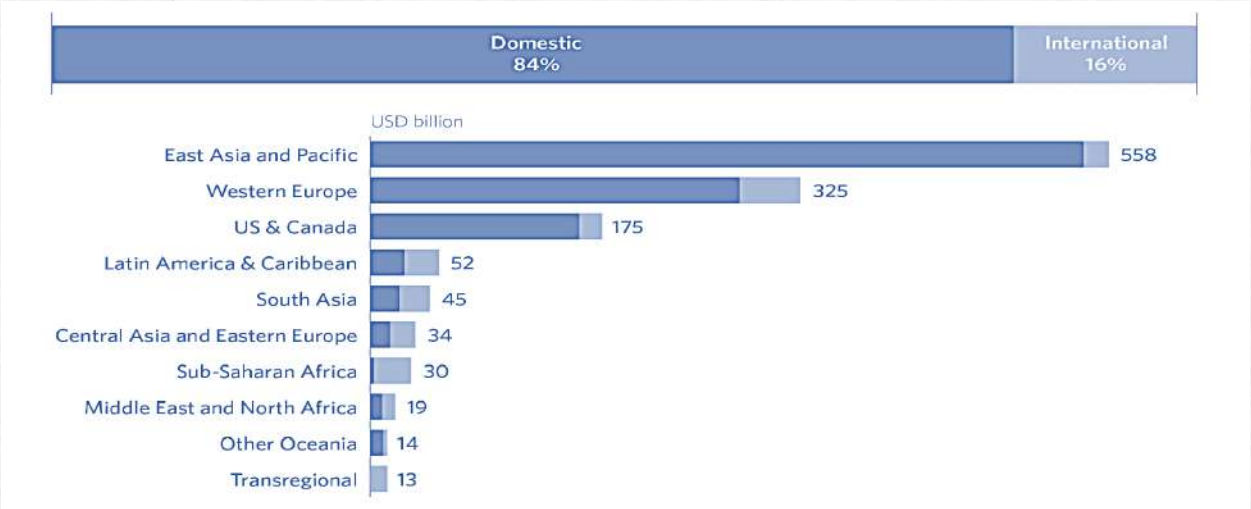
[95] *https://www.climatepolicyinitiative.org/*

Figure 23: Flows in climate finance (CPI)[96]



Geographic Distribution: Climate finance is not evenly distributed globally. Developing countries, particularly in Africa, Asia, and Latin America, receive significant portions of international climate finance to address their unique vulnerabilities to climate change.

Figure 24: Domestic and international climate finance by destination region[97]



[96] *https://www.climatepolicyinitiative.org/*
[97] *Ibidem*

3.2. Global Climate Finance Commitments

The commitment by developed countries to mobilize USD 100 billion per year by 2020 to support climate action in developing countries was a key outcome of the Copenhagen Accord (2009) and reaffirmed in subsequent agreements, including the Paris Agreement.

To achieve its climate goals, Iraq is seeking international cooperation and funding. The country has been engaging with international organizations, donor countries, and financial institutions to secure technical and financial support. Iraq's participation in global climate initiatives and access to climate finance mechanisms, such as the Green Climate Fund, are vital for the implementation of its climate policies and strategies.[98]

3.2.1. Progress and Contributions

Bilateral Aid: Countries like the United States, Germany, and Japan provide substantial bilateral climate finance through their development agencies. For instance, Germany committed to doubling its international climate finance to €4 billion annually by 2030.

Multilateral Contributions: Contributions to multilateral funds such as the GCF and the GEF are significant. The European Union and its member states are major contributors to these funds.

Tracking and Accountability: The OECD and UNFCCC regularly track and report on climate finance flows. While progress has been made, gaps remain in meeting the USD 100 billion annual target.

3.2.2. Challenges and Barriers

Accessibility: Many developing countries face difficulties in accessing international climate finance due to complex application processes and stringent eligibility criteria.

Predictability and Sustainability: Ensuring predictable and sustained financial flows is a challenge, as funding commitments can fluctuate with political and economic changes in donor countries.

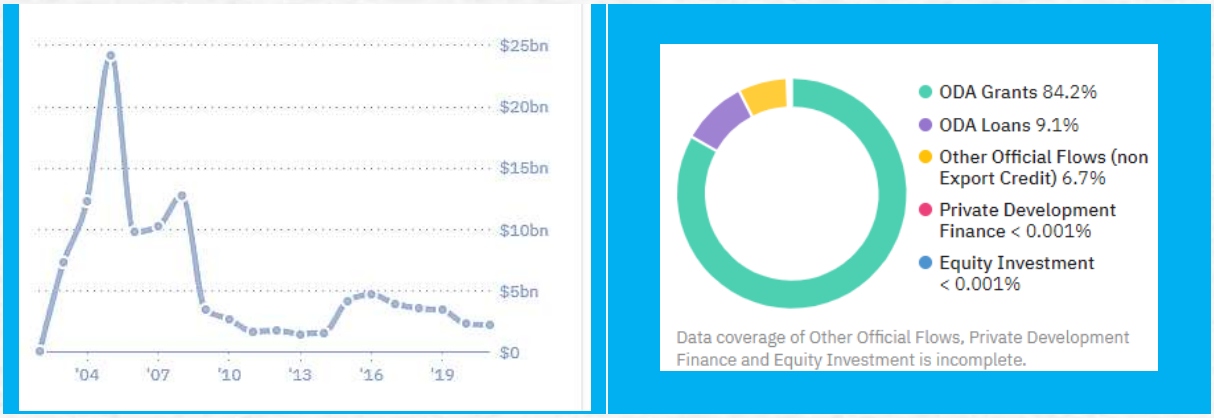
Effectiveness and Impact: Measuring the effectiveness and impact of climate finance is critical. There is a need for robust monitoring, reporting, and verification (MRV) systems to ensure that funds achieve their intended outcomes.

3.2.3. International Commitments towards Iraq

Between 2002 and 2021, global funders committed a total of USD 114 billion in development finance to Iraq. Of this, USD 96.3 billion (84.2%) came in the form of Official Development Assistance (ODA) grants, while USD 10.4 billion (9.1%) was allocated through ODA loans. The overall disbursement ratio for this development finance—representing the proportion of committed funds that were disbursed—was 86%, slightly higher than the global average disbursement ratio of 83.2% during the same period. A lower disbursement ratio often signals difficulties in project implementation or suggests that funds were reallocated after approval, highlighting potential challenges in effectively utilizing development finance.

[98] *Green Climate Fund. (2021). Iraq's Country Programme. Retrieved from GCF*

Figure 25: Iraq and Development Finance: Trend over Time (left) and Financial Instruments (right)[99]



Development finance plays a crucial role in supporting Iraq's reconstruction and development across various sectors. The financial commitments made to Iraq reflect the country's pressing needs in areas such as debt relief, governance, civil society, and emergency response. These investments are vital for stabilizing Iraq's economy, improving governance, and addressing immediate humanitarian needs.

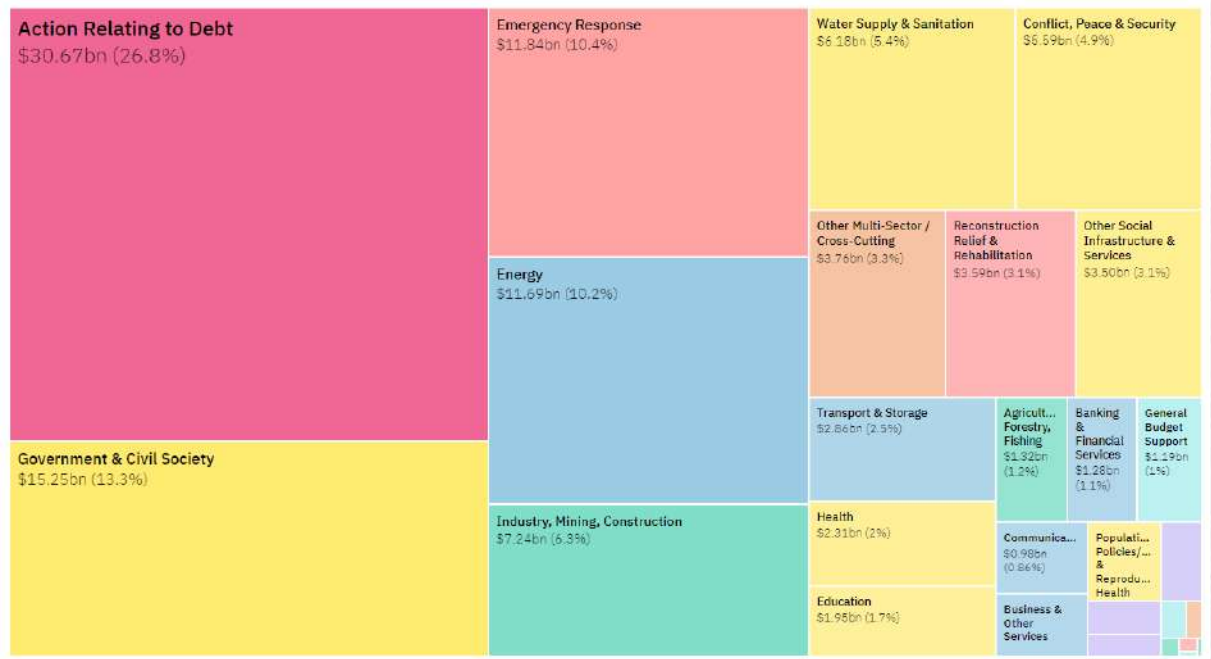
Table 23: Development Finance Allocations to Iraq by Sector (authors Calculations)

Sector	Financial Commitments	Economic Benefits
Action Relating to Debt	USD 30.7 billion	Reduced national debt burden, improved credit rating, and economic stability.
Government & Civil Society	USD 15.2 billion	Strengthened governance, enhanced public services, and improved civil society engagement.
Emergency Response	USD 11.8 billion	Addressed immediate humanitarian needs, supported disaster relief, and contributed to social stability.
Economic Infrastructure & Services	USD 9.5 billion	Improved infrastructure, boosted economic productivity, and facilitated trade.
Education and Health	USD 8.1 billion	Enhanced educational outcomes, improved public health, and supported social development.

The allocation of development finance to Iraq reflects the critical needs across various sectors, with significant investments directed towards debt relief, governance, and emergency response. These financial commitments are essential for stabilizing Iraq's economy, rebuilding its infrastructure, and addressing the urgent needs of its population. By channeling resources into these key areas, Iraq can pave the way for sustainable development and long-term economic growth.

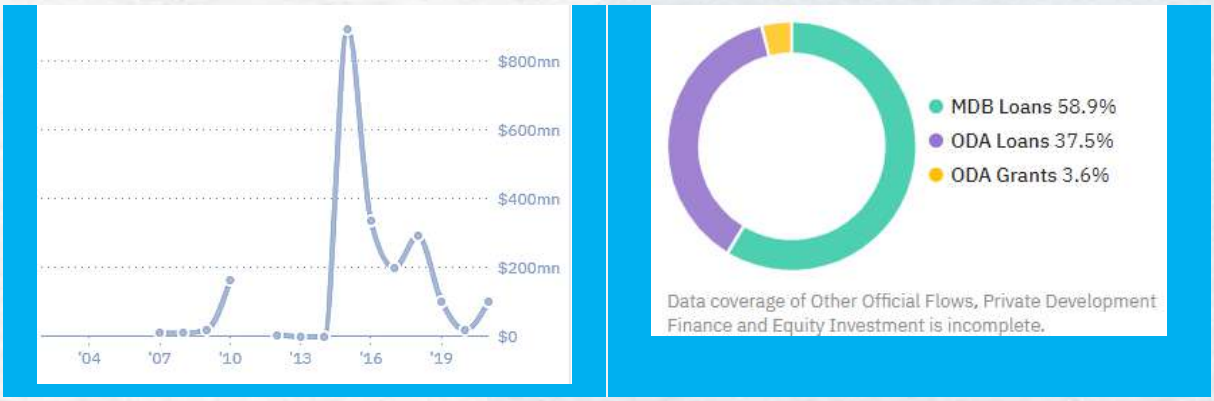
[99] *(https://www.climatepolicyinitiative.org/)*

Figure 26: Total finance by sector targeted



In climate finance directed to Iraq, a total of USD 1.74 billion (80.4%) was allocated to mitigation activities, USD 419 million (19.4%) to adaptation activities, and USD 3.88 million (0.18%) targeted both mitigation and adaptation simultaneously. Over this period, the disbursement ratio for climate-related development finance in Iraq was 53.6%, significantly lower than the global average disbursement ratio of 83.2%. This lower ratio suggests potential challenges in implementing climate projects or that some funds may have been redirected after initial approval, reflecting difficulties in effectively utilizing committed climate finance in Iraq.

Figure 27: Iraq and Climate Finance: Trend over Time (left) and Financial Instruments (right)



Development finance commitments to Iraq targeting Climate Change came from different funders and were allocated to different recipients, as shown in the figure. The largest sources of finance were the International Bank for Reconstruction and Development (USD 1.27bn), Japan (USD 706mn), and France (USD 113mn).

Figure 28:Iraq and Climate Finance: Commitments vs. disbursements (left) and Total development finance to Iraq targeting Climate Change (total) (right)

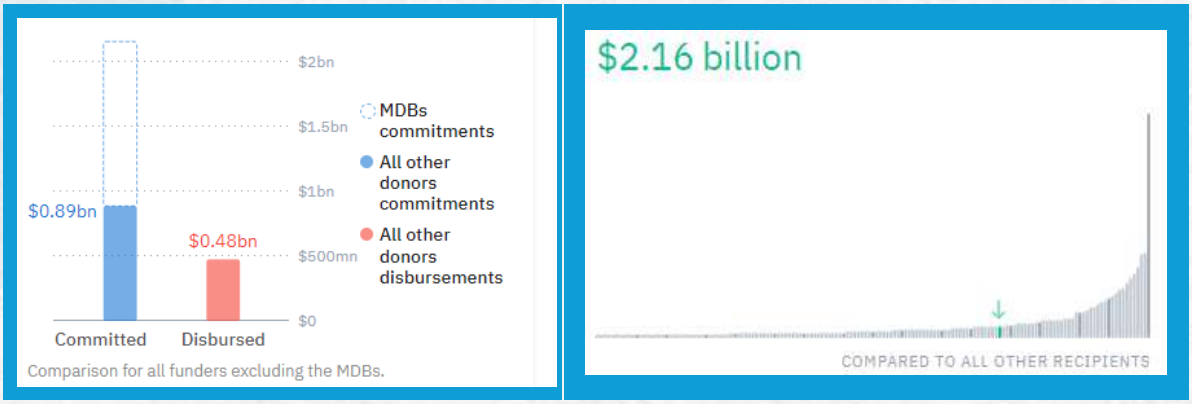
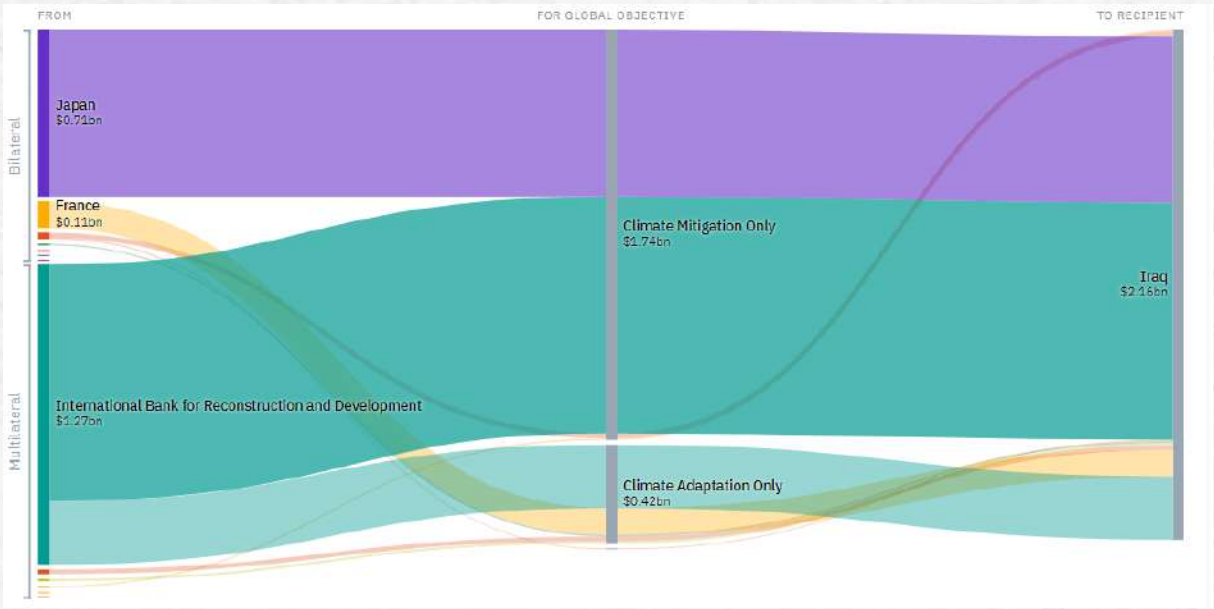


Figure 29: All recipients of development finance from All Donors in Iraq for Climate Change (total)



Development finance to Iraq targeting Climate Change is provided to different sectors, as shown in the figure below. The largest commitments were USD 801million to Energy, USD 649million to Water Supply & Sanitation, and USD 416million to Other Social Infrastructure & Services.

Figure 30: How has the finance been used? Total finance by sector targeted

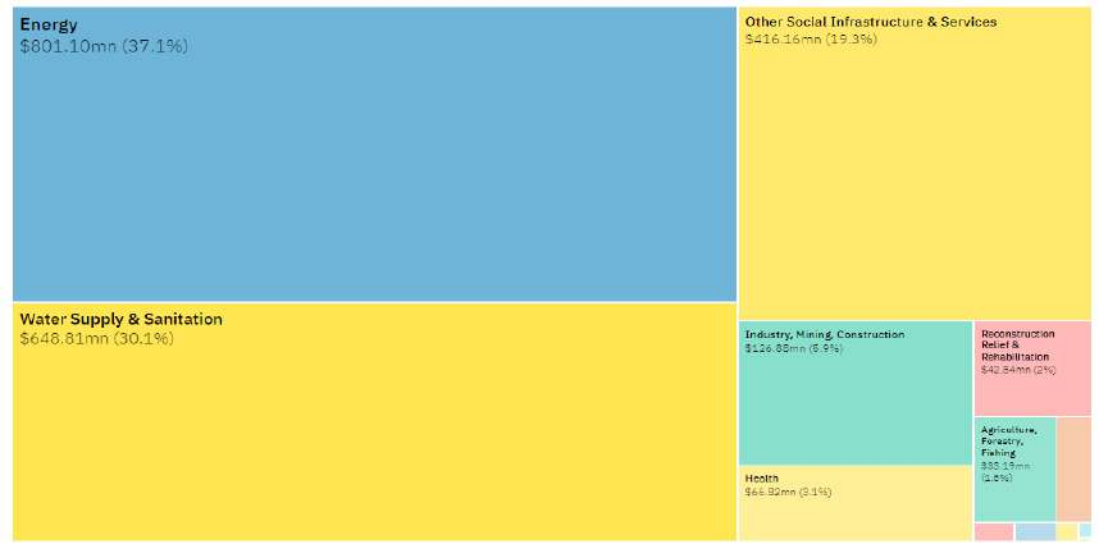


Table 24: Previous Top 10 ODA supported projects

#	Amount (USD)	Year	Donor	Recipient	Sector	Sub-Sector	Project Title
1	USD 335 million	2016	International Bank for Reconstruction and Development	Iraq	Other Social Infrastructure & Services	Social Protection	Iraq: Second Expenditure Rationalization; Energy Efficiency And State-Owned Enterprise Governance Programmatic Dpf
2	USD 297 million	2015	Japan	Iraq	Water Supply & Sanitation	Sanitation - large systems	Sewerage Construction Project in Kurdistan Region (I)
3	USD 187 million	2015	Japan	Iraq	Energy	Energy generation, non-renewable sources, unspecified	Hartha Thermal Power Station Rehabilitation Project
4	USD 141 million	2010	Japan	Iraq	Energy	Hydro-electric power plants	To improve electricity in the area
5	USD 124 million	2015	International Bank for Reconstruction and Development	Iraq	Industry, Mining, Construction	Mineral/mining policy and administrative management	Iraq Emergency Fiscal Stabilization; Energy Sustainability; & Soes Dpf
6	USD 124 million	2015	International Bank for Reconstruction and Development	Iraq	Energy	Energy generation, non-renewable sources, unspecified	Iraq Emergency Fiscal Stabilization; Energy Sustainability; & Soes Dpf
7	USD 124 million	2015	International Bank for Reconstruction and Development	Iraq	Energy	Energy policy and administrative management	Iraq Emergency Fiscal Stabilization; Energy Sustainability; & Soes Dpf
8	USD 94.6 million	2021	France	Iraq	Water Supply & Sanitation	Sanitation - large systems	Assainist/Drainage Pluvial Al Khalidiya
9	USD 90.1 million	2017	International Bank for Reconstruction and Development	Iraq	Energy	Electric power transmission and distribution (centralized grids)	Emergency Operation For Development
10	USD 85.3 million	2019	International Bank for Reconstruction and Development	Iraq	Energy	Electric power transmission and distribution (centralized grids)	Iraq: Basra Elec Dissem & Dev Prj (Eddp)

This table summarizes the projects, amounts, donors, and sectors involved in the development finance commitments to Iraq.

4. Climate Investment Opportunities Identification

Identifying climate investment opportunities in Iraq requires a comprehensive assessment of key sectors, challenges, and potential solutions. Iraq, with its diverse climate challenges ranging from water scarcity and desertification to energy transitions and infrastructure resilience, presents a landscape ripe for targeted investments. The country's rich natural resources, including solar and wind potential, fertile agricultural lands, and strategic geographical location, offer opportunities for sustainable development and climate resilience. Leveraging these opportunities involves strategic planning, stakeholder engagement, technology innovation, and financing mechanisms tailored to Iraq's unique context. By identifying and prioritizing climate investment opportunities, Iraq can unlock economic growth, enhance environmental sustainability, and build resilience to climate change impacts for a prosperous future.

4.1. Government of Iraq as a driver of change

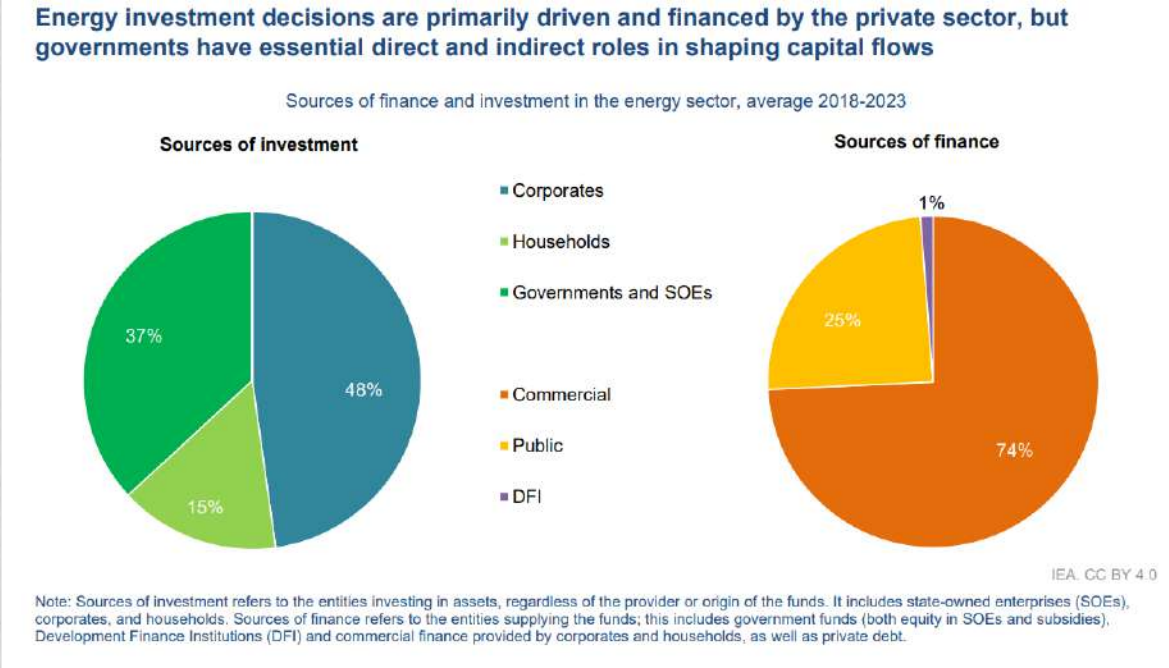
Iraq has a mixed economic system, with state-owned enterprises and the government playing an active role in the major sectors.

Table 25: SOEs per each Ministry

Sector	Number of SoE
Ministry of Industry and Minerals	28
Ministry of Electricity	24
Ministry of Oil	18
Ministry of Finance	12
Ministry of Transportation	10
Ministry of Construction, Housing, and Public Municipalities	4
Ministry of Trade	7
Ministry of Agriculture	7
Ministry of Water Resources	3

SoEs play traditionally an important role in the essential infrastructures of a country. However, economic performance can sometimes be challenging. Globally SoEs play an important role in the energy sector as shown in the below figure but are outperformed with corporate and commercial structures. The reforms of SoE are long due. In this reform process, SoE can benefit from the modernization of its administrative and operational structure while adhering to Iraq's energy transition and climate agenda

Figure 31: Sources of finance and investment in the energy sector internationally[100]



4.1.1. The leadership of State-Owned Enterprises in climate action

The Government exerts a substantial influence over the nation's economy through its involvement in state-owned enterprises (SOEs), particularly in key sectors such as energy. The government's active role not only drives economic growth but also positions it as a pivotal agent in advancing Iraq's climate goals.

To support the transition towards a low-carbon economy, various measures should be implemented within SOEs, including enhancing stakeholder engagement and promoting responsible business practices.

Additionally, the state is encouraging the adoption of international standards to ensure responsible conduct, while also advancing initiatives such as green public-private partnerships and corporate social responsibility (CSR) programs that involve SOEs.

In the marketplace, SOEs are expected to meet climate-related engagements and international expectations, which are being supported by market mechanisms like emissions trading and carbon taxes. These tools help facilitate the climate transition while ensuring that SOEs balance their commercial and non-commercial objectives. By aligning these goals, SOEs can effectively contribute to the achievement of broader climate objectives. Through strategic oversight and policy directives, Iraq can leverage SOEs to align with international climate commitments and promote a transition to a low-carbon economy. The integration of climate considerations into the operational frameworks of these enterprises is essential to ensure that Iraq meets its environmental objectives while maintaining economic stability.

[100] *https://www.iea.org/reports/world-energy-outlook-2024*

As an asset owner, the state should focus on fostering climate-change readiness by setting clear expectations and diligently tracking progress through established milestones. Active engagement with company boards, coupled with a hands-on approach to ownership, is essential. Furthermore, fostering open dialogue between stakeholders will ensure that climate objectives are met and that these enterprises contribute meaningfully to broader environmental goals.

SoE should foster a culture of corporate social responsibility and enhanced environmental governance. They could play a pivotal role in scaling up environmental and social safeguards during the implementation of projects and lead by example by defining and publishing not only economic performance indicators but also social and environmental achievements. These indicators are often used by the broader public but most importantly by prospective international investors to assess the sustainability of a project.

4.1.2. Current government achievements toward international commitments

Iraq in its different mitigation sectors has started implementing measures to reduce its carbon footprint according to international standards.

Achievements of National Determined Contributions of Iraq (1-2% NDC)

Iraq has undertaken a series of projects aimed at meeting its national determined contributions of 1-2% reduction in GHG emissions as outlined in its NDC. These efforts primarily target the energy sector, which is a significant contributor to the country's total emissions. Projects under this initiative include the conversion of simple cycle power plants to combined cycle plants, which enhances energy efficiency and reduces emissions per unit of electricity generated.

One of the most significant projects is Basra Natural Gas improved processing efficiency that has allowed to capture of flared gas and reprocessed the clean amount to supply a newly built power station for local electricity use. This project has the double benefit of increasing the efficiency of the current process as well as reducing the amounts of flared gas exhausted into the atmosphere.

The Bismayah Investment Plant Project is another step forward in the electricity sector, which adds 1,500 MW to Iraq's energy grid, bringing the total capacity to 3,000 MW by increasing the processing efficiency of the current power plant. A similar initiative is installed at the Maysan Simple Cycle to Combined Cycle Plant, which increased the capacity by 250 MW, enhancing the efficiency of power generation and contributing to emission reductions and in Erbil Gas Power station. MoE has a programme in all governorates that has started to increase and convert all gas power plants to combined cycle processes, thereby significantly reducing the carbon footprint of electricity production. [101]

In the renewable energy sector, the Ministry of Electricity allocated most of the solar farms land and contracts to achieve the 25% renewable energy share by governorate. The Ministry of Oil has implemented several solar energy projects across different regions. These include the installation of solar panels in various administrative and technical buildings for the ministry in addition

[101] *As recognized by the CDM ACM0007 methodology - https://cdm.unfccc.int/methodologies/DB/UVVSD3V6CADRJXKIKGUCFWRH3SRTKA*

to cathodic protection systems installation with solar system in some of the pipelines achieving a total of 9000 KW. Moreover, the MoO installed cathodic protection systems in some pipeline projects using solar panels, with a total amount installed of 9000 kilowatts. These projects are designed to be bundled with similar initiatives from other ministries to maximize their impact on reducing GHG emissions.

The Ministry of Municipalities and Tourism of KRI is also contributing to the reduction in GHG emissions through the recently completed solid waste treatment plants in Amedi, Kwashi, Sulaymaniyah, and Gdraseen Akrev that are using mechanical biological treatment with composting and safe landfill treatment processes.

Through these initiatives, Iraq is making measurable progress toward its compulsory NDC targets, laying the foundation for more ambitious voluntary commitments in the future. The government continues to monitor and report on these projects, ensuring that they meet both national and international climate goals.

This analysis highlights Iraq's strategies and progress in meeting its compulsory NDC targets, emphasizing the role of energy sector projects in achieving thes e goals.

Table 26: Iraq's achievement towards the 2% unconditional GHG reductions in accordance with NDC 2021

Project Name	Project-End date	Financial Investment ($)	Description	UNFCCC Methodology POTENTIAL	GHG reduction [ton CO2e/ Year] ESTIMATION
Basra Natural Gas (First Stage) (BNGL1) (200 mmscf)	5/30/2023	858,000,000	Construction and operation of a power plant that supplies electricity to the grid and uses permeate gas, low heating value off-gas resultant from the processing of natural gas, as fuel to operate the power plant.	AM009	3,125,531.50
Bismayah Investment Plant Project - Phase I with an added capacity of 1500 MW with a total capacity of 3000 MW = 4500 MW	12/31/2025		Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	258,094.48
Conversion of Maysan Simple cycle to combined cycle with an added capacity of 250 MW to bring the total capacity to 750 MW	12/31/2025		Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	43,015.77
Replacing the fuel used in cement manufacturing kilns (gas instead of black oil) by 100%/ Iraqi cement state CO.	1/1/2022		The fossil fuel switching in new or existing industrial, residential, commercial, institutional, or electricity generation applications.	AMS-III.B.	12,474.00
Replacing the fuel used in cement manufacturing kilns (gas instead of black oil) by 50%/ Iraqi cement state CO.	1/1/2022		The fossil fuel switching in new or existing industrial, residential, commercial, institutional, or electricity generation applications.	AMS-III.B.	4,573.80
The fossil fuel switching in new or existing industrial, residential, commercial, institutional, or electricity generation applications.	1/1/2022		The fossil fuel switching in new or existing industrial, residential, commercial, institutional, or electricity generation applications.	AMS-III.B.	2,079.00
Activities for adoption of energy-efficient light bulbs (e.g. CFLs and LED lamps) to replace less efficient light bulbs in residential applications.	31/12/2021		Activities for adoption of energy efficient light bulbs (e.g. CFLs and LED lamps) to replace less efficient light bulbs in residential applications.	AMS-II.J.	521.22
Capture of landfill gas (LFG) and its flaring and/or use to produce energy and/or use to supply consumers through natural gas distribution networks or trucks.	6/22/2025		Capture of landfill gas (LFG) and its flaring and/or use to produce energy and/or use to supply consumers through natural gas distribution network or trucks.	ACM0001	580,192.62
Solid waste treatment plant in Kwashi, Sulaymaniyah, Grdaseen-Akre, Amedi (Mechanical Biological Treatment (MBT) (Waste Sorting Plant, Windrow Composting) and Landfill).	28/09/2023		Recovery and recycling of materials from solid wastes	AMS-III.AJ	271.675.00
Conversion of Erbil Simple cycle to combined cycle to bring the total capacity to 1000 MW	10/2017		Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	122,902.00

Conditional Commitments towards GHG emissions reduction (15% NDC)

Iraq's voluntary commitment to reduce GHG emissions by 15% under its NDC involves a series of projects across various sectors, including environment, agriculture, energy, waste, and water management. These projects are essential for Iraq's broader climate goals, focusing on sustainability, biodiversity, and reducing emissions through innovative practices and technological advancements.

Key projects include:

- **Mangrove Planting Project in Al-Kabir Port:** This environmental project led by the Ministry of Transportation aims to rehabilitate degraded mangrove habitats, utilizing methodologies for afforestation and reforestation. It plays a crucial role in carbon sequestration and enhancing coastal ecosystems.
- **Trees of Your City Campaign:** Initiated by the Ministry of Higher Education and Scientific Research, this project targets desertification by promoting urban forestry. It's part of a broader effort to enhance urban green spaces and combat the adverse effects of climate change.
- **Combined Cycle Plants:** These energy projects, under the Ministry of Electricity, involve the conversion of simple cycle power plants to combined cycle plants. This upgrade significantly improves energy efficiency and reduces GHG emissions in the electricity sector.
- **Solar Energy Projects** from the Ministry of Electricity are the first step forward in energy sources diversification. The country is intending as well to install renewable energies in most of its administrative buildings contributing to Iraq's renewable energy capacity and reducing reliance on fossil fuels.
- **Waste Management Initiatives:** These projects involve the development of waste sorting plants and sanitary landfills, managed by the Baghdad Municipality and Ministry of Housing and Construction. The Ministry of municipalities and tourism in KRI is continuing its efforts in improved waste management through the MBT and composting processes projects such as in Zaxo and Chamchmal. They are crucial for improving waste management practices and reducing methane emissions from waste.

These voluntary commitments demonstrate Iraq's proactive approach to mitigating climate change by integrating sustainable practices across various sectors. The successful implementation of these projects will be instrumental in achieving the 15% GHG reduction target, contributing to global climate efforts while fostering local environmental resilience.

However substantive international funds are required to sustain the national efforts towards low carbon transition in Iraq.

Achievement towards Methane Pledge

As a signatory to the Global Methane Pledge, Iraq is committed to reducing methane emissions by 30% by 2030. The government has prioritized addressing methane leaks in the oil and gas sector, where SOEs are predominant. By upgrading infrastructure and adopting best practices in methane management, Iraq is making significant strides toward fulfilling this commitment. These efforts not only contribute to the global reduction of methane emissions but also improve the efficiency and environmental performance of Iraq's mitigation sector.

These projects are already being implemented and have already contributed to a significant amount of methane reduction (up to 42%). The SoE are in the process of installing the required advanced measurement equipment to start the monitoring activities.

The Road towards Zero Waste

In its pursuit of sustainability, Iraq is also focusing on a zero-waste strategy. The government is spearheading initiatives to enhance waste management systems, promote recycling, and develop waste-to-energy projects.

Notable among these initiatives is the development of sanitary landfills across various governorates, including Kerbala, Salah Al-Din, Al-Muthanna, Al-Qadissiya, Diyala, Maysan, Ninewa, and ThiQar, Duhok and Sulaymaniah. These projects are designed not only to manage waste more effectively but also to mitigate environmental impacts by integrating modern waste management practices such as landfill gas flaring and waste-to-energy conversion. Moreover, initiatives like the recycling of used tires and the production of electrical energy from waste further emphasize Iraq’s commitment to reducing waste generation. These efforts align with the broader international goals of promoting a circular economy and achieving significant reductions in waste, particularly in urban areas. Success in these projects will be crucial for Iraq as it seeks to meet its long-term sustainability targets and contribute to global environmental goals.

These efforts are critical in reducing the environmental impact of waste, particularly in urban areas, and are aligned with international goals of reducing waste generation and promoting a circular economy. The success of these initiatives will be vital in achieving Iraq’s long-term sustainability goals.

The projects contributing to the methane pledge and zero waste initiative are listed in the next table highlighting the main projects under implementation for 2025 – 2030 and contributing to the conditional commitments of Iraq

Table 27: Implementation of the unconditional commitments of Iraq

Project Name	Project-End date	Financial Investment ($)	Description	UNFCCC Methodology POTENTIAL	GHG reduction [ton CO2e/ Year] ESTIMATION
Mangrove planting project in Al -Kabir Port	1/12/2025	330,000	Afforestation/reforestation of degraded mangrove habitats.	AR-AM0014	105.00
Trees of Your City campaign.		100,000	Afforestation/reforestation of lands other than wetlands.	AR-ACM0003	105.00
Dune Stabilization	12/31/2027	16,670,000	Afforestation/reforestation of lands other than wetlands.	AR-ACM0003	70.00
Dune Stabilization	12/31/2027	6,000,000	Afforestation/reforestation of lands other than wetlands.	AR-ACM0003	70.00
Dune Stabilization	12/31/2027	2,000,000	Afforestation/reforestation of lands other than wetlands.	AR-ACM0003	70.00
Dune Stabilization	12/31/2027	8,000,000	Afforestation/reforestation of lands other than wetlands.	AR-ACM0003	70.00
Dune Stabilization	12/31/2027	12,000,000	Afforestation/reforestation of lands other than wetlands.	AR-ACM0003	70.00
Green Belt	9/27/2025		Afforestation/reforestation of lands other than wetlands.	AR-ACM0003	1,050.00
Development and improvement of forests and cultivation of eucalyptus trees	12/31/2027	4,000,000	Afforestation/reforestation of lands other than wetlands.	AR-ACM0003	140
Development and improvement of forests and cultivation of eucalyptus trees	12/31/2027	5,250,000	Afforestation/reforestation of lands other than wetlands.	AR-ACM0003	140
Development and improvement of forests and cultivation of eucalyptus trees	12/31/2027	1,300,000	Afforestation/reforestation of lands other than wetlands.	AR-ACM0003	140
Development and improvement of forests and cultivation of eucalyptus trees	12/31/2027	1,300,000	Afforestation/reforestation of lands other than wetlands.	AR-ACM0003	140
Development and improvement of forests and cultivation of eucalyptus trees	12/31/2027	1,300,000	Afforestation/reforestation of lands other than wetlands.	AR-ACM0003	140
Development and improvement of forests and cultivation of eucalyptus trees	12/31/2027	1,300,000	Afforestation/reforestation of lands other than wetlands.	AR-ACM0003	140
AlHamad Sinks	12/31/2027	15,699,000	Afforestation/reforestation of lands other than wetlands.	AR-ACM0003	140
Samawa combined cycle Plant - with an added capacity of 250 MW for a total capacity of 750 MW	12/31/2025		Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	106,407.35
Dhi Qar combined cycle Plant - with an added capacity of 250 MW for a total capacity of 750 MW -	12/31/2025		Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	106,407.35
Solar Energy for Administration Building and Roads in North Gas Company (NGC) (29 KW)	4/19/2023		Generation of electricity from the zero-emission renewable energy sources such as wind, geothermal, solar, hydro, wave, and/or tidal projects that displaces electricity produced from a specific fossil fuel plant.	AM0019	12.39
New Basra Natural Gas (First Stage) (BNGL1) (200 mmscf)	1/1/2025	858,000,000	Construction and operation of a power plant that supplies electricity to the grid and uses permeate gas, low heating value off-gas resultant from the processing of natural gas, as fuel to operate the power plant.	AM009	3,125,531.50
Halfaya Gas Investment Project (300 mmscf)	6/7/2024	1,094,000,000	Construction and operation of a power plant that supplies electricity to the grid and uses permeate gas, low heating value off-gas resultant from the processing of natural gas, as fuel to operate the power plant.	AM009	4,133,179.22
Nasriya & Garraf Gas Investment Progect (200 mmscf)	1/1/2026	487,000,000	Construction and operation of a power plant that supplies electricity to the grid and uses permeate gas, low heating value off-gas resultant from the processing of natural gas, as fuel to operate the power plant.	AM009	3,125,531.50

Al-Faihaa Gas Investment Project (130 mmscf)	1/1/2026		Construction and operation of a power plant that supplies electricity to the grid and uses permeate gas, low heating value off-gas resultant from the processing of natural gas, as fuel to operate the power plant.	AM009	1,791,044.33
Bin Omer Gas Investment Project (2-stages 150 + 150 mmscf)	1/2/2028		Construction and operation of a power plant that supplies electricity to the grid and uses permeate gas, low heating value off-gas resultant from the processing of natural gas, as fuel to operate the power plant.	AM009	4,133,179.22
Manufacturing economical lamps (LED) with a production capacity of one million units annually/ state company for electrical and electronic industry	1/1/2027	1,000,000	Activities for adoption of energy efficient light bulbs (e.g. CFLs and LED lamps) to replace less efficient light bulbs in residential applications.	AMS-II.J.	26,061.00
Al Buaitha landfill	11/30/2024		Capture of landfill gas (LFG) and its flaring and/or use to produce energy and/or use to supply consumers through natural gas distribution network or trucks.	ACM0001	193,397.40
Establishing conversion stations for and to Waste transfer and distribution Centres	6/14/2025				12,893.16
Mass Transportation project	1/2/ 2030		Establishment and operation of rail-based or bus-based mass rapid transit systems in urban or suburban regions for passenger transport by replacing a traditional urban bus-driven public transport system.	ACM0016	1251.6
Bus Rapid Transit Routes Project (BRT)	1/10/ 2030		Construction and operation of a new bus rapid transit system (BRT) for urban transport of passengers. Replacement, extensions or expansions of existing bus rapid transit systems (adding new routes and lines) are also allowed.	AM0031	19.418
(275x2) AlDoura Project – Grand Anbar Station	1/1/2028	467,500,000	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	47,317.34
(10×104)+520 Conversion of Al-Khairat gas station to the combined cycle	1/1/2028	442,000,000	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	89,472.74
(3*169) Beiji Gas Project II Combined Cycle	1/1/2028	430,950,000	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	43,617.98
(6*125)+375 Conversion of Qayyarah gas station to combined cycle	1/1/2028	318,750,000	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	64,523.62
(2*169) Baiji AlAwla Gas station Combined Cycle Project	1/1/2028	287,300,000	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	29,078.63
(2×160)+160 Conversion of Sadr/1 gas station to combined cycle	1/1/2028	279,650,000	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	27,530.09
Nasiriyah Gas Plant Project Phase II (329) Combined Cycle	1/1/2028	279,650,000	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	28,304.36
(4×182)+364 Conversion of Mansourieh gas station to combined cycle	1/1/2028	239,900,642	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	62,630.89

(265+292)+278 Conversion of Kirkuk gas station to combined cycle	1/1/2028	236,000,000	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	47,919.55
Combined Cycle Project for Najibia Gas Station	1/1/2028	212,500,000	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	43,015.77
(4×125)+250 Conversion of Al-Haidariyah/1 gas station to combined cycle	1/1/2028	212,500,000	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	43,015.77
(4×125)+250 Conversion of Al-Quds/1 gas station to combined cycle GE	1/1/2028	212,500,000	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	43,015.77
Conversion of Al-Quds / 3 gas station to the combined cycle simple units GE Hyundai / 250+(125×4) (14,13,12,11)	1/1/2028	212,500,000	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	43,015.77
(4×125)+250 Conversion of Diwaniyah Gas Station to Combined Cycle Shanghai	1/1/2028	196,208,000	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	43,015.77
Haidariya Project Grant Complex Course (180) Iranian Maabna Company	1/1/2028	153,000,000	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	15,485.68
(169) Combined Cycle Project for Debs Gas Station (Sunir)	1/1/2028	143,650,000	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	27,530.09
(2×125)+125 Conversion of Khor Al Zubair gas station to the combined cycle Dong Fong	1/1/2028	106,188,000	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	21,507.85
(2×125)+125 Conversion of Najaf gas plant to combined cycle Shanghai	1/1/2028	104,328,900	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	21,507.85
(2×125)+125 Conversion of Karbala Gas Station to Combined Cycle Shanghai	1/1/2028	104,000,000	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	21,507.85
(2×125)+125 Conversion of Hilla gas station to combined cycle	1/1/2028	99,128,500	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	21,507.85
(2×125)+125 Conversion of South Baghdad/1 gas station to combined cycle	1/1/2028	93,927,000	Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.	ACM0007	21,507.85
Al-Ramadi Sanitary landfill	11/5/2025	1,000,000	Capture of landfill gas (LFG) and its flaring and/or use to produce energy and/or use to supply consumers through natural gas distribution networks or trucks.	ACM0001	38,679.20
Kerbala Sanitary landfill	12/31/2030	20,000,000	Capture of landfill gas (LFG) and its flaring and/or use to produce energy and/or use to supply consumers through natural gas distribution networks or trucks.	ACM0001	99,288.70
Tikrit Sanitary landfill	12/31/2030	20,000,000	Capture of landfill gas (LFG) and its flaring and/or use to produce energy and/or use to supply consumers through natural gas distribution network or trucks.	ACM0001	129,964.10
Al-Samawa Sanitary landfill	12/31/2030	20,000,000	Capture of landfill gas (LFG) and its flaring and/or use to produce energy and/or use to supply consumers through natural gas distribution networks or trucks.	ACM0001	66,347.12
Al-Diwanya Sanitary landfill	12/31/2030	20,000,000	Capture of landfill gas (LFG) and its flaring and/or use to produce energy and/or use to supply consumers through natural gas distribution network or trucks.	ACM0001	105,180.53

Baaquba Sanitary landfill	12/31/2030	20,000,000	Capture of landfill gas (LFG) and its flaring and/or use to produce energy and/or use to supply consumers through natural gas distribution networks or trucks.	ACM0001	133,385.35
Alimaraa sanitary landfill	12/31/2030	20,000,000	Capture of landfill gas (LFG) and its flaring and/or use to produce energy and/or use to supply consumers through natural gas distribution networks or trucks.	ACM0001	90,649.44
Al-Musel sanitary landfill	12/31/2030	20,000,000	Capture of landfill gas (LFG) and its flaring and/or use to produce energy and/or use to supply consumers through natural gas distribution networks or trucks.	ACM0001	303,882.81
AL-Nasiria sanitary landfill	12/31/2030	20,000,000	Capture of landfill gas (LFG) and its flaring and/or use to produce energy and/or use to supply consumers through natural gas distribution network or trucks.	ACM0001	170,693.74
Al-Kut sanitary landfill	12/31/2030	20,000,000	Capture of landfill gas (LFG) and its flaring and/or use to produce energy and/or use to supply consumers through natural gas distribution networks or trucks.	ACM0001	112,325.85
Solid waste treatment plant in Zaxo,and Chamchmal (Mechanical Biological Treatment (MBT) (Waste Sorting Plant, Windrow Composting) and Landfill).	01/07/2025	90,000,000	Recovery and recycling of materials from solid wastes	AMS-III.AJ	92,094

Table 28: Summary of estimation of Iraq's achievement in GHG reduction 2024 – 2030 (authors estimations)

ESTIMATIONS		2024	2025	2026	2027	2028	2029	2030
Population		44,414,794	45,520,477	46,639,925	47,771,925	48,914,100	50,061,500	51,211,700
Per capita emissions (3.8 tons in 2021)		4.75	4.80	4.85	4.90	4.95	5.00	5.05
Total Estimated Country CO2e emissions [ton/year]		244,993,103	301,376,951	312,005,016	322,872,321	333,965,234	345,251,724	356,715,979
Sectorial GHG Emission distribution [ton/year]								
Energy sector	72.5%	177,620,000	218,498,290	226,203,636	234,082,433	242,124,795	250,307,500	258,619,085
Transport	12.2%	29,889,159	36,767,988	38,064,612	39,390,423	40,743,759	42,120,710	43,519,349
Waste	10.7%	26,287,760	32,337,747	33,478,138	34,644,200	35,834,470	37,045,510	38,275,625
Agriculture	3.18%	7,790,781	9,583,787	9,921,759	10,267,340	10,620,094	10,979,005	11,343,568
IPPU	1.36%	3,331,906	4,098,727	4,243,268	4,391,064	4,541,927	4,695,423	4,851,337
Paris Agreement GHG Reduction commitments [ton/year]								
Unconditional reduction	2%	4,899,862	6,027,539	6,240,100	6,457,446	6,679,305	6,905,034	7,134,320
Conditional reduction	15%	36,748,966	45,206,543	46,800,752	48,430,848	50,094,785	51,787,759	53,507,397
GHG Emission Reduction achievements [ton/year]								
Energy sector		3,168,547	6,764,988	11,681,564	11,681,564	16,620,772	16,620,772	16,620,772
Transport					1,271	1,271	1,271	1,271
Waste		454,439	493,119	493,119	493,119	493,119	493,119	1,605,548
IPPU		19,648	19,648	19,648	19,648	45,709	45,709	45,709
Total GHG reduction		3,642,635	7,277,755	12,194,330	12,195,601	17,160,871	17,160,871	18,273,300
2% unconditional		(1,257,227)	1,250,216	5,954,230	5,738,155	10,481,566	10,255,836	11,138,980
15% conditional		(33,106,331)	(37,928,788)	(34,606,422)	(36,235,247)	(32,933,914)	(34,626,888)	(35,234,097)

The GHG reductions estimated to be achieved by 2030 are illustrated in the table above. The table demonstrates the commitment of the country to a cleaner future while promoting a just and fair transition to a low-carbon economy. The country is set to achieve its target of 2% GHG emissions reductions for each year except 2024. The country is exceeding its target for the following years up to 2030. The cumulative GHG reductions from 2024 to 2030 are exceeded. However international technical and financial cooperation is still required to fully meet the 15% GHG reduction by 2030. The country is dedicated to transitioning towards a cleaner environment for its citizens and to certainly achieving its international commitments.

SUMMARY:

The transition to low low-carbon economy for Iraq has substantial implications and requires huge amounts of upfront costs that cannot be sustained with its national budget only.

Sectorial estimation	Investment Required (USD)	Expected Annual Economic Benefits (USD)
Water Resources Management	7.5 billion	7.95 billion
Agriculture	5.1 billion	8.3 billion
Biodiversity and Ecosystem protection	2.15 billion	1.1 billion
Health sector	600 million	2.5 billion
Infrastructures	2.87 billion	2.5 billion
Education	0.85 billion	0.85 billion
Tourism	0.53 billion	0.53 billion
Oil and Gas Transition	11.8 billion	14.6 billion
Electricity	23.25 billion	8.7 billion
Transportation	13.4 billion	9.8 billion
Industries	7.95 billion	4.1 billion
Waste and Wastewater Circular Economy	7.05 billion	3.4 billion

A careful and stepwise approach to the transition would require an active role from direct and indirect foreign investment directed in the specific areas that will pave the long-term transition. The successful implementation of these programs and projects requires enhanced participation of the private sector.

After regular stakeholder consultations, the following chapter presents the required investment needs to align with the international commitments of the country with international support not only to achieve GHG reduction but also to make the vulnerable areas and communities of Iraq more climate resilient.

4.2. Scaling up low carbon transition in Iraq

Developing a robust financing strategy and utilizing appropriate financial instruments are essential for unlocking climate investment opportunities in Iraq. The financing strategy should align with Iraq's climate goals, prioritize sustainable development, and mobilize resources effectively. Although climate tagging is not yet implemented in Iraq, the country has already started investing in measures to reduce its carbon footprint and increase the share of renewable energy in the energy mix. However, the careful selection of financial instruments is crucial to ensure a successful implementation of the projects in a volatile and fragile regional context.

Moreover, the country has yet to build its climate finance strategy in accordance with the Paris Agreement Art. 2.a (c) and the required monitoring reporting and verification mechanisms under Art. 6. As such in this transitional phase, while the country builds its climate finance framework in the upcoming years, the country must be supported in its efforts.

The technical committee of the CIP has worked very hard to select pipelines of projects that align with the needs of the country in adaptation and mitigation. The projects highlighted are a selection of projects that align with the priorities identified during the CIP workshops for the period 2025 – 2030. Financial needs represent initial estimates.

Below is a list of combinations of financial tools that are deemed appropriate for the country in consideration of the priority's streams of funding for 2025 – 2030. Additional projects, however, are required to be added to fully cover the transitional period.

4.2.1. Identified priorities

Iraq's transition to a low-carbon economy is guided by several key priorities to achieve sustainable development. Central to this strategy is the energy transition through firstly enhancing energy efficiency across various sectors while introducing renewable energy sources, particularly solar and wind power gradually.

Waste management and the promotion of a circular economy are also prioritized. Iraq is developing comprehensive strategies that include recycling initiatives, waste-to-energy projects, and the establishment of modern sanitary landfills equipped with advanced waste treatment technologies. These efforts are essential for mitigating the environmental impact of waste, reducing pollution, and supporting broader sustainability objectives.

In the industrial sector, optimization of processes to improve energy efficiency and reduce carbon emissions is a major focus. This transition has already started in the cement industry for example or through the installation of combined cycle in the power generation but scaling up is required. This includes increasing the implementation of waste heat recovery systems and the adoption of cleaner fuels in manufacturing processes. Such measures are critical for minimizing the environmental impact of Iraq's industrial activities and fostering sustainable industrial growth.

Urban development and green infrastructure initiatives are being promoted to support Iraq's low-carbon transition. This includes the development of sustainable urban infrastructure, such as green buildings, energy-efficient public transport systems, and the expansion of green spaces in urban areas. Additionally, sustainable agricultural practices and improved land use management are being emphasized to enhance food security, improve water management, and address land degradation, all of which contribute to Iraq's overall sustainability goals.

The key, however, to the economic diversification that is critically needed is the empowerment and modernization of the agriculture and water sectors. Dedicated funding streams were identified that are focusing on strengthening the agriculture and water sectors resilience to climate change.

The full list of priorities identified with the stakeholder consultations are listed under Table 36 in conjunction with the national documents identifying the priority technologies, the priorities sustainable development indicators and the priority areas for SME investments. These priorities provide a valuable opportunity to scale up private investments in Iraq.

The consultation with stakeholders has also led to the identification of main funding streams that are necessary to tackle in the next five years to fast track the national efforts towards a low carbon transition.

These funding streams are discussed in more detail in the following chapters. Finally, the following table provides an overview of specific investments initiatives with high potential for fast-tracking the diversification of the economy while strengthening the resilience to climate change.

Table 29: Key sectorial priorities for the transitional period 2025-2030 (authors estimations)

Initiative	Investment Required (USD)	Expected Annual Economic Benefits (USD)	Description
Modernizing Cement Production	1 billion	500 million	Upgrading cement production technologies to reduce energy consumption and greenhouse gas emissions.
Implementing Cleaner Technologies in Petrochemicals[102]	2.75 billion	412.5 million	Integrating cleaner technologies in the petrochemical industry to reduce emissions and improve waste management.
Energy Efficiency in Metal Processing	600 million	400 million	Investing in energy-efficient equipment for metal processing to reduce energy costs.
Promoting Recycling and Material Recovery	1.5 billion	300 million	Developing infrastructure for recycling and material recovery to reduce raw material costs.
Sustainable Agriculture[103]	1.5 billion	150 million	Investing in sustainable agricultural practices to improve crop yields and soil health.
Protection ecosystems	1.8 billion	800 million	Increasing carbon sequestration through reforestation and afforestation efforts.
Combating Land Degradation	500 million	600 million	Investing in soil restoration and management to enhance agricultural productivity.
Promoting Agroforestry	400 million	500 million	Establishing agroforestry systems to improve crop diversity and yields.
Livestock Management	300 million	100 million	Investing in sustainable livestock systems to increase meat and dairy productivity
Resilient Water Management	2.5 billion	1.0 billion	Sustainable and efficient water management including storages
Waste and Wastewater Circular Economy	2.0 billion	300 million	Significant reduction in greenhouse gas emissions: Enhanced environmental compliance and potential for international funding.
Sustainable Cities	4.0 billion	1.0 billion	Meet the high demand for housing and accommodation while avoiding extensive GHG emissions
Low Carbon & Public Transportation	3.0 billion	600 million	Reduced traffic congestion and pollution while providing affordable transportation
Gas capture and reuse	5.0 billion	1.0 billion	Increased energy efficiency and GHG avoidance
Transmission lines and transformers	10.0 billion	TBD	Enabling better energy transfers, reducing loads, and stabilizing power supply, which will, in turn, support development across other sectors.

4.2.2. Funding Stream 1: Research, and Transfer of Technology & Innovation grants

Iraq's transition towards a sustainable, low-carbon economy with resilient infrastructures necessitates robust research and innovation to drive forward technological advancements and policy frameworks. Research and innovation grants are designed to support projects that focus on developing new technologies, methodologies, and strategies for addressing climate change. This includes initiatives aimed at improving renewable energy technologies, enhancing energy efficiency, and advancing waste management systems on one hand, the use of climate-resilient materials in construction, and the introduction of smart technologies in the water and agriculture sectors.

[102] *Based on the assumption of ROR value of 15%*
[103] *Assuming ROR of 10%*

The funding stream emphasizes collaboration between academic institutions, research centers, and the private sector to foster innovation that aligns with Iraq's climate needs and economic sustainability goals and with the needs of the companies. This funding stream should be driven by international private companies and investors in applied research and technology transfer partnerships through for instance capacity building developed in dedicated training centers and laboratories.

Given the transversal nature of R&D in climate change, approximately 5 to 7 % of the total investment needs across various sectors should be allocated to selected research and innovation projects. This ensures a continuous pipeline of innovative solutions and technological advancements.

Furthermore, the national documents recently approved, the technology needs assessment for mitigation and adaptation are valuable assessment documents to be used to scale up tailored technology transfers. The Building Research Department, hosted under the Ministry of Housing and Construction, has completed several studies to develop practical adapted solutions for the climate conditions in Iraq (use of construction, industrial and agricultural waste in the manufacture of concrete and building materials with good thermal insulation, using modern technologies (nanotechnology, etc).

Based on a set of identified projects discussed with the government, an allocation related to the technologies specified of total R&D Investment amounts to $10,930,000.

In conjunction with international private sector partners, this funding stream also focuses on capacity-building initiatives such as waste-to-energy projects, smart irrigation systems, ecosystem protection setups, and the establishment of biodiversity labs. These initiatives aim to enhance technical knowledge, infrastructure, and practices, fostering innovation and improving environmental management, and be beneficial for skills development in Iraq.

A selection of universities and research institutes dedicated to climate change is presented in Annex IV

4.2.3. Funding Stream 2: Adaptation priority areas

Adaptation to climate change is a pressing concern for Iraq, particularly in areas such as water scarcity, desertification, and the increasing frequency of extreme weather events. This funding stream focuses on providing co-financing for water infrastructure projects that are essential for building resilience against climate change impacts. Projects such as irrigation systems, flood protection, and water treatment facilities are prioritized to ensure water security and sustainable management of water resources. Additionally, international guarantee funds will offer co-guarantees for agricultural projects and initiatives aimed at combating desertification, enhancing the financial security of investments in these critical areas.

Table 30: Proposed projects under Adaptation

Sector	Sub-Sector	Project Name	Investment Needs (USD)	Financial instruments
Agriculture	Desertification	Various projects in ThiQar, Al-Qadissiya, Maysan, Salah Al-Din, Al-Muthanna, Duhok, Erbil	$44,670,000	Grants, PES
	Ecosystem	Various projects in Baghdad, Wassit, Al-Anbar, Ninewa, Kirkuk, Diyala, Duhok, Erbil	$17,849,000	Grants, PES
	Food Security		$750,000	Grants, R&D
	Plant Breeding	For each governorate specific plant breeding species	$62,820,000	Grants, R&D
	Plant Gene Bank	Creation of a native gene bank for the country	$30,000,000	Grants, R&D
Environment	Biodiversity	Mangrove planting project in Al-Kabir Port	$330,000	Grants, Article 6 of the Paris Agreement, PES
	Land Use	Reclamation of sabkha (fallow) soil through cultivation of two local plants: Iraqi henna and the jet plant	$100,000	Grants, R&D
	Ecosystem	Green-Belt Climate change platform (Electronic library)	$150,000	Grants, R&D, PES
Waste	Solid Waste	Waste sorting plants Project of Purifying and recycling waste oil spills (OSS system)	$1,250,000,000	Grants, Loans, PPPs
Water	Water Management	Update the rainfall maps of the agricultural areas for Nineveh Governorate in line with climate changes	$25,000	Grants
	Water Treatment	Saqlawiya trocar	Not specified	Grants, Loans

The identified investment needed over the next five years so far for this adaptation funding stream amounts to approximately USD 171.3 million. The scale of adaptation measures needed to safeguard Iraq's natural resources and livelihoods against climate require however much more financial and technical support. This funding stream will need to be increased

Key financial instruments needed:

Grants: Many of these projects require grants, particularly in areas like desertification, ecosystem restoration, and food security. Grants are essential for initiating projects with high public benefits but low immediate financial returns, such as biodiversity conservation and water management initiatives.

Payments for Ecosystem Services (PES) / Result-Based Payments: It can incentivize landowners and communities to manage natural resources sustainably. PES are often used for projects that provide ecosystem services, such as mangrove planting and green belt creation, contributing to both carbon sequestration and habitat restoration.

R&D needs R&D investments are necessary to support innovation in plant breeding, soil reclamation, and the development of climate-resilient agricultural practices. These funds can drive technological advancements that enhance agricultural productivity and sustainability under changing climate conditions.

Loans + PPPs: Large-scale infrastructure projects, such as waste sorting plants and water treatment facilities, require substantial capital investment (CAPEX). Loans and PPPs are common financial instruments for mobilizing the required funds, enabling the implementation of these high-cost projects while sharing risks and returns between the public and private sectors.

Article 6 of the Paris Agreement: This mechanism is more and more used for adaptation (for the co-benefits) and is part of the international cooperation on carbon markets. Leveraging Article 6 can help finance projects that generate carbon credits, such as the mangrove planting initiative, by selling these credits to countries or companies seeking to offset their emissions.

Rationale for the selection of the financial instruments:

Many adaptation projects typically have a low Internal Rate of Return (IRR) due to their focus on long-term environmental and social benefits rather than immediate financial gains. This characteristic necessitates the need for strategic financial preparation and the identification of appropriate donors and funding sources and specific financial instruments such as grants. To enhance the attractiveness of these projects to private investors, for instance, a robust project monitoring system is expected to set clear indicators and engage in international auditing.

This approach of the CIP is aimed at reassuring private investors by demonstrating accountability, transparency, and the potential for measurable outcomes. Additionally, international auditing can serve as a guarantee of the project's credibility, thereby facilitating greater confidence among investors and donors.

4.2.4. Funding Stream 3: Combined adaptation and mitigation projects

This funding stream supports projects that simultaneously address adaptation and mitigation challenges in Iraq, particularly targeted at wastewater contamination, and integrates both adaptation and mitigation components. These projects aim to reduce the environmental impact of wastewater while ensuring infrastructure and communities are resilient to climate change. By aligning adaptation with mitigation, these projects

This funding stream focuses on projects that aim to reduce GHG across various sectors and contribute to a resilient economy, including energy, waste management, and transportation. By prioritizing projects such as energy efficiency improvements, and sustainable waste management, Iraq can significantly lower its carbon footprint while fostering sustainable development. The Ministry of transportation in federal and in the KRI region have ambitious projects of public transportation, most notably the Baghdad Metro Skytrain, the Erbil City Bus and the Tramway on Erbil, Duhok and Sulaymaniyah.

Selected Projects for Funding Stream 3:

Table 31: Proposed project under adaptation and mitigation

Sector	Sub-Sector	Project Name	Investment Needs (USD)	Financial Instruments
Energy	Electricity	Samawa combined cycle Plant - with an added capacity of 250 MW for a total capacity of 750 MW	$44,670,000	Loans, PPPs
Energy	Electricity	Dhi Qar combined cycle Plant - with an added capacity of 250 MW for a total capacity of 750 MW	$17,849,000	Loans, PPPs
Transportation	Urban Transmission	Bus rapid transit routes projects (BRT)	Not specified	Grants, Loans, PPPs, R&D
Transportation	Urban Transmission	Mass Transportation as Tram way projects (LRT)	Not specified	Grants, Loans, PPPs, R&D
Waste	Solid Waste	Waste sorting plants Project of Purifying and recycling waste oil spills (OSS system)	$1,250,000,000	Grants, Loans, PPPs
Total Investment Needs: Over $2 billion across various sectors for Funding Stream 3 projects.				

Financial Instruments Analysis:

Grants and R&D Funding: Grants play a vital role in supporting projects that contribute significantly to GHG emission reductions but may not generate immediate financial returns, such as ecosystem restoration and biodiversity projects. R&D funding is crucial for innovation in areas like renewable energy, agricultural waste management, and ecosystem rehabilitation, supporting the development of efficient and sustainable technologies.

Loans and PPPs: Large-scale infrastructure projects, particularly in the energy and waste sectors, require substantial capital investment. Loans and PPPs are key financial instruments for these high-cost projects, allowing for risk-sharing between the public and private sectors while leveraging private investment for public benefit. Projects such as combined cycle power plants and large-scale waste recycling facilities fall under this category.

Article 6 of the Paris Agreement: Leveraging the carbon markets under Article 6 can provide additional funding streams for mitigation projects. By generating and selling carbon credits, projects such as the mangrove planting initiative can access international financing and contribute to global GHG reduction targets.

International Guarantee Funds: To encourage private sector participation in projects with long-term environmental and social benefits but low immediate financial returns, international guarantee funds can provide co-guarantees. This reduces investment risks and enhances the attractiveness of projects in areas such as renewable energy and sustainable transportation.

4.2.5. Funding Stream 4: Renewable Energy

Iraq's renewable energy sector offers substantial opportunities for reducing greenhouse gas emissions and transitioning towards a sustainable energy future. This funding stream is centered on public-private partnerships (PPP) that facilitate investment in solar, wind, and other renewable energy projects. These initiatives are crucial for expanding Iraq's renewable energy capacity, decreasing dependency on fossil fuels, and enhancing overall energy security. The involvement of the private sector through PPPs is essential for meeting Iraq's renewable energy goals and supporting global climate change mitigation efforts. This funding stream focuses on supporting the development and implementation of renewable energy projects, particularly solar energy initiatives across various regions. These projects aim to reduce greenhouse gas emissions, improve energy security, and provide clean energy solutions to meet the growing demand. By promoting renewable energy, Iraq can diversify its energy mix, reduce dependence on fossil fuels, and contribute to global climate mitigation efforts. The key project in the funding stream is the 12 GW of solar PV capacity to be deployed by 2030, as announced by the NIC. The plan involves granting investment licenses to companies, with 7.5 GW already allocated. This builds on a previous target of 10 GW by 2030, which sought to fulfill 20% of Iraq's electricity demand with solar energy. Despite high solar potential, Iraq's solar market has yet to take off, but recent developments include a 1 GW PV deal with Total Energies. Also, the Karbala Solar PV Park, a 300 MW solar power project planned in Karbala, is currently in the permitting stage, with construction expected to begin in 2026 and commercial operations starting in 2027. It is being developed by Al Bilal Group for General Contracts, Orascom Construction Industries, and Scatec, each holding a stake in the project.

Table 32: Proposed projects under Solar Energy

Project Name	Estimated Capacity (MW)	Investment Needs (USD)	Financial Instruments
Solar Energy for HR Department Building (29 KW)	0.029	USD 29,000	Loans, PPPs
Solar Energy for Cathodic Protection System (1.3 MW)	1.3 MW	USD 1,300,000	Loans, PPPs
Solar Energy for Technical Dep. In Baghdad Oil Training Inst.	Estimated 1 MW	USD1,000,000	Loans, PPPs
Solar Energy for Deanship Building In Baiji Oil Training Institute	Estimated 1 MW	USD1,000,000	Loans, PPPs
Solar Energy for Service Dep. Building In OPDC	Estimated 1 MW	USD1,000,000	Loans, PPPs
Karbala Solar PV Park	300 MW	USD300,000,000	Loans, PPPs

Total Investment Needs identified so far: USD 304,329,000

Renewable Energy Opportunities in Iraq: The Government of Iraq has recently announced a major initiative to promote renewable energy by allocating 25% of the country's power generation (estimated of 12,000 Mega Watt) to come from solar energy. This shift towards sustainable energy will be distributed across the federal governorates based on their energy needs and capacity. This strategy not only aims to diversify Iraq's energy sources but also addresses the rising electricity demand, reduces reliance on fossil fuels, and aligns with global efforts to combat climate change. This initiative is to be accomplished by 2030.

The below table shows the allocation of solar systems per governorate, it is important to highlight that most of the allocations have been contracted and under implementation, noting 4 governorates have not yet been invested.

Table 33: Total Investment in Solar Energy Power generation

#	Governorate	Designed System Capacity MW	Awarded	Capacity to be Invested
1	Basrah	1000	750+250	0
2	Muthana	830	500	330
3	Qadisiya	550	500	50
4	Najaf	1000	1000	0
5	Babil	550	250+225	25
6	Karbala	500	500	0
7	Maysan	700	100	600
8	Wasit	500	500	0
9	Diyala	800	0	800
10	Kirkuk	650	250	400
11	Anbar	750	750	0
12	Salah Adin	800	250	550
13	Mosul	1000	0	1000
14	Baghdad	1000	0	1000

Key Financial Instruments Needed:

Solar PV projects are capital-intensive, requiring significant upfront investment for equipment, installation, and infrastructure. To mobilize the necessary funds, loans, and PPPs are key financial instruments to be applied in Iraq. Loans provide the initial capital required for the project, which is repaid over time through the revenue generated from the sale of electricity. This approach allows project developers to spread the cost of the project over its operational life, making it more financially manageable.

Renewable energy projects, while having significant long-term benefits, often require substantial upfront investment. To attract private investors, it is crucial to offer a mix of financial instruments that can mitigate the risks and provide a return on investment. Grants can help reduce the initial costs, making the projects more financially viable. Loans and PPPs provide the necessary capital while ensuring that there is a shared commitment between public and private entities.

4.2.6. Funding Stream 5: Conversion to low carbon and methane capture

This funding stream focuses on the transition to low-carbon technologies and the capture of methane, a potent greenhouse gas, particularly in the industrial and waste management sectors. Public-private partnerships (PPP) are key to converting existing infrastructure to cleaner technologies and implementing methane capture projects. International guarantee funds play a crucial role by providing co-guarantees for investments in these areas, particularly in agriculture and efforts to combat desertification. These initiatives are vital for reducing Iraq's greenhouse gas emissions and aligning with international climate commitments, such as the Paris Agreement.

To facilitate this, key financial instruments such as grants, loans, and PPPs e.g. for municipal waste management, are common for initial implementation, particularly in sectors where immediate financial returns are minimal but environmental impact is substantial. It allows for shared investment and risk management between the public and private sectors (e.g. municipalities and one side, and Utilities on the other). Additionally, international guarantee funds can provide co-guarantees, enhancing investment security.

Table 34: Selection of Investment Needs in Funding stream 5

Project Name	Estimated Impact (GHG Reduction)	Investment Needs (USD)	Financial Instruments
Methane Capture from Landfills	Significant	$5,000,000	Grants, Loans, PPPs
Conversion of Industrial Boilers to Low-Carbon Fuels	Moderate	$3,500,000	Grants, Loans, PPPs
Methane Capture in Agricultural Waste Management	Significant	$4,200,000	Grants, Loans, PPPs
Methane Capture from Oil and Gas Operations	High	$6,800,000	Grants, Loans, PPPs
Upgrading Wastewater Treatment Plants for Methane Capture	Significant	$2,500,000	Grants, Loans, PPPs

Total Investment Needs identified so far: USD 642,000,000. Projects are still under costing review and preparation and not yet ready for publication

SUMMARY:

Iraq has started implementing GHG reduction projects. These projects are mainly directed towards energy efficiency and gas and methane capture projects. These projects contribute to the international commitments of the country per the NDC 2021. The country has also started a program of landfill construction and a wastewater construction rollout improving water, soil, and air quality for the Iraqi population. Earmarked by the national commission are also further projects in waste to energy and by the Ministry of Transportation a bus rapid transfer and extensive mangrove plantation in the south. However, scaling up and multiplying these projects in all governorates requires scaling up financing and technology transfer with the required combination of financial instruments and transparency reporting. Five main funding streams are identified that will contribute to scaling up the achievements of the conditional NDC commitments of 15%:

Funding stream 1: Research, innovation, technology transfer, and capacity building. Current stand or projects valued at USD 10 million.

Funding stream 2: Adaptation projects dedicated to specific issues in the water and agriculture sector. Current stand or projects valued at USD 171,3 million.

Funding stream 3: Adaptation and mitigation projects that contribute to GHG reduction while strengthening the resilience of communities. Current stand or projects valued at over USD 2 billion.

Funding stream 4: Renewable energy scale-up at a governorate and district level. Current stand or projects valued at USD 304 million.

Funding stream 5: Methane and gas capture projects that require substantial upfront costs and a dedicated technology transfer Current stand or projects valued at USD 642 million

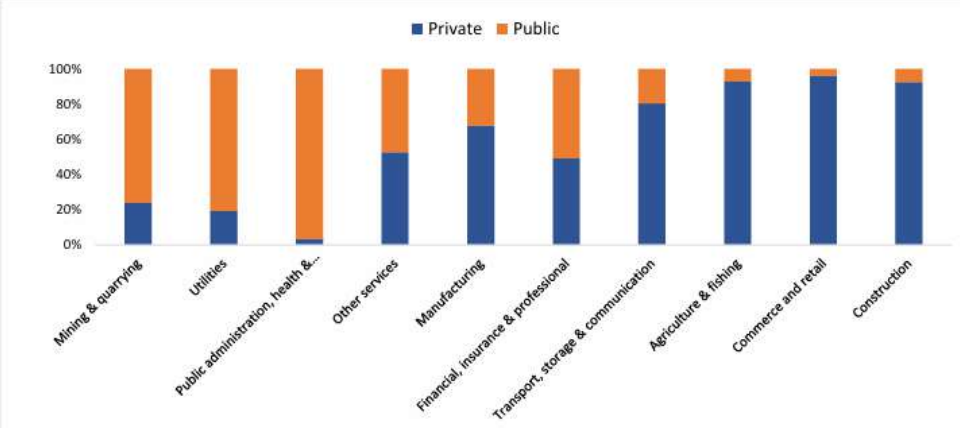
4.3 The private sector's role in the implementation

The role of the private sector in Iraq's transition to a low-carbon economy is critical, with the potential to significantly enhance the implementation of sustainable development initiatives. As Iraq seeks to diversify its economy and revenue sources, the engagement of private enterprises in key sectors is essential for driving innovation, investment, and efficiency in the country's climate action efforts.

Table 35: Development of the GDP of the public and private sectors at fixed prices and the percentage of private sector contribution during the period 2018-2022 (trillion dinars)[104]

Years	Public	Private sector	Percentage of private sector
2018	154,3	57,9	27,3
2019	158,5	65,6	29,3
2020	137,3	59,0	30,1
2021	137,3	68,1	30,8
2022	152,1	62,3	40,9
Compound growth rate %	-0,36	1,8	

Figure 32: Number of SOE to Private Sector companies Ratio per Sector



Source: Iraq Household Socioeconomic Survey 2012.

Engagement with the private sector after many decades of conflict and unrest has been hampered by many challenges, among which a lack of data on the private sector is only one of them (informal, formal, number of companies, structures, financial status, number of employees, etc.). There was a project Bringing Business Back (BBB) in Iraq seeks to contribute to recovery and reconstruction by spurring the participation of the private sector. The project aims to identify concrete entry points for private sector activity that can contribute positively to recovery and reconstruction in Iraq, as well as to identify obstacles hindering its growth. The concept stems from the premise that the private sector is an essential participant in stimulating early and inclusive recovery and reconstruction. Following up on this a private sector strategy for 2024-2030 was approved that has yet to be implemented and demonstrates tangible results.

[104] *NDP 2024-2028*

The current private sector in particular construction identifies access to credit as the main obstacle; obtaining guarantees hinders the running of several projects concurrently for example. Firms have also struggled with delays in obtaining supplies, both domestically and through imports. The average delay in obtaining domestic supplies was 33 days, while the average delay in obtaining imported supplies was 25 days.

The transition to low carbon energies could support to a certain extent a stepwise introduction and collaboration with the private sector.

Private sector participation is particularly vital in the renewable energy sector, where investment in solar, wind, and other renewable energy projects can accelerate Iraq's energy transition. By leveraging private capital and expertise, Iraq can expand its renewable energy capacity, improve energy efficiency, and reduce greenhouse gas emissions. Public-private partnerships (PPPs) will play a crucial role in this regard, facilitating the development of large-scale renewable energy projects and integrating sustainable energy solutions across the national grid.

In the waste management and circular economy sectors, the private sector is expected to lead in the development and implementation of advanced waste treatment technologies, recycling programs, and waste-to-energy projects. By collaborating with the government, private companies can introduce innovative solutions that reduce environmental pollution, enhance resource efficiency, and create new economic opportunities. Private sector involvement in these areas is also key to advancing Iraq's circular economy goals, promoting sustainable consumption and production patterns.

The industrial sector in Iraq stands to benefit significantly from private sector engagement in optimizing industrial processes to reduce carbon emissions and improve energy efficiency. Through investments in cleaner technologies, waste heat recovery systems, and fuel switching, private enterprises can help reduce the environmental impact of Iraq's industrial activities while contributing to sustainable industrial growth. Furthermore, the private sector can drive the adoption of best practices in environmental management, fostering a culture of sustainability within the industry.

Overall, the private sector's active participation is crucial for Iraq to achieve its sustainability objectives and successfully implement its low-carbon transition. By fostering collaboration between the government and private enterprises, Iraq can create a conducive environment for sustainable development, attract foreign investment, and build a resilient and diversified economy well-positioned to meet climate change challenges.

Public-private partnerships can be explored in the agriculture and water sector to leverage international expertise and competencies and transfer knowledge and technologies while reducing financial risk and improving the collection of revenues.

During the consultation process with the stakeholders, priorities and challenges were identified for the transitional period. The consultation also highlighted areas that are not covered yet by implemented project are or pipeline future projects. These areas represent an excellent opportunity for private investment activities and should be prioritized in the upcoming years. These areas are presented in the table below.
Highlighted activities are activities already covered by projects under implementation.

Table 36: Private Sector Opportunities (authors summary)

TNA Adaptation & Mitigation	SDG indicators improvements	SDG Investment Mapping	CIP priorities
AGRICULTURE & BIODIVERSITY & ECOSYSTEM			
• Improvements in freezing technology • Agriculture water management – drought-resistant crop varieties ☑ • Postharvest/processing/distribution • Conservation-friendly agriculture – drip feed irrigation ☑	• Sustainable nitrogen management in the agriculture sector • Mean area that is protected in terrestrial sites important to biodiversity • Mean area that is protected in freshwater sites important to biodiversity • Red List index of species survival • Fish caught by trawling or dredging	• Food processing • Mid-tech greenhouses • Specialty dairy products	• Sustainable soil management • Water and or energy efficiency☑ • Storage and distribution • Pollution and contamination control
EDUCATION			
	Expenditure on research and development	• Low-fee private schools • Education Infrastructure • Early childhood development • EdTech platforms	• Climate awareness☑ • Climate Research & development
ENERGY AND POWER			
• Solar farms ☑ • Wind Farms • Concentrating Solar-Thermal Power (CSP) • Off/On-grid Rooftop Solar PV ☑ • Combined Cycle Gas Turbine (CCGT) P	• CO2 emission from fuel combustion per total electricity output P • Renewable energy share in total final consumption	• Utility-scale solar farm☑s • Solar-based green energy solutions	• Renewable Energies (solar, wind, bioenergy, heat) • Energy efficiency (appliances and equipment) ☑ • Sustainable generation and distribution
OIL AND GAS SECTOR			
Green Hydrogen		Flaring solutions	• Solar and Geothermal • LNG & Gas distribution • Hydrogen production and utilization
HEALTH			
	• Death rate attributable to household air pollution and ambient air pollution • Death rate due to cardiovascular disease, cancer, diabetes, or chronic respiratory disease • Annual mean concentration of pm 2,5 (ug/m3)	Advanced healthcare services	• Climate-resilient healthcare infrastructures • Strengthening the Health insurance • Heat and temperature stress

INDUSTRY (IPPU)			
		Pharmaceuticals production	• Circular economy ☑ • Sustainable extractive and minerals processing • Energy efficient industries
INFRASTRUCTURE			
			• Climate resilient energy infrastructures • Emergency and disaster preparedness and recovery ☑ • Climate resilient water infrastructures
TRANSPORT			
	Population with convenient access to public transport in cities	Railroad infrastructure	• Urban or rural low-carbon connectivity- • Electrical vehicles I Low carbon transportation • Climate resilient stations/buildings
TOURISM			
			• Protection of historical sites • Eco-tourism • Climate-related safety
WATER RESOURCES			
Flood Mapping ☑ Low data probabilistic flood forecasting	Access to improved water source, piped	Water resources management solutions	• Sustainable water management☑ • Water efficiency and reuse • Distribution / transmission of water
WASTE & WASTEWATER			
Wastewater treatment: Pond systems and growth treatment technologies Wastewater treatment: Nutrient removal activated sludge processes.	Anthropogenic wastewater receiving treatment		• Wastewater treatment • Recycling of waste (circular economy) • Waste recycling to energy
BUILDINGS AND CONSTRUCTION			
Solar Water Heater	Proportion of urban population living in slums ☑	Social Housing	• Climate resilient buildings • Sustainable urbanization ☑ • Sustainable landuse changes

4.4. The role of the banking sector as a facilitator of implementation

The banking sector in Iraq plays a crucial role in facilitating the transition towards a low-carbon economy by providing the necessary financial infrastructure, capital, and financial instruments that support green projects and sustainable development initiatives.

Iraq's financial sector, including both state-owned and private banks, can play a role in scaling up investment in low-carbon and adaptation projects by helping the private sector participate in the implementation of the CIP. State-owned banks are well-positioned to de-risk investments through loan guarantees and government-backed initiatives, making them key partners for large-scale infrastructure projects (e.g. desalination plants). Private banks, on the other hand, can offer specialized green financial products and attract foreign investments through innovative financial instruments, should the business environment for foreign investors continue to progress with Iraqi's signature of the Singapour[105] Convention.

Banks in Iraq, including the Central Bank of Iraq (CBI), Al-Rafidain Bank, Al-Rasheed Bank, and Trade Bank of Iraq, among others, have begun to explore and implement strategies that align with national and international environmental goals, such as the Paris Agreement and the Sustainable Development Goals (SDGs).

Both public and private Iraqi banks could enhance transparency, align with international climate finance, and promote Iraq's evolving investment environment, which is gaining international attention, particularly in the energy, finance, and manufacturing sectors as well as nature-based solutions.

Central Bank of Iraq (CBI) [106]

The Central Bank of Iraq (CBI) has been instrumental in setting the financial regulatory framework that encourages sustainable investments. CBI has initiated several green finance mechanisms, including lower interest rates for loans directed at renewable energy projects, energy efficiency improvements, and environmental sustainability initiatives. These efforts are designed to reduce the financial barriers for businesses and individuals seeking to invest in green technologies.

One tangible example is CBI's involvement in facilitating green bond issuance. By providing regulatory support and guidelines, CBI is enabling both public and private sector entities to raise capital specifically earmarked for green projects. This initiative is expected to mobilize significant investments into renewable energy, waste management, and other sustainability-focused projects across Iraq.

CBI outlines recently a roadmap for sustainable finance 2023 – 2029 to assist the Iraqi Financial Sector in its contributions to meet Iraq's NDC1 goals. This framework can outline specific financial policies, regulations, tools, and instruments that provide transitional support for new green technologies. Policies should also be established to enable investment and strengthen market incentives for low-carbon infrastructure.

[105] https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXII-4&chapter=22&clang=_fr
[106] https://www.cbi.iq/

This Sustainable Finance Roadmap is being developed to:

1. Manage Environmental, Social, and Governance (ESG) Risks to maintain Monetary and Financial Stability and protect depositors, investors and shareholders.
2. Foster Financial Inclusion and deploy excess liquidity of private banks particularly to finance Small and Medium Enterprises (SMEs).
3. Need to finance other industry sectors (agriculture, tourism, renewable energy) to diversify sources of revenues.
4. Need to finance climate change mitigation and adaptation as well as pollution management.
5. Align with international and regional banking standards and expectations.

Al-Rafidain Bank's Green Financing[107]

Al-Rafidain Bank, one of the largest and oldest banks in Iraq, has started to incorporate sustainability into its lending practices. The bank is now offering preferential loan terms for projects that demonstrate a commitment to reducing carbon emissions or enhancing energy efficiency. For instance, Al-Rafidain Bank has provided financing for several solar energy projects in urban and rural areas, helping to reduce the dependency on fossil fuels and promoting the use of renewable energy sources.

Additionally, the bank has partnered with international financial institutions to leverage co-financing opportunities, particularly in areas such as water management and waste treatment. This approach not only mitigates the financial risks associated with large-scale environmental projects but also ensures that these initiatives are financially viable and sustainable in the long term

Trade Bank of Iraq's Support for PPPs[108]

The Trade Bank of Iraq (TBI) has been a key player in supporting public-private partnerships (PPPs) that focus on infrastructure development, including those related to renewable energy and low-carbon technologies. TBI's involvement includes structuring financial deals that bring together government resources, private sector investments, and international funds. One notable example is TBI's financing of the solar power plant in Al-Muthanna, which is part of a broader strategy to increase Iraq's renewable energy capacity.

Moreover, TBI has been actively involved in providing guarantees and financial products that reduce the investment risks for private companies engaged in green projects. This includes credit enhancement tools such as guarantees and insurance products that protect against political and environmental risks, thereby attracting more private sector participation in Iraq's green economy.

Co-Guarantees and International Collaboration

Iraqi banks, including the Central Bank of Iraq, have also engaged with international guarantee funds to provide co-guarantees for projects that address climate adaptation and desertification. These co-guarantees help secure financing for projects that might otherwise be considered too risky, such as those in the agriculture and water management sectors. By sharing the financial risk with international partners, Iraqi banks can facilitate the implementation of critical infrastructure projects that are essential for the country's climate resilience and sustainable development.

[107] https://www.rafidain-bank.gov.iq/
[108] https://tbi.com.iq/

In conclusion, the banking sector in Iraq is increasingly aligning its financial products and services with the country's environmental and sustainability goals. Through strategic investments, innovative financial instruments, and international partnerships, Iraqi banks are playing a pivotal role in facilitating the implementation of the low-carbon transition and ensuring the successful execution of green projects across the country.

4.5. Proposed pipeline of projects for a long-term transition

These proposed additional projects for scaling up the economic low-carbon transition in Iraq aim to prepare Iraq for its future LT-LEDS, i.e. a 2050 sustainable and low-carbon future, ensuring economic growth, environmental protection, and resilience against climate change. The CIP outlines a roadmap for mobilizing these resources, including leveraging international financing mechanisms, public-private partnerships, and national budget allocations, beyond the 2030 NDC horizon.

The proposed projects in Iraq focus on various sectors, including waste management, environmental sustainability, and energy production, with significant financial needs to ensure successful implementation. For instance, in Baghdad, the recycling of used tires, led by the Baghdad Municipality, is in its initial phase and requires an investment of USD 1.9 million. This project, part of the waste sector, aims to enhance environmental sustainability through a public-private partnership and could be supported by donors such as the GCF. Similarly, the development of sustainable gardens in Baghdad, also in the initial phase, seeks USD 1 million in funding from the national private sector, with targeted support from the GEF. This project focuses on improving urban ecosystems as part of the adaptation category under the UNFCCC.

Another significant project in Baghdad involves the installation of air pollution monitoring devices, currently in the planning phase. This project requires USD 1.6 million in financial support to advance, as work has been suspended. Additionally, Baghdad Municipality is working on producing electrical energy from waste, a project that is also in its initial phase and seeks USD 1.6 million in funding. This initiative aligns with the mitigation category under the UNFCCC and aims to provide a sustainable energy solution through a public-private partnership. These initiatives can be easily scaled up to main cities in other governorates such as Erbil and Basra etc. that are suffering regularly from air pollution exacerbated with the use of diesel generators.

The Ministry of Housing and Construction is planning the development of sanitary landfill in each governorate and has allocated a budget of USD 20 million per landfill. This programme includes landfill gas flaring capture and integrated solid waste management, is crucial for mitigating environmental impacts in the region. The project is in the planning phase and requires equity financing, with the Iraqi government as a key donor. These projects highlight Iraq's commitment to addressing environmental challenges through strategic investments, requiring substantial financial and technical support to achieve their objectives.

The success of this plan will depend on coordinated efforts across sectors and the active participation of all stakeholders, including the private sector, government agencies, and international partners.

5. Summary and next implementation steps

Iraq is at a crossroads in many aspects: while climate change is impacting daily life in Iraq, the country lacks the tools to prepare for the projected worsening scenarios. Food, water, and revenue generation are all dependent on global market volatility. With current fiscal constraints, the low-carbon transition requiring high upfront costs, innovation, and technology transfer can only be considered just and fair if implemented in a stepwise approach aligning low-carbon energy sources with the much-needed economic and revenue diversification. Foreign direct investment and the private sector can play a pivotal role in facilitating the implementation and introduction of adequate technologies, capacity-building transfer, and the use of diversified financial instruments.

Key sectorial priorities for the transitional period 2025-2030 are summarized in the table below. The needs are estimated at USD 36.85 billion.

Table 37: Key sectorial priorities for the transitional period 2025-2030 (authors estimations)

Initiative	Investment Required (USD)	Expected Annual Economic Benefits (USD)	Description
Modernizing Cement Production	1 billion	500 million	Upgrading cement production technologies to reduce energy consumption and greenhouse gas emissions.
Implementing Cleaner Technologies in Petrochemicals[109]	2.75 billion	412.5 million	Integrating cleaner technologies in the petrochemical industry to reduce emissions and improve waste management.
Energy Efficiency in Metal Processing	600 million	400 million	Investing in energy-efficient equipment for metal processing to reduce energy costs.
Promoting Recycling and Material Recovery	1.5 billion	300 million	Developing infrastructure for recycling and material recovery to reduce raw material costs.
Sustainable Agriculture[110]	1.5 billion	150 million	Investing in sustainable agricultural practices to improve crop yields and soil health.
Protection ecosystems	1.8 billion	800 million	Increasing carbon sequestration through reforestation and afforestation efforts.
Combating Land Degradation	500 million	600 million	Investing in soil restoration and management to enhance agricultural productivity.
Promoting Agroforestry	400 million	500 million	Establishing agroforestry systems to improve crop diversity and yields.
Livestock Management	300 million	100 million	Investing in sustainable livestock systems to increase meat and dairy productivity
Resilient Water Management	2.5 billion	1.0 billion	Sustainable and efficient water management including storages
Waste and Wastewater Circular Economy	2.0 billion	300 million	Significant reduction in greenhouse gas emissions: Enhanced environmental compliance and potential for international funding.
Sustainable Cities	4.0 billion	1.0 billion	Meet the high demand for housing and accommodation while avoiding extensive GHG emissions
Low Carbon & Public Transportation	3.0 billion	600 million	Reduced traffic congestion and pollution while providing affordable transportation
Gas capture and reuse	5.0 billion	1.0 billion	Increased energy efficiency and GHG avoidance
Transmission lines and transformers	10.0 billion	TBD	Enabling better energy transfers, reducing loads, and stabilizing power supply, which will, in turn, support development across other sectors.

[109] *Based on the assumption of ROR value of 15%*
[110] *Assuming ROR of 10%*

While the country has already started implementing GHG reduction to meet its international commitments, the need to scale up financial and technology cooperation is urgently needed. Iraq will achieve its 2% emissions reduction throughout the period 2025-2030, even exceeding it unconditional target from 2026 onwards. However, much more financial and technical support is required.

To effectively mobilize and utilize climate financing for the implementation of the Climate Investment Plan (CIP), the following steps should be considered.

Step 1. Integrate Climate Change into the National Budget and Fiscal Policy

Recommendation 1.1. Embed Climate Actions in Fiscal Policies

Incorporating climate measures into budget planning is crucial for embedding climate change mitigation and adaptation efforts into the financial fabric of the nation. By specifically integrating these measures into future yearly budget planning and medium-term expenditure frameworks, Iraq can ensure that climate considerations are a central component of financial decision-making. This strategic alignment will enable the allocation of necessary resources toward achieving climate goals and facilitate a more structured and sustained approach to funding climate actions.

Additionally, introducing fiscal incentives can significantly enhance the mobilization of resources for green investments. Implementing special fiscal policies, such as lower taxes for climate adaptation measures or converting existing levies into carbon taxes, can generate additional revenue for climate-related projects. These fiscal measures not only provide financial resources but also create economic incentives for private sector engagement and sustainable practices, thereby supporting the broader objectives of the CIP.

Recommendation 1.2. Monitor and evaluate the CIP every five years

To better implement the CIP, it is recommended to structure it into a Mid-Term Investment Plan, aligning Iraq's climate objectives with its broader development goals. By developing a Mid-Term structure in the CIP, spanning five years and closely aligned with the revised Nationally Determined Contributions (NDC), Iraq can ensure that climate change priorities are effectively integrated into national development strategies. This plan should include a robust M&E Framework to allow for annual adjustments and refinements based on progress and emerging needs. This alignment will help ensure that resource allocations in both public and private budgets are adequate and responsive to evolving climate challenges.

The Mid-Term Evaluation of the CIP Plan will also strengthen the connection between climate actions and broader national policies, facilitating a more coherent approach to climate finance and regular adjustments. By embedding climate priorities within the investment framework, Iraq would enhance the effectiveness of its climate initiatives and support long-term sustainability. This approach will enable more strategic and informed allocation of resources, ensuring that investments are targeted towards the most impactful climate actions and integrated seamlessly into national development plans.

Step 2. Optimize Financial Management and Monitoring

Recommendation 2.1. Improve Financial Planning and Management

Enhancing financial planning capacity is crucial for optimizing the management and utilization of climate finance. Strengthening institutional capacities through baseline assessments, expenditure reviews, and cost-benefit analyses will provide a solid foundation for effective financial planning. These assessments will help identify current financial needs, allocate resources efficiently, and measure the potential impact of investments. Developing skills in financial management and project formulation will further enable institutions to craft well-structured financial strategies, ensuring that climate funds are used effectively and targeted towards high-impact projects. Investing in these capacity-building activities will not only improve the efficiency of financial planning but also enhance the overall effectiveness of climate finance initiatives. By equipping institutions with the necessary tools and expertise, Iraq can better align its financial strategies with climate objectives, ensuring that resources are utilized in the most impactful way possible. This approach will support the successful implementation of climate actions and contribute to the broader goals of the CIP.

Recommendation 2.2. Linking Monitoring, Reporting, and Verification and the M&E Framework

Establishing robust monitoring systems is essential for ensuring transparency and accountability in climate finance management. Developing comprehensive systems for monitoring, reporting, and verifying climate finance flows and project performance will enable effective tracking of progress and outcomes. Implementing centralized reporting units and dedicated communication channels will facilitate the clear and consistent dissemination of information, ensuring that all stakeholders are informed about financial flows, project statuses, and performance metrics. This approach will help maintain transparency and build trust among stakeholders, reinforcing the credibility of the CIP. Building technical expertise is equally important for the successful implementation of monitoring, reporting, and verification (MRV) processes. Investing in training and capacity building for skills related to greenhouse gas (GHG) inventory, expenditure review methodologies, and independent verification will enhance the technical proficiency of the institutions involved. This investment will ensure that the monitoring systems are supported by skilled professionals capable of conducting accurate and reliable assessments. Strengthening these technical capabilities will improve the overall quality of reporting and verification processes, leading to more effective and credible climate finance management.

Recommendation 2.3. Promote Efficiency and Transparency

Tracking resource utilization is vital for ensuring the efficient use of project resources and maximizing the impact of climate investments. By closely monitoring how resources are allocated and used, Iraq can identify areas of wastage or underutilization, allowing for timely corrective actions. Implementing measures to optimize resource management will help ensure that every dollar spent contributes effectively to project goals and enhances overall project performance.

Enhancing transparency through regular reporting is crucial for maintaining stakeholder trust and accountability. By consistently reporting on project progress and financial performance, Iraq can provide stakeholders with clear and timely information on how resources are being used and what outcomes are being achieved. Effective communication of M&E findings and outcomes will not only foster transparency but also support informed decision-making and continuous improvement in project execution.

Step 3. Enhance Coordination and Private Sector Engagement

Recommendation 3.1. Establish a Working Group with the Financial Sector

Forming a Climate Finance Working Group is a critical step towards developing a comprehensive financing strategy for implementing adaptation and mitigation measures outlined in the NDC. This working group should include representatives from the financial sector to leverage their expertise in crafting financial solutions tailored to climate goals. Additionally, identifying and accrediting banks as Direct Access Entities to the GCF will facilitate increased private sector participation and access to climate finance, thereby strengthening the overall financial framework for climate initiatives.

In parallel, exploring innovative financial solutions is essential to enhance private sector involvement in climate finance. This includes developing insurance solutions and other financial mechanisms that address climate risks and incentivize private investments. By incorporating these financial innovations, Iraq can attract a broader range of private sector investments and create a more dynamic and resilient climate finance ecosystem. These measures will not only mobilize additional resources but also ensure that private sector contributions are effectively channeled toward achieving climate objectives.

Recommendation 3.2. Strengthen Stakeholder and Private Sector Engagement

Raising awareness and building partnerships are essential for mobilizing resources and implementing climate initiatives effectively. By implementing targeted awareness-raising initiatives at local, national, regional, and international levels, Iraq can enhance understanding of climate finance needs and opportunities. These initiatives should aim to educate stakeholders about the importance of climate finance and the benefits of collaborative efforts. Fostering cross-sector collaboration and establishing strategic partnerships will be crucial for enhancing resource mobilization and ensuring the successful execution of climate projects. By creating a network of informed and engaged actors, Iraq can drive a more coordinated and impactful response to climate challenges.

By adopting and implementing a strong corporate social and environment responsibility vision that aligns with the climate vision and sustainable development goals of the country, state owned enterprises can play a pivotal role in the low carbon transition and resilient diversification of the economy.

Engaging stakeholders effectively is a key component of a successful climate finance strategy. Developing strategies to actively involve key stakeholders—such as local communities, non-governmental organizations (NGOs), and the private sector—in climate finance processes will ensure that diverse perspectives and expertise are integrated into decision-making. Establishing coalitions and partnerships will allow for the pooling of resources and the leveraging of different competencies, enhancing the overall effectiveness of climate initiatives. This inclusive approach will not only improve project outcomes but also build a stronger, more resilient network for addressing climate change.

Step 4. Increase Resources and Direct Access to Climate Finance

Recommendation 4.1. Leverage Domestic Public Finance

Integrating climate actions into national and sub-national budget planning processes is essential for ensuring that climate mitigation and adaptation measures receive the necessary financial support. By incorporating these measures into the budgeting framework, Iraq can allocate domestic public finance to cover operational costs, support cross-cutting initiatives, and fund local adaptation projects. This approach will ensure that climate priorities are embedded within the financial planning cycle, facilitating the alignment of resources with strategic climate objectives and enhancing the overall effectiveness of the CIP.

Efficient utilization of domestic resources is critical for maximizing the impact of climate finance. Public budgeting should be strategically directed to support ongoing operations, technical inputs, and essential climate services. Additionally, leveraging domestic finance to scale up successful pilot projects can attract international and private funding, creating a multiplier effect that enhances the implementation of climate initiatives. By strategically combining domestic resources with external financial support, Iraq can optimize resource allocation and drive greater progress in achieving its climate goals.

Recommendation 4.2. Consider a National Climate Fund

To strengthen Iraq's climate financing capacity, it may be useful to consider the setting-up of a National Environment and Climate Change Fund by pursuing for instance direct access to the Green Climate Fund (GCF). By securing this direct access, the fund will gain increased resources and enhanced capabilities to mobilize and channel financial resources effectively for climate actions. This approach will provide a stable and substantial source of funding, enabling Iraq to implement its climate initiatives with greater efficiency and coherence. Direct access to the GCF will also facilitate streamlined processes for acquiring funds, thus improving the overall effectiveness of climate finance management.

In conjunction with expanding the National Environment and Climate Change Fund, Iraq should develop a comprehensive financial strategy to support the CIP through its various phases. This strategy must detail how both public domestic finance and private investments will be leveraged to achieve the CIP's goals. By outlining clear mechanisms for financial planning, allocation, and utilization, the strategy will ensure that resources are directed toward both the development and implementation phases of the CIP. Such a strategy will not only enhance financial efficiency but also attract additional funding by demonstrating a well-structured approach to managing climate finance.

In consultation with the different stakeholders, it is proposed that Phase II includes the following main elements

- → Discuss pertinent projects with relevant entities in details to prepare for investments offers
- → Discuss project implementation at governorate level
- → Identify the best financial instruments and the required implementation indicators
- → Identify financial risk mitigation strategies by sector
- → Discuss climate change, economic transformation with banking and private sectors
- → Engage with CSO and NGO
- → Prioritize subsectors projects relevant strategic projects and prepare detailed financial and operational implementation annual plans
- → Start long term climate investment planning for 2030 – 2050
- → Set up database and GIS platform in UNFCCC standard
- → Follow up on recommendations implementations

ANNEXES

Annex. I

Key Stakeholders in Climate Change Governance

Key stakeholders in climate change governance encompass a diverse group of actors beyond just national governments. This includes international organizations like the UNFCCC and UNEP, which provide frameworks and support for global cooperation. National governments have primary responsibility for developing and implementing policies, while local governments play a crucial role in on-the-ground implementation. Non-governmental organizations (NGOs) raise awareness, advocate for strong policies, and implement climate projects. The private sector has a significant role in developing clean technologies and transitioning to sustainable practices. Additionally, indigenous communities hold valuable knowledge about adapting to climate change and should be included in decision-making processes. Effective climate action requires collaboration and coordinated effort from all these stakeholders.

1.1. National Government Agencies

Government agencies play a critical role in climate change governance by developing policies, implementing programs, and monitoring progress. Key agencies typically include environmental ministries, energy departments, and meteorological institutes.

Figure 1: The series for Climate Governance

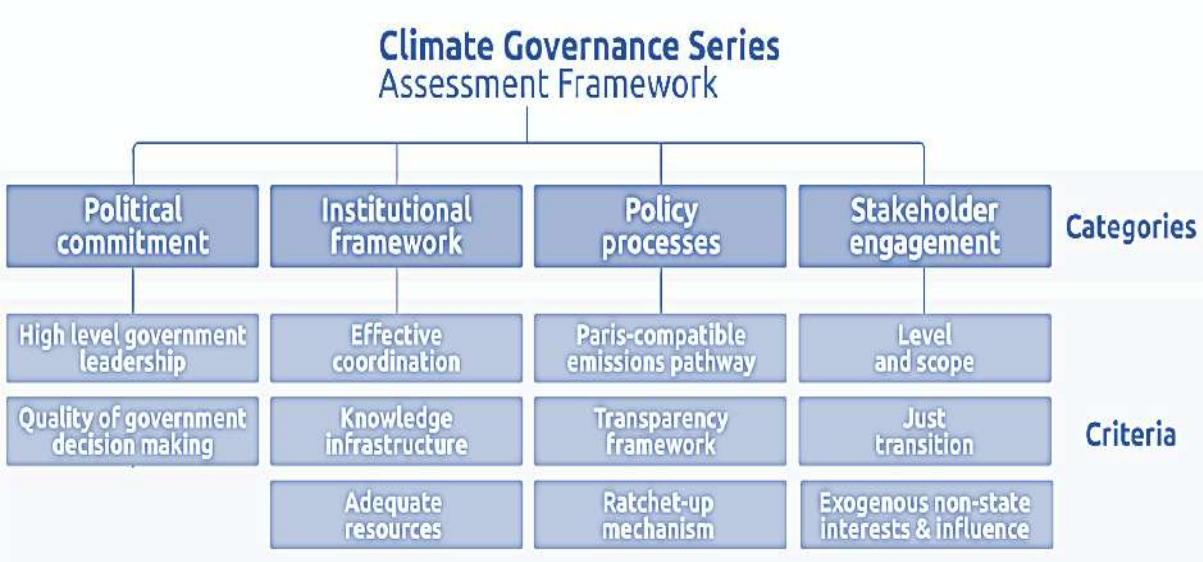


Table 1: Typical Climate Governance Series

#	Ministries and Directorates
1.	Ministry of Environment
2.	Ministry of Planning
3.	Ministry of Finance
4.	Ministry of Oil
5.	Ministry of Electricity
6.	Ministry of Housing, Construction and Municipalities
7.	Ministry of Agriculture
8.	Ministry of Transportation
9.	Ministry of Industries and Minerals
10.	Ministry of Culture, Tourism and Heritage
11.	Ministry of Higher Education and Scientific Research
12.	Ministry of Water Resources
13.	Ministry of Foreign Affairs
14.	Ministry of Trade
15.	Baghdad Municipality
16.	Prime Ministry Presidency
17.	KRI/ Environmental Protection and Improvement Board (EPIB)
18.	KRI/ Ministry of Finance and Economy
19.	KRI/ Ministry of Planning
20.	KRI/ Ministry of Natural Resources
21.	KRI/ Ministry of Electricity
22.	KRI/ Ministry of Transportation and Communication
23.	KRI/ Ministry of Construction and Housing
24.	KRI/ Ministry of Municipalities and Tourism
25.	KRI/ Ministry of Trade and Industry
26.	KRI/ Ministry of Higher Education
27.	KRI/ Ministry of Agriculture and water Resources
28.	KRI/ Ministry of Health

1.1.1. National Investment Commission[111]

The National Investment Commission (NIC) in Iraq acts as a one-stop shop for both domestic and foreign investors, offering guidance, streamlining processes, and facilitating business ventures in the country. The NIC uses this position to promote investments that can address the country's most critical needs. Attracting private capital and modern technology and pairing it with business management experience is essential to this mission. The NIC has full access to national-level bodies including parliament, ministries, and the Prime Minister's office.

[111] *https://investpromo.gov.iq/*

1.1.2. Ministry of Environment (MoEn)[112]

The Ministry of Environment (MoEn) in Iraq plays a central role in the country's climate change governance. As the primary governmental body responsible for environmental protection and sustainable development, the MoEn is tasked with developing and implementing national climate policies and strategies. The ministry coordinates climate action across various sectors, ensures compliance with environmental regulations, and oversees the implementation of Iraq's Nationally Determined Contribution (NDC). The Climate Change Directorate established under the Ministry of Environment serves as a dedicated body for coordinating climate change research, policy development, and implementation. The CCD conducts scientific research on climate impacts, develops adaptation and mitigation strategies, and provides technical support to various government agencies. It also plays a key role in raising public awareness about climate change and fostering stakeholder engagement in climate action. The CCD represents the national focal point for climate change for Iraq with the Secretariat of the United Nations Framework Convention on Climate Change. Additionally, the MoEn engages with international organizations, negotiates on behalf of Iraq in global climate forums, and secures international funding for climate projects.

1.1.3. Ministry Of Planning[113]

The Ministry of Planning in Iraq is the architect of the country's economic and social development, crafting strategic plans to promote growth, improve living standards, and ensure optimal use of resources. MoP has a vision of outstanding planning for sustainable development. Its mission is to activate and coordinate efforts, developing developmental policies, plans and programs in all economic and social sectors and activities. In a way that secures the optimal investment of human and material energies and capabilities, Improving the quality of government performance and strengthening partnership in the public and private sectors

1.1.4. Ministry Of Finance[114]

The Ministry of Finance in Iraq is the government body responsible for managing the nation's finances, including setting budgets, collecting revenue, and overseeing spending.

1.1.5. Ministry of Oil[115]

The Ministry of Oil is another critical stakeholder in Iraq's climate governance, given the country's reliance on the oil sector. This ministry is responsible for regulating and managing Iraq's oil resources,. The Ministry of Oil is involved in initiatives to reduce emissions from oil extraction, production, and refining processes. Efforts include improving energy efficiency in the oil sector, investing in cleaner technologies, and exploring alternative energy sources to reduce the sector's carbon footprint.

1.1.6. Ministry of Electricity

The Ministry of Electricity is involved in efforts to transition Iraq's energy sector towards more sustainable and renewable energy sources. This ministry is responsible for developing policies and infrastructure for electricity generation, transmission, and distribution. Key initiatives include promoting renewable energy projects, such as solar and wind power, and improving energy efficiency in the power sector. The Ministry of Electricity collaborates with the private sector and international donors to achieve Iraq's renewable energy targets.

[112] *http://www.moen.gov.iq/*
[113] *https://mop.gov.iq/en*
[114] *https://mof.gov.iq/Pages/MainMof.aspx*
[115] *https://www.oil.gov.iq/*

1.1.7. Ministry of Transportation

The Ministry of Transportation in Iraq administers the aviation, land, and maritime sectors with their respective subcategories. It oversees imports and exports, transportation of people and goods, development of railways, management of ports, monitoring of weather forecasts, and many more related operations. The MoT entities:

- **Roads:**
  State Company for Land Transportation (SOE)
  State Company for Travelers and Delegates Transportations (SOE)
- **Aviation:**
  Iraqi Airways (SOE)
  General Company for Air Navigation Services (SOE)
- **Railways:**
  General Company for Railways (SOE)
- **Maritime:**
  State Company for Maritime Transport (SOE)
  General Company for Ports of Iraq (SOE)

1.1.8. Ministry of Housing and Construction

It is the official body in Iraq responsible for providing potable water, treating sewage and solid waste, in addition to municipal road networks, and managing public real estate in determining land uses, urban planning, and establishing strategies for developing cities and rural settlements and improving their environment.

1.1.9. Ministry of Agriculture[116]

The Ministry of Agriculture plays a vital role in addressing climate impacts on agriculture and food security. This ministry develops and implements policies related to sustainable agriculture, water management, and rural development. Key initiatives include promoting climate-smart agricultural practices, improving irrigation efficiency, and enhancing the resilience of agricultural systems to climate change. The Ministry of Agriculture collaborates with farmers, research institutions, and international organizations to implement these strategies effectively.

1.1.10. Ministry of Water Resources

The Ministry of Water Resources is crucial for managing Iraq's water resources, which are increasingly stressed by climate change. This ministry oversees the planning and implementation of water management policies, infrastructure development, and flood control measures. It is responsible for enhancing water efficiency, restoring wetlands, and developing strategies to address water scarcity. The Ministry of Water Resources works closely with other government agencies and international partners to ensure sustainable water use and protect water ecosystems.

1.1.11. Ministry of Industry and Minerals

The Ministry of Industry and Minerals in Iraq plays a pivotal role in driving industrial development, managing state-owned enterprises, and fostering economic diversification, which are crucial for the country's efforts toward sustainable growth and reducing its dependency on oil revenues.

[116] *https://www.zeraa.gov.iq/*

1.1.12. Local Governments and Municipalities

Local governments and municipalities are essential stakeholders in Iraq's climate governance framework. They are responsible for implementing national climate policies at the local level and developing localized strategies to address specific climate challenges. Local authorities manage urban planning, infrastructure development, and community-based adaptation projects. They also play a crucial role in raising public awareness and engaging communities in climate action efforts.

1.1.13. Mayoralty of Baghdad[117]

Mayoralty of Baghdad is responsible for providing municipal services within the borders of the city of Baghdad, ensuring its development in a planned manner that is consistent with its status as the capital of Iraq. The municipality performs many services, including providing potable water, sewage, paving roads, and engaging in projects that serve the capital, including the construction of bridges, planting trees in the capital, and the establishment of public parks and gardens.

1.2. Kurdistan Region Government Agencies[118]

1.2.1. KRI Board of Investment

The Board of Investment in the Kurdistan Region is dedicated to fostering economic growth by authorizing investment licenses and tracking the progress of licensed projects. It provides essential information on investment opportunities to investors and stakeholders, supports the import of equipment and raw materials exempt from taxes, gathers citizen feedback on projects, and facilitates land allocation for investments, offering tax exemptions and other incentives to attract further investment.

1.2.2. KRI Environment Protection and Improvement Board

This pivotal entity plays a critical role in safeguarding the environment across the Kurdistan Region of Iraq (KRI). It not only develops and enforces environmental policies but also actively collaborates with key stakeholders to address pressing ecological issues. Through its coordinated programs, the Board focuses on preserving vital ecosystems, reducing pollution levels, and fostering sustainable development practices. Its work is fundamental in aligning environmental protection efforts with sustainable growth goals, ensuring a healthier, more resilient environment for future generations.

1.2.3. KRI Ministry of Planning

The Ministry of Planning in the Kurdistan Region is responsible for formulating development strategies, coordinating government projects, and managing public resources to ensure effective economic planning and sustainable development. The ministry also focuses on statistical data collection and analysis, providing critical information for informed decision-making and policy formulation across various sectors.

1.2.4. KRI Ministry of Finance and Economy

The Ministry of Finance and Economy in the Kurdistan Region is responsible for managing public finances, budgeting, and economic policy formulation. It oversees revenue generation, expenditure management, and financial regulations to promote economic stability and growth, while also working to enhance transparency and accountability in financial operations within the region.

[117] امانة بغداد - الموقع الرسمي
[118] https://gov.krd/

1.2.5. KRI Ministry of Natural Resources

The Ministry of Natural Resources (MNR) is managing the Kurdistan Region's rich reserves of oil, gas, and minerals. It is responsible for overseeing sustainable extraction practices, ensuring that resource utilization aligns with environmental standards and long-term economic stability. The Ministry's efforts focus on generating revenue, enforcing regulatory compliance, and supporting economic growth while balancing natural resource use with sustainability. Through these actions, MNR contributes to the Kurdistan Region's prosperity and responsible resource management.

1.2.6. KRI Ministry of Electricity

The Ministry of Electricity in the Kurdistan Region plays a vital role in powering the region's growth and development. It is tasked with generating, transmitting, and distributing electricity to meet increasing demand, all while prioritizing energy efficiency and reliability. Committed to a sustainable future, aiming to reduce dependency on fossil fuels and lower emissions. Through these initiatives, the Ministry supports a more resilient, eco-friendly energy infrastructure, essential for long-term regional sustainability and economic stability.

1.2.7. KRI Ministry of Transport and Communication

The Ministry of Transport and Communication is essential to advancing connectivity and economic growth in the Kurdistan Region. This Ministry manages a broad range of transportation infrastructure, including the construction, maintenance, and expansion of roads, airports, and public transit systems, aiming to improve accessibility and mobility for residents and businesses alike. In addition to transportation, it oversees communication services to foster reliable and modern connectivity, bridging communities and supporting digital transformation. Through these efforts, the Ministry drives both regional integration and economic development, positioning the Kurdistan Region for sustainable, interconnected growth.

1.2.8. KRI Ministry of Agriculture and Water

The Ministry of Agriculture and Water is crucial to fostering sustainable development in the Kurdistan Region by ensuring food security and managing vital natural resources. It oversees agricultural growth, promoting sustainable farming practices that enhance productivity while preserving soil health and biodiversity. The Ministry also manages water resources with a focus on efficient usage and conservation, addressing the region's water scarcity challenges and supporting rural communities' livelihoods. Through these initiatives, it aims to strengthen food security, empower rural economies, and contribute to long-term environmental sustainability across the Kurdistan Region.

1.2.9. KRI Ministry of Trade and Industry

The Ministry of Trade and Industry is a driving force for economic expansion and business development in the Kurdistan Region. By promoting industrial growth and regulating trade, it works to create a dynamic, competitive business environment that attracts both local and foreign investments. Through strategic policies and support for entrepreneurship, the Ministry strengthens the region's economic resilience and provides opportunities for sustainable growth.

1.2.10. KRI Ministry of Construction and Housing

The Ministry of Construction and Housing plays a key role in enhancing urban living and infrastructure throughout the Kurdistan Region. Responsible for urban planning, infrastructure projects, and housing development, the Ministry is dedicated to improving the quality of life and addressing the region's growing housing needs. Its efforts are pivotal in fostering sustainable urbanization and supporting equitable growth, ultimately boosting the region's standards of living.

1.2.11. KRI Ministry of Municipalities and Tourism

The Ministry of Municipalities and Tourism is instrumental in managing urban development, municipal services, and tourism within the Kurdistan Region. By overseeing essential infrastructure, improving public services, and promoting a sustainable tourism sector, the Ministry works to make the region more attractive to both residents and visitors. Through its focus on quality urban services and tourism development, it contributes significantly to economic growth, cultural promotion, and regional prosperity.

1.3. Local Associations

1.3.1. Federation of Iraqi Chambers of Commerce[119]

The Chamber of Commerce in Iraq serves as a key facilitator of trade and economic activity, supporting businesses by promoting commercial interests, fostering domestic and international trade relationships, and contributing to the overall economic development of the country.

1.3.2. Iraqi Contractors Federation[120]

The Iraqi Union of Contractors of Iraq provides resources, membership information, and updates on regulations affecting contractors in Iraq. The Iraqi Union of Contractors, founded in 1988, was the only independent corporate association in the country. In contrast to labor, professional, student, and business associations, it was staffed and managed by the contractors themselves, through membership fees. By late 1989, the Iraqi Union of Industrialists was beginning to achieve some independence from the Ministry of Industry and had managed to replace bureaucrats with functionaries chosen by the board rather than the goverment.

Today, the Iraqi Contractors Federation is a key organization representing contractors across Iraq, providing support, advocacy, and resources for its members. The federation plays an important role in the construction industry by facilitating communication between contractors and government agencies, as well as promoting best practices within the industry.

1.3.3. Iraqi Engineers Association[121]

The Iraqi Engineers Association, known as Niqabat al-Muhandisin al-Iraqiyyin, is the official professional body representing engineers in Iraq. They offer various services, including professional development, certification, and advocacy for engineers' rights and interests.

1.4. Non-Governmental Organizations

Non-Governmental Organizations (NGOs) play a crucial role in climate change governance in Iraq. They contribute to policy development, public awareness, capacity building, and the implementation of climate action projects. NGOs often act as intermediaries between the government, local communities, and international organizations, facilitating cooperation and ensuring that climate policies and strategies are effectively implemented at the grassroots level. Their involvement is essential for fostering inclusive and participatory climate governance and engaging with communities impacted by climate change. Their involvement in the long-term investment strategy in Phase II is crucial.

[119] *http://www.ficc.org.iq/*
[120] *https://icf.org.iq/*
[121] *http://www.ieu-iraq.org*

Annex II

SDG Stimulus 2023 (UNDP)

IRAQ SDG STIMULUS 2023

105 of 199 countries

* Imputed data point — * نقطة البيانات المحسوبة

Performance by Indicator	Value	Year	Rating	Trend	
SDG1 – No Poverty					الهدف 1 - القضاء على الفقر بجميع أشكاله في كل مكان
Poverty headcount ratio at $2.15/day (2017 PPP, %)*	NA	NA	NA	NA	نسبة الفقر عند 2.15 دولار في اليوم (تعادل القوة الشرائية لعام 2017، %)*
Poverty headcount ratio at $3.65/day (2017 PPP, %)*	NA	NA	NA	NA	نسبة الفقر عند 3.65 دولار في اليوم (تعادل القوة الشرائية لعام 2017، %)*
SDG2 – Zero Hunger					الهدف ٢ - القضاء على الجوع وتوفير الأمن الغذائي والتغذية المحسّنة وتعزيز الزراعة المستدامة
Prevalence of undernourishment (%)	15.9	2020	●	Steady	انتشار نقص التغذية (%)
Prevalence of stunting in children under 5 years of age (%)	9.9	2022	●	Improving	معدل انتشار التقزم بين الأطفال دون سن 5 سنوات (%)
Prevalence of wasting in children under 5 years of age (%)	3	2018	●	NA	معدل انتشار الهزال لدى الأطفال دون سن 5 سنوات (%)
Prevalence of obesity, BMI ≥ 30 (% of adult population)	30.4	2016	●	Deteriorating	انتشار السمنة، مؤشر كتلة الجسم ≤ 30 (% من السكان البالغين)
Human Trophic Level (best 2–3 worst)	2.1	2017	●	Steady	المستوى الغذائي البشري (الأفضل 2-3 الأسوأ)
Cereal yield (tonnes per hectare of harvested land)	2.7	2021	●	Improving	محصول الحبوب (طن لكل هكتار من الأراضي المحصودة)
Sustainable Nitrogen Management Index (best 0–1.41 worst)	1	2018	●	Deteriorating	مؤشر الإدارة المستدامة للنيتروجين (الأفضل 0–1.41 الأسوأ)
Exports of hazardous pesticides (tonnes per million population)	NA	NA	NA	NA	صادرات المبيدات الخطرة (طن لكل مليون نسمة)
SDG3 – Good Health and Well-Being					الهدف ٣- ضمان تمتّع الجميع بأنماط عيش صحية وبالرفاهية في جميع الأعمار
Maternal mortality rate (per 100,000 live births)	76.1	2020	●	Improving	معدل وفيات الأمهات (لكل 100 ألف مولود حي)
Neonatal mortality rate (per 1,000 live births)	14.1	2021	●	Improving	معدل وفيات الأطفال حديثي الولادة (لكل 1000 مولود حي)
Mortality rate, under-5 (per 1,000 live births)	24.5	2021	●	Improving	معدل وفيات الأطفال دون سن الخامسة (لكل 1000 مولود حي)
Incidence of tuberculosis (per 100,000 population)	24	2021	●	Improving	معدل الإصابة بالسل (لكل 100.000 نسمة)
New HIV infections (per 1,000 uninfected population)	NA	NA •	NA	NA	الإصابات الجديدة بفيروس نقص المناعة البشرية (لكل 1000 من السكان غير المصابين)
Age-standardized death rate due to cardiovascular disease, cancer, diabetes, or chronic respiratory disease in adults aged 30–70 years (%)	23.6	2019	●	Steady	معدل الوفيات الموحد حسب العمر بسبب أمراض القلب والأوعية الدموية أو السرطان أو مرض السكري أو أمراض الجهاز التنفسي المزمنة لدى البالغين الذين تتراوح أعمارهم بين 30-70 سنة (%)
Age-standardized death rate attributable to household air pollution and ambient air pollution (per 100,000 population)	89.7	2019	●	NA	معدل الوفيات الموحد حسب العمر الذي يعزى إلى تلوث الهواء المنزلي وتلوث الهواء المحيط (لكل 100.000 نسمة)
Traffic deaths (per 100,000 population)	27.3	2019	●	Deteriorating	الوفيات الناجمة عن حوادث المرور (لكل 000 100 نسمة)
Life expectancy at birth (years)	72.4	2019	●	Improving	متوسط العمر المتوقع عند الولادة (بالسنوات)
Adolescent fertility rate (births per 1,000 females aged 15 to 19)	70	2016	●	NA	معدل خصوبة المراهقات (الولادات لكل 1000 أنثى في الفئة العمرية 15 إلى 19 سنة)
Births attended by skilled health personnel (%)	95.6	2018	●	NA	الولادات التي تتم تحت إشراف موظفين صحيين ماهرين (%)
Surviving infants who received 2 WHO-recommended vaccines (%)	75	2021	●	Improving	الرضع الناجون الذين تلقوا لقاحين موصى بهما من قبل منظمة الصحة العالمية (%)
Universal health coverage (UHC) index of service coverage (worst 0–100 best)	55	2019	●	Improving	مؤشر التغطية الصحية الشاملة (UHC) لتغطية الخدمات (الأسوأ 0-100 الأفضل)
Subjective well-being (average ladder score, worst 0–10 best)	4.9	2022	●	Improving	الرفاهية الذاتية (متوسط درجات السلم، الأسوأ من 0 إلى 10 الأفضل)
SDG4 – Quality Education					الهدف ٤ ضمان أن تتاح للجميع سبل متكافئة للحصول على التعليم الجيد وتعزيز فرص التعلم مدى الحياة
Participation rate in pre-primary organized learning (% of children aged 4 to 6)	NA	NA	NA	NA	معدل المشاركة في التعلم المنظم لمرحلة ما قبل الابتدائي (% من الأطفال الذين تتراوح أعمارهم بين 4 إلى 6 سنوات)
Net primary enrollment rate (%)	92.8	2007	●	NA	صافي معدل الالتحاق بالمدارس الابتدائية (%)
Lower secondary completion rate (%)	48.4	2007	●	NA	معدل إتمام المرحلة الثانوية الدنيا (%)
Literacy rate (% of population aged 15 to 24)	93.5	2017	●	NA	معدل معرفة القراءة والكتابة (% من السكان الذين تتراوح أعمارهم بين 15 إلى 24 سنة)
SDG5 – Gender Equality					الهدف ٥ تحقيق المساواة بين الجنسين وتمكين كل الإناث واللاتي تتراوح أعمارهن
Demand for family planning satisfied by modern methods (% of females aged 15 to 49)	53.8	2018	●	Steady	بين 15 إلى 49 سنة)
Ratio of female-to-male mean years of education received (%)	86	2021	●	Steady	نسبة متوسط سنوات التعليم التي تلقتها الإناث إلى الذكور (%)
Ratio of female-to-male labor force participation rate (%)	16.4	2022	●	Deteriorating	نسبة مشاركة الإناث إلى الذكور في القوى العاملة (%)
Seats held by women in national parliament (%)	28.9	2021	●	Steady	المقاعد التي تشغلها النساء في البرلمان الوطني (%)
SDG6 – Clean Water and Sanitation					الهدف 6 - كفالة توافر المياه وخدمات الصرف الصحي للجميع وادارتها إدارة مستدامة
Population using at least basic drinking water services (%)	98.4	2020	●	Improving	السكان الذين يستخدمون على الأقل خدمات مياه الشرب الأساسية (%)
Population using at least basic sanitation services (%)	100	2020	●	Improving	السكان الذين يستخدمون على الأقل خدمات الصرف الصحي الأساسية (%)
Freshwater withdrawal (% of available freshwater resources)	79.5	2019	●	NA	سحب المياه العذبة (% من موارد المياه العذبة المتاحة)
Anthropogenic wastewater that receives treatment (%)	13.1	2020	●	NA	مياه الصرف الصحي البشرية المنشأ التي تتلقى المعالجة (%)
Scarce water consumption embodied in imports (m3 H2O eq/capita)	909.9	2018	●	NA	ندرة استهلاك المياه المتجسد في الواردات (م3 ماء مكافئ/فرد)
SDG7 – Affordable and Clean Energy					الهدف 7 - كفالة حصول الجميع بتكلفة ميسورة على خدمات الطاقة الحديثة الموثوقة والمستدامة
Population with access to electricity (%)	100	2020	●	Improving	السكان الذين يحصلون على الكهرباء (%)
Population with access to clean fuels and technology for cooking (%)	99	2020	●	Improving	السكان الذين يمكنهم الوصول إلى الوقود النظيف وتكنولوجيا الطهي (%)
CO2 emissions from fuel combustion per total electricity output (MtCO2/TWh)	2.6	2019	●	Steady	انبعاثات ثاني أكسيد الكربون الناتجة عن احتراق الوقود لكل إجمالي إنتاج الكهرباء (MtCO2/TWh)
Renewable energy share in total final energy consumption (%)	0.4	2019	●	Deteriorating	حصة الطاقة المتجددة من إجمالي استهلاك الطاقة النهائي (%)
SDG8 – Decent Work and Economic Growth					الهدف 8 - تعزيز النمو الاقتصادي المطرد، والشامل للجميع، والمستدام، والعمالة الكاملة والمنتجة، وتوفيرالعمل اللائق للجميع
Adjusted GDP growth (%)	-6.4	2021	●	NA	نمو الناتج المحلي الإجمالي المعدل (٪)
Victims of modern slavery (per 1,000 population)*	NA	NA	NA	NA	ضحايا العبودية الحديثة (لكل 000 1 نسمة)*
Adults with an account at a bank or other financial institution or with a mobile-money-service provider (% of population aged 15 or over)	18.6	2021	●	Steady	البالغون الذين لديهم حساب في بنك أو مؤسسة مالية أخرى أو مع مزود خدمة الأموال عبر الهاتف المحمول (% من السكان الذين تبلغ أعمارهم 15 عامًا أو أكثر)
Unemployment rate (% of total labor force, ages 15+)	15.7	2023	●	Deteriorating	معدل البطالة (% من إجمالي القوى العاملة، الأعمار 15+)
Fundamental labor rights are effectively guaranteed (worst 0–1 best)	NA	NA	NA	NA	حقوق العمل الأساسية مضمونة بشكل فعال (الأسوأ 0-1 الأفضل)
Fatal work-related accidents embodied in imports (per 100,000 population)	0	2018	●	Improving	حوادث العمل المميتة المتجسدة في الواردات (لكل 100 ألف نسمة)
Victims of modern slavery embodied in imports (per 100,000 population)	11.7	2018	●	NA	ضحايا العبودية الحديثة المتجسدة في الواردات (لكل 100 ألف نسمة)
SDG9 – Industry, Innovation and Infrastructure					الهدف 9 - إقامة هياكل أساسية قادرة على الصمود، وتحفيز التصنيع الشامل للجميع، وتشجيع الابتكار

Fish caught from overexploited or collapsed stocks (% of total catch)	NA	NA	NA	NA	الأسماك التي يتم صيدها من المخزونات المفرطة في الاستغلال أو المنهارة (% من إجمالي المصيد)
Fish caught by trawling or dredging (%)	2.8	2019	•	Deteriorating	الأسماك التي يتم صيدها عن طريق شباك الجر أو التجريف (٪)
Fish caught that are then discarded (%)	7.1	2019	•	Steady	الأسماك التي يتم صيدها ثم يتم التخلص منها (%)
Marine biodiversity threats embodied in imports (per million population)	0	2018	•	NA	تهديدات التنوع البيولوجي البحري المتجسدة في الواردات (لكل مليون نسمة)
SDG15 – Life on Land					الهدف 15 - حماية النظم الإيكولوجية البرية وترميمها وتعزيز استخدامها على نحو مستدام، وإدارة الغابات على نحو مستدام، ومكافحة التصحر، ووقف تدهور الأراضي وعكس مساره، ووقف فقدان التنوع البيولوجي
Mean area that is protected in terrestrial sites important to biodiversity (%)	5.6	2022	•	Steady	متوسط المساحة المحمية في المواقع الأرضية المهمة للتنوع البيولوجي (%)
Mean area that is protected in freshwater sites important to biodiversity (%)	8.1	2022	•	Steady	متوسط المساحة المحمية في مواقع المياه العذبة المهمة للتنوع البيولوجي (%)
Red List Index of species survival (worst 0–1 best)	0.79	2023	•	Deteriorating	مؤشر القائمة الحمراء لبقاء الأنواع (الأسوأ 0-1 الأفضل)
Permanent deforestation (% of forest area, 3-year average)	NA	NA	NA	NA	إزالة الغابات الدائمة (% من مساحة الغابات، متوسط 3 سنوات)
Terrestrial and freshwater biodiversity threats embodied in imports (per million population)	0	2018	•	NA	تهديدات التنوع البيولوجي الأرضية والمياه العذبة المتجسدة في الواردات (لكل مليون نسمة)
SDG16 – Peace, Justice and Strong Institutions					الهدف 16 - التشجيع على إقامة مجتمعات مسالمة لا يهمش فيها أحد من أجل تحقيق التنمية المستدامة، وإتاحة إمكانية وصول الجميع إلى العدالة، وبناء مؤسسات فعالة وخاضعة للمساءلة وشاملة للجميع على جميع المستويات
Homicides (per 100,000 population)	9.4	2013	•	NA	جرائم القتل (لكل 000 100 نسمة)
Unsentenced detainees (% of prison population)	NA	NA	NA	NA	المحتجزون غير المحكوم عليهم (% من نزلاء السجون)
Population who feel safe walking alone at night in the city/area where they live (%)	74	2022	•	Improving	السكان الذين يشعرون بالأمان عند المشي بمفردهم ليلاً في المدينة/المنطقة التي
Birth registrations with civil authority (% of children under age 5)	98.8	2018	•	NA	تسجيلات المواليد لدى السلطة المدنية (% من الأطفال دون سن 5 سنوات)
Corruption Perceptions Index (worst 0–100 best)	23	2022	•	Steady	مؤشر مدركات الفساد (الأسوأ 0-100 الأفضل)
Children involved in child labor (% of population aged 5 to 14)	4.5	2018	•	NA	الأطفال المنخرطون في عمالة الأطفال (% من السكان الذين تتراوح أعمارهم بين 5 إلى 14 سنة)
Exports of major conventional weapons (TIV constant million USD per 100,000 population)	0	2021	•	NA	صادرات الأسلحة التقليدية الرئيسية (قيمة TIV الثابتة مليون دولار أمريكي لكل 100,000 نسمة)
Press Freedom Index (worst 0–100 best)	32.9	2023	•	Deteriorating	مؤشر حرية الصحافة (الأسوأ 0-100 الأفضل)
Access to and affordability of justice (worst 0–1 best)	NA	NA	NA	NA	الوصول إلى العدالة والقدرة على تحمل تكاليفها (الأسوأ 0-1 الأفضل)
Timeliness of administrative proceedings (worst 0–1 best)	NA	NA	NA	NA	توقيت الإجراءات الإدارية (الأسوأ 0-1 الأفضل)
Expropriations are lawful and adequately compensated (worst 0–1 best)	NA	NA	NA	NA	عمليات المصادرة قانونية ويتم تعويضها بشكل مناسب (الأسوأ 0-1 الأفضل)
SDG17 – Partnerships for the Goals					الهدف 17 - تعزيز وسائل تنفيذ الشراكة العالمية وتنشيطها من أجل التنمية المستدامة
Government spending on health and education (% of GDP)	7.5	2020	•	Improving	الإنفاق الحكومي على الصحة والتعليم (% من الناتج المحلي الإجمالي)
For high-income and all OECD DAC countries: international concessional public finance, including official development assistance (% of GNI)	NA	NA	NA	NA	بالنسبة للبلدان ذات الدخل المرتفع وجميع بلدان لجنة المساعدة الإنمائية التابعة لمنظمة التعاون والتنمية في الميدان الاقتصادي: التمويل العام الدولي الميسر، بما في ذلك المساعدة الإنمائية الرسمية (% من الدخل القومي الإجمالي)
Other countries: Government revenue excluding grants (% of GDP)	38.6	2019	•	Improving	البلدان الأخرى: الإيرادات الحكومية باستثناء المنح (% من الناتج المحلي الإجمالي)
Corporate Tax Haven Score (best 0–100 worst)*	0	2021	•	NA	درجة الملاذ الضريبي للشركات (الأفضل 0-100 الأسوأ)*
Statistical Performance Index (worst 0–100 best)	56.3	2022	•	Improving	مؤشر الأداء الإحصائي (الأسوأ 0-100 الأفضل)

Annex III

Summary of climate change impacts on economic sectors according to main national policies

The sectoral Adaptation and Mitigation actions in this document are targeted in a way that enables the synergies between the reflected adaptation and mitigation measures in the related national documents especially Iraq's Nationally Determined Contributions (NDC), The National Adaptation Plan (NAP), the Nationally Appropriate Mitigation Action (NAMA) and the National Country Programme to the Green Climate Fund (GCF) to show the Iraqi vision to address the climate challenges and harness opportunities for sustainable development.

Below are the key priority sectors highlighted in the national related documents and the current situation of each one in the presence of climate finance change with the CIP goals[122,123]

Table 2: Adaptation contribution areas

Current Impact of Climate Change on the Sector	Future Impacts of CC	The economic value of the sector and impacts of CC	Opportunities
Agricultural Sector			
Desertification: 39% of Iraq's territory Degraded lands: 69.8% (2021). Soil salinization: 54% increase in agricultural land. Area affected by sand dunes: 2.4% Dust storms: 25 days in 1990 to 200 days in 2022. Increased erosion of arable land leads to farmers' displacement to urban areas. In 2022 alone, the IOM registered 10,464 families (62,784) people in 259 locations in southern and central Iraq displaced due to climate change-induced drought. Traditional farming practices using over 75% Reduced food production Food insecurity: An estimated at 1.77 million (2019) Low annual rainfall for the second year in 2022 led to reduced water storage availability in dams (73% to 32% between 1988 to 2018[124]) and less recharge to the groundwater. Reduced flows and increased evaporation lead to an increased seawater intrusion and a considerable deterioration of water quality in the southern part	Stormy days will reach 300 days/year in 2050. Irrigation will increase by 30-40% in the next three to five years. Increased poverty with potential for displacement and loss of employment, extending to urban communities as well as rural, agriculture-dependent areas[125]. Severe implications for people's livelihoods as well as their health.	The agricultural sector accounts for 5% of the country's gross domestic product (GDP) The added value of the agri-food sector decreased from the GDP (from 20% before 2003 to 3.3% in 2019) Agriculture sector is the second largest contributor after the oil sector. In 2018, the agricultural sector was responsible for employing 18.7% of the active workforce, and 23.3% of these workers were women.	Climate-smart agroforestry Soil management, and sustainable use of resources Mangrove plantations Healthy food system to support the food security and transfer towards Water-efficient practices using recycled water, Crop management and diversification. Introduction of salt and drought-resistant crops Land use good practice,

[122] *Iraq – Technology Needs Assessment report for mitigation and adaptation 2022*
[123] *NDC of Iraq, 2021*
[124] *Iraqi SNC and 1BUR to the UNFCCC, 2024*
[125] *Climate Risk Assessments for Iraq- A Report Developed Collaboratively between UNEP (the Walker Institute) and the Ministry of Environment funded by the Green Climate Fund under the Iraq National Adaptation Plan, 2024*

Water resources			
A decline in transboundary water resources (over 75% of water resources are originated outside Iraq) A sharp decline in internal water resources due to drought conditions. 16% less renewable water resources compared to the early 2000s. Evaporation losses in 2021 were also significant in Iraq due to high temperatures, with an estimated 9 BCM water loss by evaporation from Iraq's reservoirs[126]. Industrial needs for oil production require approximately 1.3 to 1.5 barrels of water injected for every barrel of oil extracted. Iraq is already grappling with a significant water crisis, evident in the current per capita water consumption of 1250 m3/person/year[127].	Reduction by 9% on average in annual precipitation by 2050) 20% reduction in available freshwater. Decline in renewable water resources is projected to reach 37% during the period 2020–2030, and 51% between 2040–2050. Higher stormy rainfall events and extreme rainfall intensity. The sea level rise (SLR) is increasing and is very likely to reach +0.3-0.4m by 2050s (high confidence) and then between +0.5m to +1m by 2100 depending on the emission scenario, and this will increase the salinization of the inlands[128]. Expected decline in water availability in the Tigris-Euphrates Basin (TEB) by 30 to 70% by 2100, threatening the very existence of the 'Fertile Crescent'[129]. Marshes flooding reduction to 30% with irreversible changes in the Southern Marshes eco-region By 2050, the optimistic scenario of the water available will be around 600 m^3/person/year to a pessimistic scenario as low as 400 m3/person/year. The resulting decline in water quality will increase health issues.	Iraq's GDP is projected to drop by 3.5 percent (or USUSD 6.6 billion) under a 20 percent reduction in water supply, and by 3.9 percent when higher temperatures are factored in[130]. Increase in local conflicts due to water scarcity and drought/migration. Without action, water constraints will lead to large losses across multiple sectors of the economy and come to affect more and more vulnerable people. Shatt al-Arab: loss of 22 billion Iraqi dinars in the year 2022 (16,500 USD) due to the loss of water buffalos Loss of 14 billion Iraqi dinars (10.5 Mio USD) based on FAO estimates from dead or migration with over 80,000 head losses. The volume of losses and damages that the country was exposed to due to floods and torrents amounted to about 344.3 million USD until 2020.	Smart water management Urban wastewater treatment and water recycling. Water desalination Construction of small dams to harvest water in the eastern and desert regions of the country, Use of non-conventional water resources (treated wastewater) to irrigate green belts adjacent to cities, Use of treated wastewater for oil wells injection Lining of transportation canals with concrete pads Switching from surface irrigation to closed irrigation Early warning system for scarcity (drought) and flood.

[126] *Economic Monitor, the Slippery Road to Economic Recovery- Fall 2021- World Bank group, middle east and north Africa region.*
[127] *National Adaptation Plan, 2024*
[128] *Climate Risk Assessments for Iraq- The Southern Marshes Eco-region and Persian Gulf and Shatt Al-Arab Eco-Region- A Report Developed Collaboratively between UNEP (the Walker Institute) and the Ministry of Environment (Climate Change Center) funded by the Green Climate Fund under the Iraq National Adaptation Plan*
[129] *Climate Risk Assessments for Iraq, A Report Developed Collaboratively between UNEP (the Walker Institute) and the Ministry of Environment funded by the Green Climate Fund under the Iraq National Adaptation Plan- 2022.*
[130] *Country Climate and Development Report- Iraq-World Bank, November 2022.*

Health Sector			
Increased exposure of vulnerable populations to health threats due to high temperatures, water scarcity, water pollution, and extreme weather events. In 2018, ca. 118,000 cases of gastrointestinal poisoning in southern Basra due to water shortages and water pollution. In 2019, 4,762,333 children were infected with acute epidemic diarrhea due to flood waters, 8 times higher than the normal rate of previously recorded infections. Nutritional deficiencies in rural communities due to water scarcity and poor-quality impacting livestock and agriculture Heat stress increases and impacts on health of vulnerable populations and labor capacity The increase in water-borne diseases is on the rise because people/livestock are concentrated around fewer water sources. An increase in respiratory problems due to higher events of sand and dust storms significantly worsens air quality by increasing particulate matter and carrying harmful substances and pathogens. Increase in fecal contamination from runoff, overflow, or and untreated sewer	15% increase in hot days on average Under a high emissions scenario, about 70% of days on average are defined as 'hot' by the century, Increase in the frequency and/or intensity of dry episodes Increase in the frequency and/or intensity of drought events. Population exposure to heat stress is likely to rise in the future, due to increased urbanization (and the associated urban heat island effect) and climate change increasing the likelihood of severe heat waves. The heat-related deaths among the elderly (65+ years) are projected to rise to about 64 per 100,000 by 2080. A rapid reduction in emissions could significantly reduce deaths among the elderly in 2080 to around 14 per 100,000 population[131].	Health expenditure in 2021 was 5.25% of GDP[132] This is expected to increase due to the normal demographic growth but even more with the climate change impacts External workers (ca 35% of workers in the agriculture and 45% in the construction sector) will face increased exposure to extreme heat exceeding 50 degrees Celsius and longer heat waves. Given that jobs in these sectors are rarely formal or salaried and compensation is mostly tied to output, reduced labor productivity translates into lost earnings[133].	Enhance the multisectoral collaboration between health and health-determining sectors with agreements on climate change and health action (e.g. transport, energy, water and sanitation, national meteorological and hydrological services sectors, etc.). Strengthening the use of meteorological information to inform risk surveillance of all climate-sensitive diseases. Strengthening health infrastructures providing clean drinking water, integrating climate change into national health policy, and raising awareness by informing the public about the necessary measures to protect health from the harmful effects of climate change would reduce the negative effects of climate change on health. Desalination of seawater in southern of Iraq to provide the local population with fresh water by installing (R.O) units.

[131] *HEALTH AND CLIMATE CHANGE COUNTRY PROFILE 2021- WHO- UNFCCC.*
[132] *OIC COUNTRIES IN FIGURES (OIC-CIF): Iraq - SESRIC*
[133] *Country Climate and Development Report (CCDR)- WB group- November 2022- Iraq*

Biodiversity			
Expected reduction in renewable water resources of 37% in 2020–2030 and 51% in 2040–2050. This will adversely affect natural systems and biodiversity.[134] Forests and natural reserves areas (3.1% of Iraq in 2018) decreased to 1.6% in 2020. Iraq's natural systems and biodiversity are vulnerable, especially the marshland ecosystems in the south, the forests in the north, and the lakes and rivers. The marsh ecosystem, recognized as a UNESCO heritage site, and the rich biodiversity in the region face their highest risk yet, putting the livelihoods of 1 million Marsh Arabs in jeopardy, including the risk of displacement.[135] The percentage of marsh flooding decreased from 57.4% in 2018 to 26.85% in 2022. Loss of habitat for biodiversity due to unregulated flow into the marshes.	Habitat degradation rate is increasing. Approximately 250 species out of the 648 species present in Iraq suffer from threats related to climate change and extreme weather, according to the criteria of the Red List of Threatened Species of the International Union for Conservation of Nature (IUCN) for assessing threats. to which biodiversity is exposed. The number of invasive alien species has increased due to the entry of some species via imported goods through the Iraqi border[136].	Pollution of freshwater and marine water resources, air pollution, and biodiversity lead to high societal and environmental costs (damage to health and quality of life) estimated at 3.7% of GDP in 2013 (56% of total losses), and to natural resources, 2.9% of GDP (44% of total losses) (Ministry of Environment 2013). For the Southern Marshes eco-region, critical changes expected are likely from a decrease in water inflow from upstream of the marshes with an increase in aridity levels. This could decrease agricultural land productivity and fisheries and increase the loss of habitat for biodiversity due to unregulated flow into the marshes.	Maintaining and enhancing marshlands as carbon sinks while preserving biodiversity through sustainable actions involving local communities to promote sustainable development, strengthen governance, and encourage alternative livelihoods. Developing a national legislative framework to protect wildlife (animals and plants) and reserves, focusing on regulating tourism activities. Eliminating encroachments on the paths of the rivers feeding the marshes to ensure the delivery of the necessary water quotas to the mouths of the marshes. Iraq could deeply invest in protecting its environment and sea coastal areas, recognizing the importance of biodiversity and the precious ocean resources in the Gulf. Biodiversity can be increased in farming via conservation-friendly agriculture. Such methods include reductions in fertilizer and pesticide use, promotion of natural crop pests (e.g., intercropping to promote pest enemies), and management to encourage pollinating insects.

[134] *Iraq – Technology Needs Assessment report for mitigation and adaptation 2022*
[135] *National Green Growth Strategy, 2024*
[136] *Iraq's sixth national report to the Convention on Biological Diversity*

Infrastructures			
Climate change increases the intensity and frequency of extreme weather events including drought and floods. Current infrastructures, already damaged by weathering and conflicts were not designed to sustain extreme events. The most important infrastructure affected are electric power generation, water complexes and irrigation networks, roads, bridges, health infrastructures, transportation, and industry. Climate-induced displacements will increase the burden on already inefficient and ill-maintained urban essential infrastructures such as water and power supply, waste and wastewater treatments. Rising sea levels can lead to storm surges, coastal erosion, saltwater intrusion of groundwater aquifers and ecosystem disruption.	The climate change effects will put more pressure on the already deteriorated and maladapted infrastructures.	According to the CCDR report, the required frontloaded investments and operational spending till 2040, for the adaptation package to face of water scarcity is identified as USD 70 billion. Macro simulations reveal that introducing this package would add 0.12 percent to the GDP in the first 5 years on top of the gains from the CEDP* transition pathway and the accompanying fiscal reforms (0.87 percent gain by 2040). However, it would come at a fiscal cost where the budget deficit would average at 11 percent of GDP in the first 5 years before declining to an average of 4.3 percent thereafter[137]. The package includes (i) critical infrastructure programs for the rehabilitation of dams, barrages, regulators, drains, and canals; (ii) reclamation and modernization of irrigation (on-farm and off-farm); as well as (iii) soft investments in public and private water service institutions and programs (e.g., capacity building of farmer-led organizations, cost recovery policy reform, and update of the operations of dams); and (iv) water security and conservation programs. These adaptation measures are estimated to reduce water scarcity by half (down to 10 percent). Also, according to Iraq construction and investment document by the World Bank, 2018, the industry displays one of the highest recovery and reconstruction needs among the Productive sectors with IQD 12.5 trillion (USD 10.6 billion)[138].	Infrastructure in transport, communications, IT, electricity, and water to exploit the maximum available resources, direct investments and attract the local and foreign private sector to this direction. There is an urgent need for quick intervention to reconstruct infrastructures especially those related to drinking water and sanitation, solid waste treatment, housing, public transport and roads, and bridges. The infrastructure of irrigation and water management in rural areas is considered a priority to enable the reclamation of agricultural production. Thus, major investments are needed in infrastructure to ensure the growth and development process is not obstructed in the future. Continue investment in infrastructure in partnership with the private sector whenever possible to boost the population welfare, protect the environment and develop the production sectors. The government will need to consider the opportunities for privatizing the infrastructure's management and maintenance. Take geographic integration into account. The reconstruction activities and future investments should be based on an integrated geographic planning approach to ensure that all the systems of IT, communications, water, roads, airports, railways, and ports should be integrated. Developing electricity entails implementing reforms in four key areas including energy supplies and reliability, sector operational capacities, financial sustainability, and the institutional, legal, and regulative framework. Develop the transport sector through increasing railway connections locally and internationally especially to transfer goods among ports, border crossings, and industrial zones, making the sector more responsive to the industrial and commercial growth needs and facilitating the easy and quick flow of goods and people across the country. Develop the IT and communications infrastructure, increase access to these technologies, increase the speed of internet connections, develop the national structure of digital storing and link it effectively to the internet. Develop healthcare facilities, universities, schools, and other infrastructure to be capable of withstanding extreme weather events, given the increasing frequency of severe natural disasters due to climate change.

[137]* *Cost-Effective Decarbonization Pathway- CEDP*
Country Climate and Development Report (CCDR)- Iraq-World Bank, November 2022.
[138] *Iraq construction and investment document by the world bank, 2018, part2- damage and needs assessment of affected governorates.*

Table 3: Key mitigation areas

Current Impact of Climate Change on the sector	Future Impacts of CC	The Economic value of the sector and impacts of CC	Opportunities
Energy sector- Oil and gas			
- In 2019[139]: Total GHG emissions = 150,484.50 Gg CO_2 eq from: - Fuel combustion = 80.76% - Volatile emissions = 19.24% In 2022[140]: - Methane emissions =29.5 Mt of CO_2 eq - Approximately 5% of methane leaks without combustion= 21.856 Mt CO_2eq - The cumulative emissions stemming from the oil production sector = 42.513 Mt annually=22.5% of Iraq's total GHG emissions.	By 2030: 33% power capacity from clean energy (12 GW)	-The Ministry of Oil sells domestically produced natural gas, crude, and fuel oil to the electricity sector at highly subsidized prices, which are fixed in Iraqi dinar regardless of movements in international energy prices or exchange rates. In 2019, these prices represented 16, 11 and 46 percent of their respective international prices implying an additional cost of IQD 6.4 trillion in implicit subsidy. By including the implicit cost, the total cost of the electricity sector in 2019 amounted to IQD17.4 trillion (6.3 percent of GDP). As a result, attempts to close the supply-demand gap using past strategies would lead to losses more than doubling to IQD 55 trillion by 2027 (12.6 percent of GDP) from IQD 19 trillion in 2021 (6.5 percent of GDP). - The forgone annual value of the gas flared has been estimated at USD 2.5 billion. - In 2019 alone, Iraq imported around USUSD 6 billion worth of refined petroleum, plastics, fertilizers, pharmaceuticals, and other key chemical-based products - The investment cost needed for gas capture and elimination of gas flaring in Iraq was estimated at USD 29 billion (CCDR 2022)	- Electrifying upstream facilities with low emissions electricity. - Equipping oil and gas processes with carbon capture, utilization, and storage. - Expanding the use of low-emissions hydrogen in refineries. - The development of technologies that will allow to phase out flaring can be an important incentive to stimulate private investments to pursue a sustainable economic growth. - Expanding investment projects in associated gas by adding projects in different regions of Iraq. - Phase out routine flaring in Iraq, to be utilized in energy generation potential for the country, allowing it to increase its Energy security without having to import gas from neighboring countries. The forgone annual value of the gas flared has been estimated at USD 2.5 billion. Similar amount would be sufficient to fuel more than 10 GW of much-needed electricity generation capacity to achieve a clean energy transition. - Attract investors to utilize it in downstream chemicals production. Large amounts of associated gas can be utilized as a cost-effective feed for downstream chemicals, mainly methane (C1), ethane (C2), and propane (C3).

[139] *Iraqi SNC and 1BUR to the UNFCCC, 2024*
[140] *Nationally Appropriate Mitigation Actions (NAMA) Strategy of Iraq 2024- NAMA Mitigation Strategy*

Electricity and Power generation			
	- This may lead to peak electricity demand crossing the 37 GW barrier, which may reach 50 GW by 2030 when considering the steady increase in population[141]. - The extreme heat drives up demand for electricity for cooling purposes, putting pressure on the energy grid and potentially leading to blackouts. - If the situation continues as the same, there will be no Hydro-power generation in Iraq, due to the shortage of the available water. Iraq possesses substantial solar energy potential, boasting an average irradiation of 5.6 kWh per square meter daily and basking in over 3,000 hours of sunshine annually.	- The sector's financial demands exert considerable fiscal strain on Iraq's federal budget annually. - Iraq records the highest levels of subsidies and rates of unpaid electricity bills in the Middle East and North Africa region. - Expenditures on electricity consume sizable amounts of public and private resources, with some accounts estimating that more than USD 80 billion went into the sector since 2003[142]. - In 2019, fuel subsidies amounted to 5.6 billion US dollars, half of the cost of operating the energy system annually (11.3 billion US dollars), while the Ministry of Oil bore the remaining amount (5.7 billion US dollars). - Furthermore, a significant portion of electricity, exceeding 67%, is lost before billing, and current tariff collection only covers approximately 11% of the cost associated with electricity production and distribution. - The neighborhood generator industry has grown in scale, and its revenues in 2018 were estimated at around USUSD 4 billion—roughly four times what the official electricity sector had collected during the same period (IEA, 2019).	- Gradual and safe transition to renewable energy and increased energy efficiency. - Improve energy demand management through the development of a smart power grid. - Solar PV technology reduces significantly the power emissions factor, in the grid and off-grid, especially in isolated rural areas.

[141] تقرير تزويد العراق بالطاقة- التحديات التي تواجه قطاع الكهرباء في العراق، روبن ميلز ومريم سلمان/ تشرين الاول/ اكتوبر 2020) https://library.fes.de/pdf-files/bueros/amman/16924.pdf

[142] Al-Khatteeb, Luay, Istepanian, Harry, 2015, "Turn a Light On: Electricity Sector Reform in Iraq" Foreign Policy at Brookings

Transportation			
- Total emissions = 21,654.75 Gg CO2 eq in 2019 = 18% of total. - 20.6% of CO2 emissions are from transports including domestic aviation, domestic navigation, road, rail, and pipeline transport. - The annual traffic growth rate during the last 10 years of 11.5% is found which is much higher than the population growth rate of 3.14%[143]. - Average passenger per car in Iraq= 2.8 person/car - Car consumed 7.576liter/100km (NAMA) - The transportation sector's demand for fossil fuels, which constitutes 60% of the total consumption of petroleum derivatives, is increasing, to increase the number of vehicles, the number of which was estimated throughout Iraq, including the Kurdistan Region, at 7,460,000 vehicles as per 2023 statistics. The transport sector relies on two types of emission-causing fuels: i) gasoline and ii) diesel. - For gasoline, Iraq consumes about 28 million liters per day, with 18 million liters produced locally and 10 million litters imported (excluding Kurdistan Region). The combustion of one kilogram of gasoline produces 0.85 kg of CO2eq per liter. This results in daily emissions of 18,878.5 tons into the atmosphere. Transport emissions amount to approximately 18.89 million tons of CO2eq annually. - Diesel vehicles (trucks + passengers) constitute approximately 11% of the total number of cars in Iraq, with 820,600 cars. The average daily consumption per car is 20 liters, totaling 16.4 million liters per day (13.77 million kg). Each kilogram of diesel combustion emits 3.22 kg of CO2eq.	According to the NAMA document, diesel and gasoline, used primarily in the transport sector, would dominate future growth in fossil fuels by 2030.	Actual investment expenditures per transportation sector were 2,311.81 Iraqi billion dinar (9.47%) in 2019	Public transportation with advanced, efficient, and environmentally friendly technology Hybrid and eco-friendly vehicles, through: - Suspended train system to provide efficient, reliable, and eco-friendly transportation within urban areas powered by renewable energy - Cooperating with automobile manufacturers and their agents to facilitate the gradual transition to hybrid vehicles. - Establishing infrastructure for electric charging systems - Using aircraft with more fuel-efficient engines and a more efficient operating system.

[143] *Highlighting the Ongoing Roads Infrastructure Challenges: Car Ownership Rates in Iraq/ Dr. Jalal Taqi Shaker Al-Obaedi/ †College of Engineering, University of Al-Qadisiyah, Iraq/ University of Thi_Qar Journal for Engineering Sciences/ Vol.10 No.1 (May 2019)- ISSN 2075-9746- Available at http://jeng.utq.edu.iq*

IPPU			
GHG emissions sector = 2,414.64 Gg of CO2 eq. (1.36% of total GHG emissions) in 2019[144]. The sector consumes more than 3 million tons of oil equivalent. - Industry is the main source of hazardous waste: 33.3 tons per month[145]. The daily average amount of water used in private and public sector factories during the year 2022 is equal to 373 thousand cubic meters per day[146]. The industrial demand growth is closely tied to the overall economic expansion.	Projections indicate to: 2030 = 10.52 Mt CO2eq 2050 = 20.41 Mt CO2eq. A continuous rise in energy consumption within Iraq's industry and minerals sector, growing by over 6% annually to reach just over 15 million metric tons by 2035. This consumption comprises a mix of natural gas, natural gas liquids, and electricity.	Increased temperatures are expected to severely affect labor productivity in Iraq. A huge proportion of Iraq's labor force is facing extreme heat conditions with temperatures exceeding fifty degrees Celsius. At the same time, growing water scarcity and more frequent extreme weather events have increasingly affected socio-economic conditions in Iraq through the exacerbation of electricity shortages and reduction of economic output in various sectors of the economy. Without action, climate change and reduced water availability will reduce GDP through a cascade of negative impacts across multiple sectors of the economy and impact more the vulnerable people. Output would be reduced across the economy, with one of the worst-hit sectors being the industrial sector which would experience a 5.5 percent loss of output[147].	- The industrial sector is considered one of the most promising national sectors to diversify the national economy sources, address youth unemployment if it is developed. - Development of a national strategy to increase energy efficiency and movement towards clean energy in the industrial sector. - Industry is a vital part of the future, with a commitment to a competitive, green, and digitally advanced industrial sector. - Research and innovation are recognized should receive significant attention as they are crucial drivers of transformative change in Iraq to invest further in fueling the country's development. - Increase private sector participation for clean technology adoption and establish interrelations between manufacturing and other sectors. - Improving the efficiency of resource consumption, introducing modern technology, and preparing preliminary studies on new technologies as carbon capture and storage, producing green hydrogen, low-carbon hydrogen, and innovative products to be used in the long term. - The energy-intensive industries offer opportunities for enhancing energy efficiency and emissions reduction, with a focus on cement production that aims to integrate renewable energy sources and innovative CO2-absorbing blends to achieve substantial decarbonization.

[144] *Iraqi SNC and 1BUR to the UNFCCC, 2024*
[145] *Environmental statistics - industry sector - 2023*
[146] *Environmental statistics for Iraq - Industry sector for the year 2022 - Ministry of Planning - Central Bureau of Statistics - Department of Environmental Statistics 2023*
[147] *Economic Monitor, the Slippery Road to Economic Recovery- Fall 2021- World Bank group, middle east and north Africa region.*

Waste			
- GHGs emissions from this sector: 19,065.68 Gg of CO_2eq (10.73% of the total GHGs in Iraq). - 90.84% from domestic (municipal) solid waste - 8% wastewater treatment - 47.55% of total Methane emissions from the waste sector: In 2022: - ca. 11.9 million tone /year solid waste= 63.4% of the total waste collected[148]. The recycled municipal waste= 915.0 ton/ year - ca. 1,112 Mio m3/year wastewater with 670 million m3/year treated - 64 WWTP for 34.5% of the population - 17 400 tons/year sludge re-used for in the agriculture[149]. - Baghdad produces about 9,000-10,000 tons of municipal waste per day at a rate of 1-1.250 kg per day per person[150]. - Bin composition in Baghdad (2023) [151]: 42 % Organic waste, 22% paper and plastic, 21% plastic, 6 % metals, 5 % glass, 4% others. Only 64% of this municipal waste is collected (2016).	- The expected average annual quantity of waste in 2030 period was found to be about 23.96 million tones after taking into account that the population will be 50 million persons and comparing that with the population on 2022 which was equal to 24,833,000 persons and the average amount of waste generated that was 11.9 Mt. - BAU scenario: 2030 = 16.85 Mt CO_2eq in 2050 = 70 Mt CO2eq in 2050	- Municipal solid waste = 11.4 million tons in 2010 to 14.9 Mt in 2016 (+6%/year). - Industrial waste = 9,000 tons/year	Improve the infrastructures for waste separation, collection, transportation and treatment. - Organic materials in the municipal waste is 42% that can be used energy generation or as compos for soil conditioning. - Community awareness for waste separation and recycling to increase efficiency and reduce operational costs. - Establishing waste recycling stations. - Wastewater reuse for agricultural irrigation. - Aerobic and Anaerobic wastewater treatment with biogas recovery for heat and/or electricity generation.

[148] *Environmental statistics for Iraq (municipal services sector) for the year 2020 - Ministry of Planning - Central Statistical organization - Department of Environmental Statistics 2023*
[149] *Iraqi SNC and 1BUR to the UNFCCC, 2024*
[150] *A roadmap towards adopting energy generation projects from municipal solid waste- Dr. Ammar Jaber Al-Atta - 2024 - Policy Paper No. 53. Platform Center for Sustainable Development*
[151] *A study on the daily excretion of waste per person and its components in the city of Baghdad - Baghdad Municipality - Department of Solid Waste and Environment - 2023*

Agriculture, forest and Land Use (AFOLU sector)			
The GHG emissions from the AFOLU sector in 2019 were as follows: – Methane: 4.95 Mt – Nitrous oxide: 4.320 Mt – CO2 emissions: 5.6-6.7 Mt – Total GHG emissions =14.8-15 Mt of CO_2eq per year, about 8% of the total emissions. - Nitrous oxide emissions were highest from the agriculture, forestry, and other land use sectors, with a contribution of 79.23%.	-The reduced amount of water due to climate change, will severely impact on agricultural production, environmental systems, livestock, biodiversity, and food security. It is projected that climate change will continue affecting the region for decades to come[152]. According to the 1st BUR of Iraq, if business continues as usual in the AFOLU sector, this sector's emissions will increase to 11.19 Mt CO_2eq in 2030 and 13.19 Mt CO_2eq in 2050.	The agriculture sector contracted by 17.5% in the wake of severe drought and power outages[153] Agriculture, in contrast, attracts less than 2% annually of investment over the same period although it makes up nearly 5% of GDP in Iraq (FAO, 2017)	While Iraq's agricultural sector faces severe impacts of climate change, such as escalating water scarcity and soil salinization it can also contribute to climate mitigation. The potential carbon sequestration from the agriculture sector in Iraq depends on various factors, including land use practices, crop types, soil management, and sustainable agricultural practices adopted. Agroforestry and reforestation: Planting trees on agricultural lands or reforesting degraded areas can contribute significantly to carbon sequestration. Soil carbon management: conservation tillage, cover cropping, and organic matter additions enhance soil carbon sequestration. Improving soil health and organic matter content leads to higher carbon retention in the soil.

[152] *Iraq – Technology Needs Assessment report for mitigation and adaptation- 2022*
[153] *Iraq's Economic Update — April 2022 (worldbank.org) 2022 البنك الدولي- التحديث الاقتصادي للعراق - نيسان*

Annex IV

List of relevant universities and research institutes

Table 4: Research Institutions on Climate and Environmental related issues

abad	Research Institution	University	City	Description	Website		Entity
1	**Dams and Water Resources Research Center**	University of Mosul	Mosul	A leading scientific institution dedicated to research, studies, and projects in the fields of dams, water resources, and geotechnics. The center provides scientific consultations to both public and private sectors, contributing to sustainable water management and the application of modern hydraulic and computer models. Through collaboration with local and international organizations, the center has gained a strong reputation, producing research recognized both in Iraq and globally.	Dams researches and Water Resources Center (uomosul.edu.iq)	dwrrc@uomosul.edu.iq	Governmental
2	**Remote Sensing Research Center**	University of Mosul	Mosul	The Center has two specialized departments: Digital Processing and Geographic Information Systems, and Natural Resources and Engineering Science. It also includes the Remote Sensing Center, which covers a wide range of disciplines such as geology, agriculture, and computer science. The center is actively involved in diverse applied projects, scientific research, training programs, and community outreach, collaborating with state departments, the private sector, and universities to address critical challenges in water resource management and environmental sustainability.	Remote Sensing Center (uomosul.edu.iq)		Governmental

3	**Environmental and Pollution Control Research Center**	University of Mosul	Mosul	The Center of Environmental and Pollution Control Research at the University of Mosul is dedicated to advancing environmental protection through research, teaching, and consultation. It provides scientific advice to policymakers for sustainable development, focusing on monitoring and evaluating soil, water, and air quality. Established in 1997, the center also engages in national and international scientific collaboration, contributing to the study of pollution, biodiversity, and climate change while offering practical solutions for environmental challenges.	Environmental Researches Center (uomosul.edu.iq)	envi_rc@uomosul.edu.iq	Governmental
4	**Palm and Dates Research Center**	University of Basra	Basra	The Palm and Dates Research Center at the University of Basra focuses on advancing research related to palm cultivation and date production. It contributes to the development of sustainable agricultural practices and provides scientific insights to improve the quality and yield of dates, a key agricultural product in the region.	Home | Date Palm Research Centre - University of Basrah (uobasrah.edu.iq)	data.plam@uobasrah.edu.iq	Governmental
5	**Marine Science Center**	University of Basra	Basra	The Marine Science Center at the University of Basra specializes in marine and coastal research, focusing on the study of ecosystems, marine resources, and environmental conservation. It plays a critical role in advancing scientific knowledge and sustainable management of Iraq's coastal and marine environments.	Home | Marine Science - University of Basrah (uobasrah.edu.iq)	msc@uobasrah.edu.iq	Governmental
6	**Energy Technology and Renewable Energy Center**	University of Technology	Baghdad	Energy Research Center and fuel was established in 2004 as a specialized unit at the University of Technology . Ranges from the Centre's work in scientific research and technological applications of solar energy through the development of production technology and modeling for the purpose of building systems offer. Planning Department provides advice and technical capabilities and service required for the center . Activities at the Center for Energy Research and fuel covering a range of technical applications in the field of solar PV , and applications of wind energy and hydropower, and applications of thermal energy and chemical energy applications .	center (uotechnology.edu.iq)	eretc@uotechnology.edu.iq	Governmental

7	**Environmental Research Center**	University of Technology	Baghdad	The center works hard to obtain academic accreditation and the local, global prominence in scientific research (academic and applicable) towards a clean environment, sound economy, and serious participation in the concretization of principles of sustainable development.	https://erc.uotechnology.edu.iq/iscesd/AboutusERC.html	-	Governmental
8	**AL-Nahrain Nanorenewable Energy Research Center (NNERC)**	University of Nahrain	Baghdad	This center was established in 2014. The aims are concentrated on the researches of renewable energy devices in different fields. The insert of nanotechnology con-cept on these researches is the main vision of the center directions. The center in-cludes four departments: Solar energy re-search department, Wind energy re-search department, Biomass research and Management energy department.	http://nerc.nahrainuniv.edu.iq/	-	Governmental
9	**Biotechnology Research Center**	University of Nahrain	Baghdad	This center was established in 1999. It aims at pursuing specialized researches in Biotechnology. It consists of specialized scientific labs in the fields of molecular and medical, plant, and environmental biotechnology. It includes three departments: Molecular and Medical Biotechnology department, Plant Biotechnology department, and department of Environmental Biotechnology.	مركز بحوث التقنيات الاحيائية – جامعة النهرين – مركز بحوث التقنيات الاحيائية – جامعة النهرين nahrainuniv.edu.)(iq	-	Governmental
10	**Remote Sensing Center**	University of Kufa	Najaf	The Remote Sensing Center at the University of Kufa specializes in utilizing advanced remote sensing technologies and geographic information systems (GIS) to study environmental, agricultural, and urban changes. It supports research and provides data for effective resource management, environmental monitoring, and sustainable development in Iraq.			Governmental

11	**Natural Resources Research Center**	Tikrit University	Salah AlDeen	The Natural Resources Research Center at Tikrit University is dedicated to the study and sustainable management of natural resources, including water, soil, and minerals. It conducts research aimed at promoting environmental conservation and resource optimization, contributing to the sustainable development of Iraq's natural wealth.			Governmental
12	**Renewable Energy Research Center**	University of Anbar	Anbar	The Renewable Energy Research Center was established in 2012. The Center consists of three main engineering departments: The Technology of Renewable Energy Department, the Control and Communications Systems Department, and the Electrical Power Systems Department. The main goals of the center are: Supplying Energy, effective Participation and Implementation, Technology Transfer	Renewable Energy Research Center (uoanbar.edu.iq)	RRC@uoanbar.edu.iq	Governmental
13	**Desert Studies Center**	University of Anbar	Anbar	The Center's Objective to achieve the local, national and international levels through conducting studies and research on the development of desert areas.	Center of Desert Studies (uoanbar.edu.iq)	contact@uoanbar.edu.iq	Governmental
14	**Upper Euphrates Basin Development Center**	University of Anbar	Anbar	The Upper Euphrates Basin Development Center at the University of Anbar is dedicated to researching and developing sustainable solutions for the management of water resources in the Upper Euphrates Basin. The center focuses on environmental conservation, agricultural enhancement, and addressing water challenges in the region.	https://www.uoanbar.edu.iq/UEBDC/English/index.php		Governmental

15	**Local Environment Research Center**	University of Babylon	Babil	The Environmental Research and Studies Center aims to raise environmental awareness across society and government sectors. It actively contributes to staff training in state institutions, the private sector, and civil society, offering environmental advice, impact studies, and system designs. The center also plays a key role in coordinating local, national, and international environmental efforts to promote sustainable development and environmental protection.	University of Babylon | Environment Research Center | Home (uobabylon.edu.iq)	lerc@uobabylon.edu.iq	Governmental
16	**Environment and Renewable Energy Research Center**	University of Karbala	Karbala	The main premise of this center is to reinforce the capacity of Kerbala University researchers to publish in the fields of environment and renewable energy. Environmental and renewable energy research is becoming important in our modern world to reduce the existence of pollutant substances and to reduce our dependency on fossil fuels by finding appropriate alternative energy sources that are relatively harmless to the environment.	Environmental Research and Renewable Energy Centre – University of Kerbala (uokerbala.edu.iq)		Governmental
17	**Marshlands Research Center**	University of Thi Qar	Thi Qar	The Marshlands Research Center at Thi Qar University is focused on studying and preserving Iraq's vital marshland ecosystems. It conducts research on biodiversity, water resources, and environmental sustainability, contributing to the restoration and conservation of the marshlands. The center also collaborates with local and international organizations to support sustainable development in the region.	science research – UOThiqar (utq.edu.iq)	university.of.thiqar@utq.edu.iq	Governmental
18	**Badia and Lake Sawa Studies Center**	Al-Muthanna University	Muthana	The Badia and Lake Sawa Studies Center at the University of Muthana specializes in research on the unique ecosystems of the Badia desert and Lake Sawa. It focuses on environmental conservation, biodiversity, and sustainable development in these areas, while also addressing challenges such as desertification and water management. The center collaborates with various organizations to support environmental protection and resource management efforts in the region.	مركز دراسات البادية وبحيرة ساوه – AL-Badia and Sawa Lake Studies Center (mu.edu.iq)		Governmental

19	**IRAQ Green building council**	NGO	Baghdad	IRAQ GBC is a non-governmental organization established in Baghdad-Iraq by a team of professional engineers and experts in sustainability and green building design. It aims to address critical environmental challenges faced by the country, such as climate change and water scarcity, by increasing awareness about reducing environmental impacts, promoting sustainable and green building practices, and contributing to the development of the green economy in Iraq.	iraqgb.org	info@iraqgb.org	Private
20	**Baghdad Center for Renewable Energy and sustainability**	NGO	Baghdad	BRESC provides consultation, designing services for all types of residential and formal governmental or private sector buildings with all its sustainability requirements, waste sorting, recycling, and reproducing electric power and organic fertilizer. We are committed to the high-quality standards towards a prosperous sustainable society.	https://www.breasc.com/	info@breasc.com	Private
21	**Forsa Organization**	NGO	Baghdad	Forsa is a non-governmental organization (NGO) established by a group of researchers to help Iraqi researchers, through provision of a collaborative platform for research and publication of their findings in a variety of scientific disciplines. Trainings, Consulting, Lab testing, Planning, Performance Management, Fundraising, Research, Prototyping, and commercialization are examples of the available activities.	FORSA for Education Development and Supporting Iraqi Youth (NGO) (forsa-iq.org)	info@forsa-iq.org	Private
22	**Grow Green**	NGO	Baghdad	Grow Green Company provides agricultural consultancy and training to institutions and companies all over Iraq. In addition to our brand "Gardener" specialized in agricultural services, plants and fertilizers. Grow Green Company is classified as one of the projects concerned with the environment, combating desertification and caring for vegetation through designing gardens and landscapes, diversifying the sources of trees and shrubs, as well as providing implementation and maintenance services for gardens.	https://growgreen.iq/	info@growgreen.iq	Private

23	**Research and Development Center**	American University Iraq Baghdad	Baghdad	The center aims to create a scientific environment and conduct research-related activities on various issues that align with the basic needs of developing multiple sectors. At its core, the center at the AUIB seeks to promote theoretical research projects, infield and applied research, exploratory studies, contributing to providing consultations to institutions in order to build society and state, raise awareness and knowledge in the academic community specifically, and reflect that onto society in general.	Office of Research | The American University of Iraq – Baghdad (AUIB)		Private
24	**Applied Remote Sensing Center**	Zakho university	Duhok	The Remote Sensing Center at the University of Zakho focuses on applying remote sensing and geographic information system (GIS) technologies for environmental monitoring, urban planning, and resource management. The center conducts research and provides data to support sustainable development and informed decision-making in various sectors, both locally and regionally.	Home :: Applied remote sensing and GIS center, University of Zakho - Zakho City (uoz.edu.krd)		Governmental
25	**Research Center**	Koya University	Erbil	The Research Center at Koya University is dedicated to fostering academic research across various disciplines. It supports innovative studies, promotes scientific inquiry, and collaborates with local and international institutions to address societal challenges. The center aims to enhance research quality and contribute to the advancement of knowledge and sustainable development in the region.			Governmental
26	**Research Center**	Polytech Sulaymaniyah University	Sulaymaniyah	The Research Center at Sulaimani Polytechnic University is committed to advancing applied research and innovation in various fields, including engineering, technology, and environmental sciences. It promotes collaboration between academia and industry, facilitating projects that address regional challenges and contribute to sustainable development. The center also supports students and researchers in enhancing their skills and knowledge through training and research opportunities.			Governmental

27	**Centre for Environmental Studies (CES)**	University of Kurdstan Hawler	Erbil	The Centre for Environmental Studies (CES) at the University of Kurdistan Hawler focuses on addressing environmental challenges through research, education, and community engagement. It aims to promote sustainable development and environmental awareness by conducting studies on local ecosystems, pollution, and natural resource management. The center collaborates with governmental and non-governmental organizations to provide expertise and support for environmental policies and initiatives in the region.	Centre for Environmental Studies (CES) Archives - University of Kurdistan Hewlêr (ukh.edu.krd)	info@ukh.edu.krd	Governmental
28	**Geotechnical Research**	Cihan University	Erbil	The Geotechnical Research Center at Cihan University specializes in studying soil mechanics, foundation engineering, and geotechnical investigations. It aims to advance knowledge and technology related to ground behavior and soil-structure interaction, supporting infrastructure development and environmental sustainability. The center conducts research projects, provides consulting services, and collaborates with industry partners to address geotechnical challenges in the region.	About Research Center - Cihan University -Erbil		Private
29	**Institute of Regional and International Studies (IRIS)**	American University Iraq sulaymaniyah	Sulaymaniyah	The Institute of Regional and International Studies (IRIS) at the American University of Iraq, Sulaimani (AUIS) focuses on interdisciplinary research and education related to regional and international affairs. It aims to enhance understanding of political, economic, and social issues affecting Iraq and the broader Middle East. IRIS fosters academic collaboration, hosts public events, and provides a platform for dialogue among scholars, policymakers, and the community to address pressing challenges and promote sustainable development.	IRIS	The Institute of Regional and International Studies (auis.edu.krd)		Private
30	**Industrial Research and Development Authority**	Energy and Environment Research Center - Ministry of Industry and Minerals		The Industrial Research and Development Authority was established in 1994 to be the responsible body in the Ministry of Industry and Minerals, which is concerned with scientific research and industrial development (preparing research plans and following up on their implementation) in its affiliated research centers and in the research and development departments in the Ministry's companies and in various scientific and industrial specializations (chemical and petrochemical industries, engineering industries, food and pharmaceutical industries, textile industries, construction industries, alternative and renewable energies, environment, pure sciences, etc.).	https://www.crid.industry.gov.iq/index.php?option=com_content&view=article&id=90&Itemid=660		Public

Annex V

Identification of priority mitigation and adaptation measures

This Annex provides policy guidance aimed at reducing GHG emissions and enhancing climate resilience through targeted priority adaptation and mitigation measures. It is designed to assist policymakers across various governmental levels in responding effectively to climate change risks and supporting the implementation of policies and strategies by ensuring adequate financing. Iraq has committed to specific targets for climate change mitigation and adaptation in its NDC, NAMA Strategic Planning, and NAP. However, it is crucial to identify and develop a robust cost estimation framework to estimate these costs and facilitate the implementation of these commitments.

The analysis serves several key purposes: firstly, to estimate the costs and overall investments required to implement Iraq's CIP priority actions for both mitigation and adaptation. Secondly, to propose tools for collecting and analyzing pertinent data. Thirdly, to assess the financial needs and investment requirements necessary for Iraq to effectively finance its adaptation and mitigation actions under the Paris Agreement.

Given the diverse nature of emissions reduction and adaptation challenges, a coordinated set of well-financed policies tailored to sector-specific characteristics and opportunities is essential. This framework underscores the importance of mainstreaming climate change considerations across sectors vulnerable to climate impacts. Ultimately, the analysis aims to guide and recommend strategies to finance resilient, low-carbon initiatives at national and local levels, thereby bolstering Iraq's climate change resilience and sustainability efforts.

5.1 Analytical methods

This section outlines the methods employed to evaluate the costs and benefits of different climate actions and investment options, as well as to assess the economic impact of existing and proposed climate-related policies and regulations on investment, economic growth, and job creation. The policy assessment is structured along a three-step process that relies on a comprehensive review of existing data and relevant studies. As described in the previous section, the initial phase focused on gathering all pertinent information with the review of a wide range of national documents related to climate change mitigation strategies, technology needs assessments, established baselines, and documentation on existing and planned projects. After collection, the documents underwent a review to extract pertinent content, focusing on compiling all relevant data on past emissions across economic sectors and sub-sectors. This included future emission and climate risk forecasts when available, potential mitigation and adaptation measures, established reduction and adaptation targets, commitments, and associated cost estimates. The third step involved consolidating and cross-checking information from key sources like the NDC, the NAMA Strategy, the Technology Needs Assessment (TNA), etc. These documents provided comprehensive data and mitigation options. Additional sources were also examined to gain a detailed understanding of emission sources and potential mitigation and adaptation strategies.

The techniques to assess the impacts are straightforward.

- Cost-Benefit Analysis (CBA): Cost-Benefit Analysis is often used to evaluate the economic feasibility of projects or policies. It compares the costs and benefits associated with an intervention, allowing decision-makers to assess whether the benefits outweigh the costs. In the context of the CIP in Iraq, CBA enables to quantification of the economic gains (e.g., reduced emissions, improved health, increased productivity) against the costs (e.g., investment in clean technologies, policy implementation).
- Sectoral and National Modeling: Sectoral and national modeling involves constructing mathematical models that simulate the behavior of different sectors within an economy. These models capture interactions between sectors, households, government, and international trade. For the CIP, sectoral modeling would explore how emission reduction strategies impact specific sectors (e.g., energy, agriculture, transportation) and their interdependencies. National modeling extends this to the entire economy, considering overall growth, employment, and income effects.
- Social Accounting Matrix (SAM): This technique provides a comprehensive framework for analyzing economic transactions within an economy. It combines input-output data with information on production, income, and consumption. In Iraq, constructing a SAM would involve detailing flows of goods, services, and payments among households, businesses, government, and other economic agents. SAMs are crucial for understanding the distributional effects of the CIP.
- Distributional Impact Analysis: Distributional Impact Analysis examines how policy changes affect different population groups. In the case of the CIP, it can serve to assess impacts across men-women, poverty, and rural-urban divides (e.g. responding to questions such as i) does the transition to a resilient low-emission development disproportionately affect men or women? ii) Are there differential impacts on income, employment, or access to resources? iii) How does the CIP impact the poor? iv) Are there trade-offs between environmental goals and poverty reduction? v) Are rural communities more vulnerable to changes in agriculture or energy sectors due to CIP?

For the current report, information using the first and the second assessment techniques was used. Due to time constraints, it was not possible to undertake mathematical modeling for forecasting economic trends related to climate change, such as the impact on GDP growth, employment, inflation, and sectoral performance.

5.2 A Social-Responsive CIP for women, youth, elderly, and people with disabilities

The significance of integrating a socially responsive approach for women, youth, the elderly, and people with disabilities into Iraq's long-term efforts to mitigate and adapt to climate change is important as a foundation for fair and just social development. It can act as a catalyst and help accelerate the diversification of the economy. It is aligned with SDG n°5 which targets achieving men women equality and empowering all women, underscoring its critical role in sustainable development agendas. UNDP Iraq's Stabilization Pillar Gender Equality Strategy (2022-2024)[154] emphasizes the mainstreaming of considerations for women, youth, elderly, and people with disabilities across all sectors, encompassing initiatives for economic empowerment and establishing institutional frameworks to facilitate collaborative efforts. This national effort is to continue in the years to come. The integration of social perspectives in the CIP is hence important.

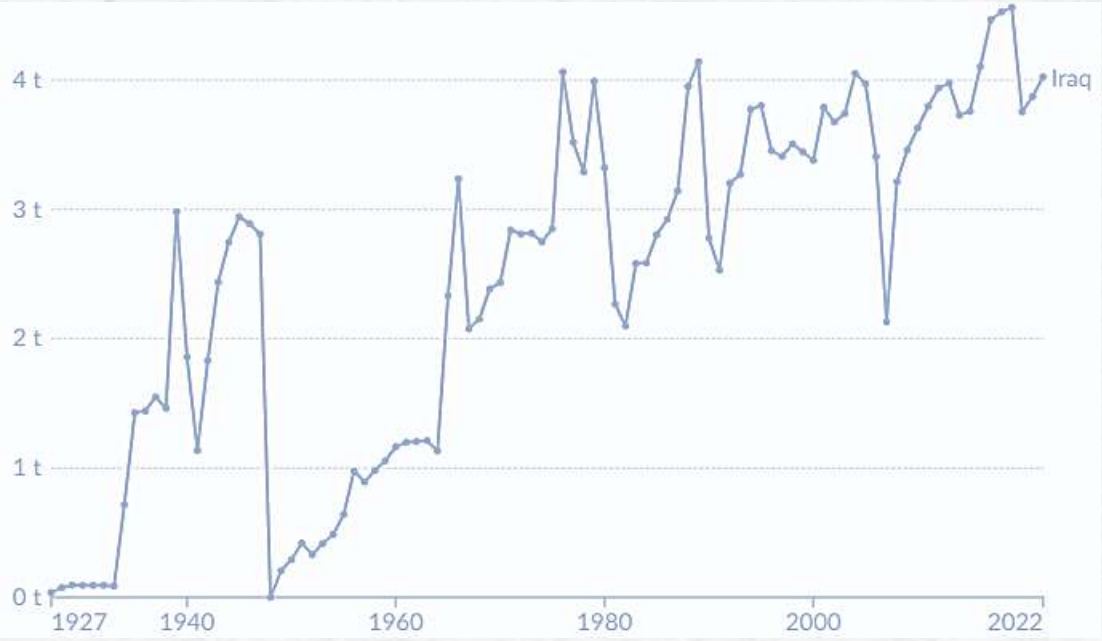
From the perspective of the Green Climate Fund (GCF), mainstreaming youth and families is integral to its objectives and guiding principles. Involving all demographic layers as stakeholders in the design, development, and implementation of strategies is essential for fostering inclusive and effective climate action[155].

[154] *https://www.undp.org/iraq/publications/undp-iraqs-stabilization-pillar-gender-equality-strategy-2022-2024*
[155] *https://www.greenclimate.fund/document/mainstreaming-gender-green-climate-fund-projects*

5.3 Sector-Level Analysis: Sectors & prioritized climate-related investment.

The NDC and the NAP documents identified several key sectors that require prioritization to address the effects of climate change. For mitigation investment, the choice is made to adopt the sectoral approach defined by the Intergovernmental Panel on Climate Change (IPCC) categorizing GHG emissions into several sectors to track and analyze sources and mitigation opportunities[156]. The primary sectors include i) Energy[157], ii) Industrial Processes and Product Use (IPPU)[158], iii) AFOLU[159], and iv) Waste[160].

Figure 2: Iraq per capita CO_2 emissions[161]



Iraq has progressively increased its ambition to curb GHG emissions, as per the NDC, with a significant progression, adopting several mitigation measures in energy (including transport), waste, IPPU, and AFOLU sectors. The purpose of the CIP is to confirm this ambition with an investment plan towards more neutral emissions actions by 2050. These measures align with new policies and strategies, aiming for sustainable development co-benefits.

5.3.1. Energy

Under the IPCC typology entitled "energy sector", it includes in Iraq emissions from oil and gas, electricity and heat generation, transportation, manufacturing and construction, and other fuel combustion.

[156] *For more information, IPCC Guidelines for National Greenhouse Gas Inventories (https://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html) and IPCC Sixth Assessment Report (https://www.ipcc.ch/report/ar6/wg3/). These documents provide comprehensive information on the categorization of GHG emissions and the methodologies for their estimation and reporting.*

[157] *Energy sector, which is the largest source of emissions, includes electricity production, transportation, and energy use in buildings and industry. This sector is mainly responsible for emissions of carbon dioxide (CO_2) due to the combustion of fossil fuels, as well as methane (CH_4) and nitrous oxide (N_2O) from energy-related activities.*

[158] *The IPPU sector covers emissions from industrial processes and the use of products, which release GHGs not directly linked to energy consumption. This includes emissions from chemical production, cement manufacturing, and metal production, among others. For Iraq, this will be limited only to a few sources of emissions.*

[159] *The AFOLU sector addresses emissions from agricultural activities, deforestation, land use changes, and forestry practices. It is notable for significant emissions of methane (CH_4) from livestock and rice paddies, and nitrous oxide (N_2O) from soil management and fertilizer use.*

[160] *The Waste sector includes emissions from waste treatment and disposal activities such as landfills, wastewater treatment, and waste incineration.*

[161] *Global Carbon Budget (2023); Population based on various sources (2023). Carbon dioxide (CO_2) emissions from fossil fuels and industry. Land-use change is not included.*

Table 5: Expected Economic Benefits of the mitigation actions in the energy sector (renewable energy)

Renewable energy	
Positive economic impacts	Potential challenges and opportunities
Reduced GHG Emissions: By increasing the share of renewables in the electricity mix, Iraq will prepare the shift from fossil fuels to a more decarbonized economy, leading to a decrease in GHG emissions, particularly from the energy sector. This will contribute to combating climate change and its associated impacts. Job Creation: The development and maintenance of renewable energy projects like solar and wind will create new jobs in various sectors like construction, engineering, and operation. This can contribute to economic growth and poverty reduction. Improved Health: Reduced air pollution due to less reliance on fossil fuels will lead to improved public health, particularly in areas surrounding power plants. Technological Advancement: Investing in renewable energy will encourage innovation and technological advancements in the sector. This can position Iraq as a leader in renewable energy within the region.	Upfront Costs: Renewable energy projects, particularly solar and wind (depending on feasibility studies), can have high upfront costs compared to traditional fossil fuel plants. This could require significant investment from the government or private sector. Land Use: Large-scale solar or wind projects may require significant land use, potentially impacting existing agricultural activities or ecosystems. Careful planning and community engagement are crucial to mitigate these issues. Intermittency: Some renewable sources like solar and wind are intermittent, meaning they don't produce energy consistently. This may require additional investments in energy storage solutions or backup power generation from other sources. Grid Integration: Integrating a large share of renewables into the existing power grid may require upgrades and grid modernization to manage fluctuating energy production. Skills Development: To capitalize on job creation opportunities in the renewable energy sector, there may be a need to invest in skills development programs to equip the workforce with the necessary technical expertise. Community Participation: Engaging local communities throughout the planning, development, and operation of renewable energy projects can promote social acceptance and ensure equitable distribution of benefits. Policy and Regulation: Supportive policies and regulations are essential to attract investment in renewable energy projects and create a stable market environment.

Table 6: Expected Economic Benefits of the mitigation actions in the energy sector (energy efficiency in the residential sector)

Energy Efficiency	
Positive economic impacts	**Potential challenges and opportunities**
Improved Health: Transitioning to clean energy (liquefied petroleum gas, biogas, electricity) will significantly reduce indoor air pollution in rural areas caused by traditional stoves. This can lead to improved respiratory health, particularly for women and children who spend more time cooking. In terms of reduced hospital admissions, research suggests a 20-50% reduction in respiratory illnesses with the transition to clean cooking solutions. Assuming a 30% reduction and average treatment cost of USD 50 per case, Iraq could save millions annually. Financial Savings: Energy-efficient appliances (e.g. air conditioning, etc.) and practices will lead to lower household energy bills, freeing up resources for other necessities or improving household income. Reduced GHG Emissions: Increased energy efficiency will result in lower energy consumption, leading to a decrease in GHG emissions from the residential sector. Job Creation: Programs promoting and installing energy-efficient appliances and technologies can create new jobs in areas like sales, installation, and maintenance.	Affordability: Upfront costs for energy-efficient appliances might be higher compared to traditional options. Financing mechanisms or subsidy programs may be needed to improve affordability. Access to Technologies: Ensuring widespread availability and distribution of energy-efficient appliances throughout Iraq, particularly in rural areas, could be a challenge. Behavioral Change: Encouraging sustained adoption of energy-efficient practices and technologies may require public awareness campaigns and educational programs. Local Production: Promoting local production or assembly of energy-efficient appliances can create additional jobs and contribute to the local economy. Durability and Maintenance: Investing in durable and easily maintainable technologies will ensure long-term benefits and reduce replacement costs for households. Waste Management: Addressing the safe disposal or recycling of used or end-of-life appliances is crucial to avoid environmental pollution.

Table 7: Expected Economic Benefits of the mitigation actions in the energy sector (energy efficiency in the industrial sector)

Reducing industry energy intensity	
Positive economic impacts	**Potential challenges and opportunities**
GHG emissions reduction in the oil & gas sector: it can yield positive economic impacts by improving energy efficiency, attracting sustainable investments, and fostering innovation, thereby enhancing the sector's competitiveness and long-term viability. Cost Savings: A reduction in energy intensity translates to lower electricity bills for industries. This can improve profit margins and make Iraq's industries more competitive in the global market Increased Productivity: Implementing energy-efficient technologies and practices can optimize production processes, leading to increased output and productivity. Job Creation: The transition to energy efficiency may create new jobs in areas like energy audits, installation, and maintenance of energy-efficient equipment. Environmental Benefits: Reduced electricity consumption leads to lower greenhouse gas emissions from power generation, contributing to a cleaner environment. Improved Resource Management: Industries will become more efficient in using electricity, leading to better resource management and potentially reducing dependence on imported energy sources. Enhanced Investment Climate: A focus on energy efficiency demonstrates a commitment to sustainability, which can attract new investments to Iraq.	Upfront Costs: Investing in energy-efficient technologies might require significant upfront capital expenditure for industries. Technical Expertise: Implementing energy-efficient solutions may require additional technical expertise within industries, potentially leading to training needs. Monitoring and Evaluation: Mechanisms need to be established to monitor and evaluate the effectiveness of energy-efficiency initiatives. Government Incentives: Financial incentives or tax breaks can encourage industries to adopt energy-efficient practices and technologies. Public-Private Partnerships: Collaboration between the government and private sector can accelerate the adoption of energy efficiency measures. Capacity Building: Providing training programs and workshops can equip industry personnel with the necessary knowledge and skills to implement energy-efficient solutions. Awareness Campaigns: Raising awareness about the benefits of energy efficiency can encourage wider participation from industries.

Table 8: Expected Economic Benefits of the mitigation actions in the energy sector (energy efficiency in the commercial and public sectors)

Reducing commercial and public services energy intensity	
Positive economic impacts	**Potential challenges and opportunities**
Cost Savings: A reduction in energy intensity translates to lower electricity bills for businesses and public institutions. This can improve financial sustainability, free up resources for other priorities, and potentially lead to lower prices for consumers. Improved Efficiency: Implementing energy-efficient practices and technologies can optimize operations and resource utilization in commercial and public buildings. This can lead to increased productivity and service delivery improvements. Environmental Benefits: Reduced electricity consumption leads to lower GHG gas emissions from power generation, contributing to a cleaner environment. Enhanced Public Image: A focus on energy efficiency demonstrates a commitment to sustainability, which can improve the public image of businesses and attract more environmentally conscious customers. Government Leadership: Public institutions setting an example by adopting energy-efficient practices can encourage similar actions within the private sector.	Split Incentives: In some cases, tenants may not be responsible for electricity bills in commercial buildings, leading to a lack of motivation to invest in efficiency measures. Behavioral Change: Encouraging sustained adoption of energy-efficient practices by employees and customers might require awareness campaigns and training programs. Renovation Costs: Upfront costs for building retrofits or upgrades to energy-efficient technologies might be a barrier for some businesses and public institutions. Financing Mechanisms: Programs offering access to low-interest loans or grants can assist businesses and public institutions in financing energy-efficiency upgrades. Building Codes: Updating building codes to incorporate energy-efficiency standards can ensure new construction is optimized for lower energy consumption. Energy Audits: Encouraging or requiring energy audits for commercial and public buildings can identify specific areas for improvement.

Employment: Energy efficiency measures can lead to increased economic activity, which often results in more jobs. When businesses adopt energy-efficient practices, they may need additional staff for implementation, maintenance, and monitoring. Exports: Improved energy efficiency can enhance a country's competitiveness by reducing production costs. This, in turn, may lead to increased exports of goods and services. Turnover from Eco-Industries: Energy efficiency can positively impact turnover in eco-industries (those focused on sustainable practices). These industries may experience growth due to increased demand for energy-efficient products and services. Resource Efficiency Impacts/Material Productivity: Energy-efficient practices often involve using resources more efficiently. For example, optimizing processes can reduce material waste. Water Productivity: Efficient water use is closely linked to energy efficiency. Implementing water-saving technologies can contribute to overall resource efficiency. Energy Productivity: Reducing energy intensity directly improves energy productivity. This means achieving more output (goods or services) with less energy input. GHG Emission Intensity: Energy efficiency measures help lower GHG emissions, contributing to environmental sustainability2.	Data Sharing and Benchmarking: Sharing energy consumption data and best practices among businesses and public institutions can promote a culture of continuous improvement.

Table 9: Expected Economic Benefits of the mitigation DC actions in the transportation sector

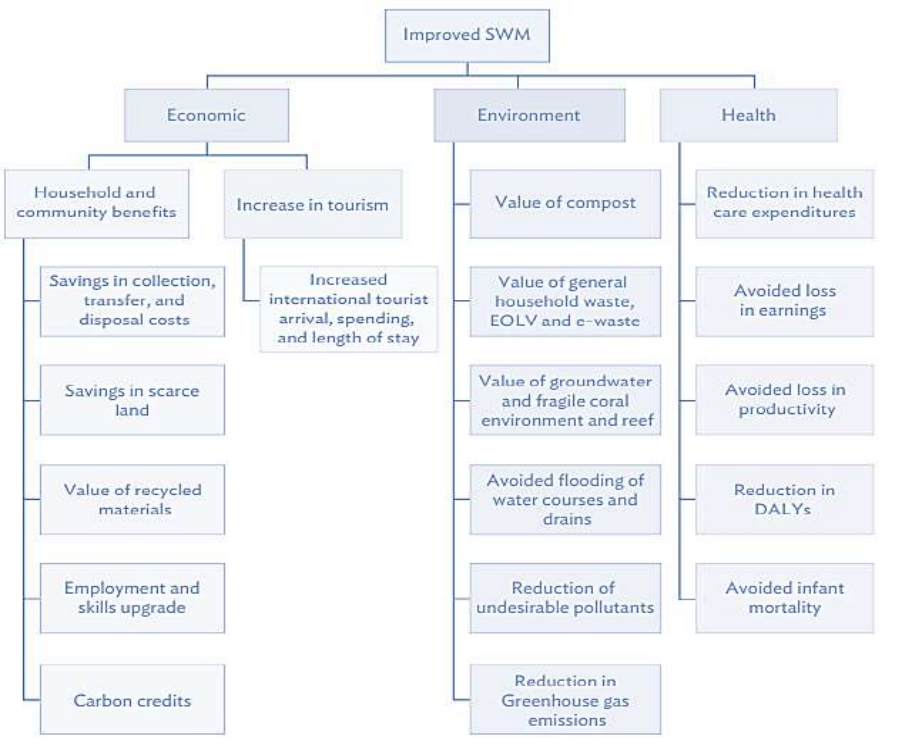
Low carbon transport	
Positive economic impacts	**Potential challenges and opportunities**
Reduced GHG Emissions: Public transport, hybrid and electric vehicles (EV) can lead to a decrease in greenhouse gas emissions from the transportation sector, particularly if the power is produced with renewable energy. Improved Air Quality: Public transport and EVs reduce significantly air pollution levels, especially in urban areas. Zero-Emission Transportation: EVs produce no tailpipe emissions, significantly reducing air pollution and greenhouse gas emissions. Reduced Fuel Costs: Electricity can be a cheaper fuel source compared to gasoline in the long run, leading to lower operating costs for EVs. Improved Public Health: Reduced air pollution from transportation can lead to improved public health, particularly in urban areas.	Vehicle Compatibility: Not all vehicles are hybrid, and some older models may require adjustments or may experience performance issues. Cheap gasoline: Being an oil & gas producer, Iraq benefits from very cheap prices for transportation. Social acceptance of shifting to EVs could be difficult. Upfront Costs: Electric vehicles are currently more expensive than gasoline-powered vehicles. Charging Infrastructure: Limited availability of charging stations can be a barrier to widespread EV adoption. It requires an important investment in infrastructure. Electricity Grid Capacity: A significant increase in EVs may require upgrades to the national electricity grid to handle the additional demand. Pilot Programs and Feasibility Studies: Conduct pilot programs and feasibility studies for electric mobility to assess infrastructure needs and consumer behavior. Financial Incentives: Consider offering financial incentives like tax breaks or subsidies to encourage the purchase of EVs and installation of charging stations. Public Awareness Campaigns: Raise public awareness about the benefits of ethanol blending and electric mobility to encourage adoption. Public Transport Development: Planification for the development of public transports is key, in urban areas and inter-cities.

5.3.2. Waste

As part of its NDC, Iraq plans to pass the Solid Waste Management Act[162]. Today, the country struggles with challenges in waste management exacerbated by relatively rapid urbanization and economic growth. Current practices often lag behind global standards due to constraints such as limited financial resources or high population density, and do not enable to diminish methane emissions. These factors influence the effectiveness of waste management systems and their socio-economic outcomes.

An effective low-carbon waste management in Iraq supported by the CIP would offer significant economic advantages. By adopting practices like composting organic waste and capturing landfill gases, the country would reduce its methane emissions. This would not only enhance environmental sustainability but also foster economic stability through reduced resource depletion and potential healthcare cost savings from improved public health outcomes.

Figure 3: Economic, Environmental, and Health Impacts of Improved Solid Waste Management (SWM)[163]



Mitigating climate change through enhanced waste management practices is critical for Iraq, but the budget is limited. Proper waste treatment reduces environmental pollution, preserves natural resources, and supports biodiversity conservation. Furthermore, initiatives promoting resource recovery and recycling can stimulate economic growth by creating jobs in waste collection, processing, and recycling industries.

For better monitoring of the economic impacts of any investment in the waste sector, it is important to enhance transparency in sector allocations and monitor progress in financing sanitation towards achieving SDG.6.

[162] *https://www.ccacoalition.org/content/iraq-waste-sector-strategy-support-ndc-action-plan-and-nama-projects-iq-23-002*
[163] *DALY = disability adjusted life years, EOLV = end-of-life vehicles, SWM = solid waste management. Source: Asian Development Bank (https://www.adb.org/publications/ex-ante-cost-benefit-analysis-waste-management-pacific)*

Table 10: Expected Economic Benefits of mitigation actions in the waste sector

Waste management plan to reduce GHG emissions, increase organic waste composting, capture landfill gas, improve wastewater treatment, and embrace circular economy principles	
Positive economic impacts	Potential challenges and opportunities
Reduced GHG Emissions: Improved waste treatment methods that capture and utilize landfill gas or divert organic waste from landfills can significantly reduce methane emissions, a potent greenhouse gas. This will include short-lived climate pollutant (SLCP) emissions including methane from the waste sector. Improved Public Health: Effective water, sanitation and hygiene (WASH) reduces exposure to harmful pathogens and pollutants that can spread through improper waste disposal. This leads to a healthier population and potentially reduces healthcare costs. Environmental Benefits: Improved waste treatment can minimize land and water pollution caused by overflowing landfills or improper waste disposal practices. This protects ecosystems and promotes biodiversity. Resource Recovery and Job Creation: Waste treatment facilities that focus on recycling and composting can create valuable resources like compost and recycled materials. This reduces reliance on virgin resources and creates new jobs in waste collection, sorting, and processing. Improved Land Use: Reduced reliance on landfills for waste disposal can free up valuable land for other purposes, such as agriculture or recreation.	Upfront Costs: Investing in new waste treatment infrastructure and technologies can require significant upfront capital expenditure. Public Awareness and Behavior Change: Encouraging responsible waste management practices like waste segregation and recycling requires public awareness campaigns and educational programs. Operational Costs: The ongoing operation and maintenance of waste treatment facilities require a dedicated budget and skilled personnel. Public-Private Partnerships: Collaboration between the government and private sector can accelerate investments in improved waste treatment infrastructure. Waste Segregation at Source: Encouraging households and businesses to segregate waste at the source (organics, recyclables, general waste) optimizes the efficiency of waste treatment processes. Informal Waste Sector Integration: Integrating informal waste collectors into the formal waste management system can improve overall coverage and create livelihood opportunities. Technology Transfer and Capacity Building: Transferring knowledge and expertise on advanced waste treatment technologies can improve the efficiency and sustainability of waste management practices in Iraq.

In summary, prioritizing effective waste management in Iraq promises socio-economic benefits that extend beyond environmental stewardship. By investing in low-carbon waste solutions with the support of the CIP, Iraq will bolster its economic resilience, enhance public health, and contribute as much as possible given its national circumstances to the global 2050 net zero emissions target.

5.3.3 IPPU

The expected socio-economic impacts of mitigation actions in the IPPU sector under Iraq's CIP are not neglectable. Transitioning to low-Global Warming Potential (GWP) alternatives for Hydrofluorocarbons (HFCs) for instance, as mandated by the Kigali Amendment will substantially reduce GHG emissions at the scale of the country[164]. This transition not only mitigates potential temperature increases but also promotes technological innovation and sustainability in industrial processes. The adoption of alternatives like ammonia, hydrocarbons, dimethyl ether, and CO_2 will create new job opportunities, requiring specialized training and education, thus fostering economic growth and workforce development.

Furthermore, the recovery and reuse of refrigerants from disposed equipment will enhance resource efficiency and reduce the environmental footprint. By implementing recycling and reclamation processes, Iraq can lower its carbon footprint by up to 90% compared to the production of virgin refrigerants. Although the benefits are not directly social-specific, ensuring women's involvement in these emerging sectors through targeted training programs can lead to more equitable economic development. Overall, these mitigation actions will support a more resilient, sustainable, and inclusive economy in Iraq.

[164] *http://www.multilateralfund.org/87/English/1/8730.pdf*

Table 11: Expected Economic Benefits of the mitigation actions for IPPU

HCFC phase-out management plan	
Positive economic impacts	Potential challenges and opportunities
Reduced Climate Impact: Lower reliance on HFCs will significantly decrease greenhouse gas emissions, combating climate change and its threats to Iraq's environment and economy. Cost Savings: Long-term, alternative refrigerants with lower GWPs may offer operational cost savings for businesses and households using air conditioning and refrigeration systems. Job Creation: The transition to new technologies and servicing of alternative refrigerants may create new jobs in servicing and maintenance sectors. Improved Air Quality: Reduced refrigerant leaks can contribute to improved air quality, particularly beneficial for those working in or around refrigeration systems.	Upfront Costs: Shifting to new refrigerants and potentially retrofitting existing equipment may require upfront investments for businesses and individuals. Technical Expertise: Servicing and maintaining systems using low-GWP alternatives may require additional training for technicians. Availability of Alternatives: Ensuring a stable and affordable supply of low-GWP alternatives in Iraq is crucial for long-term success.

Social-Specific Impacts: The implementation of the CIP, for IPPU-related activities, will offer potential for positive social impacts (e.g. on women, youth and elderly people). Key initiatives, such as substituting HFC consumption with low-GWP alternatives under the Kigali Amendment[165] and the recovery and reuse of refrigerants from disposed equipment, present a few opportunities to address social disparities.

Table 12: Social Impacts of HCFC Phase Out in Iraq from IPPU Activities

IPPU Activity	Description	Social Impacts
Substitution of HFC Consumption	The Kigali Amendment aims to limit future HFC production and consumption, reducing potential temperature warming by 0.3°C–0.5°C by 2100. Transitioning to low-GWP alternatives like ammonia, hydrocarbons, dimethyl ether, and CO_2.	Reducing GHG emissions benefits everyone, promoting sustainability and creating new technical job opportunities, particularly for women, through training and education.
Recovery and Reuse of Refrigerants	Refrigerants recovered from disposed equipment can be reused in the same system or recycled/reclaimed for use in other systems or the market.	While not directly social-specific, responsible refrigerant lifecycle management lowers the carbon footprint and contributes to global warming mitigation, benefiting society as a whole.

5.3.4. AFOLU

The AFOLU sector is a moderate contributor to Iraq's GHG emissions, accounting for a portion that ranges from 8.5 $MtCO_2e$ – 9 $MtCO_2e$[166], Key emission sources within the AFOLU sector include the burning of crop residues, releasing carbon dioxide and nitrous oxide; and land-use change and deforestation, which result in carbon dioxide emissions. Hence, the CIP may focus on enhancing carbon sinks, particularly within the forestry sector, and in the Southern part of the country, local agriculture which is vital for food security and farmers' livelihoods. Long-term strategies also involve carbon sequestration in soils, as soil carbon sequestration plays a growing role by increasing soil organic carbon content and sequestering carbon dioxide (CO_2), e.g. with technologies such as biochar pyrolysis. Implementing sustainable land management practices enhances soil health and carbon storage, supporting long-term climate change mitigation and sustainable development. These efforts will have positive impacts, in term of environmental protection with socio-economic progress.

[165] *https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVII-2-f&chapter=27&clang=_en*
[166] *https://www.climatewatchdata.org/ghg-emissions?end_year=2021&regions=IRQ&sectors=agriculture%2Cland-use-change-and-forestry&start_year=1990*

Table 13: Expected Socio-Economic Benefits of mitigation actions in AFOLU

Land restoration efforts	
Positive socio-economic impacts	**Potential challenges and opportunities**
Reduced Climate Change Impacts: More effective mitigation efforts can lessen the negative impacts of climate change on Iraq's environment, agriculture, and overall economy. Increased Access to Climate Finance: Accurate emissions data strengthens Iraq's position when seeking international support for climate action projects, e.g. carbon sequestration in the voluntary carbon market (VCM) Land Restoration and Biodiversity: Planting trees and improved land restoration practices will lead to improved livelihoods. Ecosystem restoration, including land rehabilitation and afforestation, can enhance community livelihoods. It leads to increased crop productivity, better access to education, affordable healthcare, and improved economic conditions. Restoring degraded lands provides opportunities for sustainable agriculture, which directly benefits local communities. It helps to combat land degradation, improving soil quality, preventing soil erosion, and increasing agricultural productivity. Social Cohesion: Afforestation and forest landscape restoration (FLR) efforts foster social cohesion within communities. Conflicts over forest resources transform into cooperation among community members. The establishment of Village Development Committees (VDCs) and Joint Forest Management Committees (JFMCs) promotes shared responsibility and collaboration. Environmental Benefits like Enhanced Biodiversity: Land restoration helps combat desertification, preventing the loss of productive lands. It mitigates sandstorms, reduces air pollution, and contributes to overall ecosystem health. Increased vegetation cover provides additional habitat for wildlife and promotes biodiversity. Economic Opportunities: Restored lands can support sustainable livelihoods, such as agroforestry, ecotourism, and non-timber forest products. Economic diversification through land restoration contributes to long-term stability and resilience. National Security: Healthy ecosystems enhance resilience against environmental shocks, ensuring food security and reducing vulnerability. Improved Water Security: Healthy ecosystems can better regulate water flow and reduce the risk of floods and droughts. Job Creation: Restoration efforts and tree planting can create new jobs in forestry, conservation, and related sectors. Sustainable Livestock Management: Improved practices can lead to: Reduced Methane Emissions: More efficient livestock management can significantly decrease methane emissions, a potent greenhouse gas. Increased Productivity and Food Security: Improved animal health and breeding practices can lead to higher yields of meat and milk, contributing to food security. Reduced Environmental Impact: Sustainable practices can minimize pollution from livestock waste, improving air and water quality.	Upfront Costs: Implementing a policy for SFM requires data collection systems, land restoration projects, and improved livestock management techniques can require significant upfront investments. Capacity Building: Building technical expertise within government agencies and communities for data collection, land restoration, and sustainable livestock management can be a challenge. Land Availability and Management: Identifying suitable land for large-scale tree planting and ensuring its sustainable management requires careful planning and community involvement. Behavioral Change: Encouraging widespread adoption of smart agriculture practices among farmers may require training programs and incentives. Monitoring and Evaluation: Establishing effective monitoring and evaluation systems to track progress and the impact of these initiatives is crucial.

The NDC commitment of Iraq, which is likely to be reinforced in the CIP, to reducing land degradation and enhancing livelihoods through initiatives like tree planting and improved smart agricultural practices is poised to have significant socio-economic impacts. By undertaking restoration efforts, particularly in mountain ecosystems in the Northern part of the country and in the marshes in the South, the country not only aims to mitigate environmental degradation but also expects to create numerous socio-economic benefits. These include enhanced agricultural productivity due to improved soil fertility and water retention, leading to increased yields for farmers. Moreover, tree planting initiatives can provide additional sources of income through sustainable forestry practices, while also contributing to carbon sequestration and mitigating climate change effects. Furthermore, improved agriculture and forestry management practices are expected to enhance food security, reduce conflicts over grazing areas, and bolster the resilience of rural communities against climate variability.

Specific Impacts on Women, youth, and elderly people While AFOLU is not a major sector of Iraq's economy in rural areas, its impacts can be felt differently by men and women. Here is a breakdown of the social dynamics (e.g. women, youth, and elderly people):

Table 14: Specific Impacts of CIP in AFOLU on women, youth, and elderly people

Impacts on Women	Impacts on Men
Labor Burden: Women often contribute significantly to agricultural work, including weeding, planting, and harvesting. About 80% of farmland is managed by small-scale farmers, with approximately 70% of small-scale African farmers being women[167]. However, they may not have ownership rights to land or receive equal wages compared to men. Female agricultural workers are often over-represented in unpaid and low-paid seasonal or part-time jobs, leaving them out of social protection systems. Limited rights: Right to inherit, access, and use land and other productive resources are significant barriers for women farmers. Women's smaller landholdings result in 20-30% less production compared to men[168]. Legal and cultural barriers must be addressed to enable women's full engagement in agriculture. Fuelwood Collection: Women traditionally bear the responsibility of collecting firewood for cooking, leading to time spent away from income-generating activities or education. Exposure to smoke from traditional cooking methods can also have negative health impacts on women and children. Limited Access to Resources and Decision-Making: Women may have limited access to credit, extension services, and training opportunities compared to men, hindering their ability to improve agricultural productivity or participate in decision-making regarding land use.	Land Ownership and Management: Men often hold primary land ownership rights, giving them greater control over agricultural decisions and potential benefits from AFOLU projects. Focus on Cash Crops: Men may prioritize cultivating cash crops for export over subsistence crops for household consumption, impacting food security for the family.

The CIP will be in favor of favorable equitable AFOLU practices between men, women, youth, and elderly people. For instance, in terms of land tenure, it could include promoting secure land rights for women to make climate mitigation decisions about land use and benefit from climate mitigation projects in the agricultural sector. This would also impact positively women if the CIP comprises financial support for social-inclusive training and extension services. Providing training and extension services tailored to the needs of both women and men can improve low-carbon agricultural practices, productivity, and household food security. Also, through climate finance, it can offer financial support and training programs specifically designed for women to develop income-generating activities within the AFOLU sector. Overall, women's participation in decision-making from the CIP would encourage such participation at all levels, i.e. in community decision-making processes related to land use, resource management, and AFOLU projects and at a national level.

[167] *https://www.oecd-ilibrary.org/sites/35ec6754-en/index.html?itemId=/content/component/35ec6754-en*
[168] *Ibidem*

Annex VI

Financing Strategy & Instruments

Developing a robust financing strategy and utilizing appropriate financial instruments are essential for unlocking climate investment opportunities in Iraq. The financing strategy should align with Iraq's climate goals, prioritize sustainable development, and mobilize resources effectively. Here are key elements of the financing strategy and instruments for climate investment opportunities identification in Iraq:

6.1. Public Funding Allocation

Allocate public funds from national budgets, development banks, and dedicated climate finance mechanisms to support prioritized climate-related projects. Focus budget allocations on critical sectors like climate resilience, renewable energy, water management, and sustainable agriculture. Encourage subnational governments to allocate resources towards local climate action plans.

6.1.1. Domestic Resources

Domestic resources form the backbone of climate finance and involve funds generated within Iraq. Leveraging domestic resources effectively requires strategic allocation, fiscal policies, and innovative financial instruments.

National Budget Allocations

Iraq's national budget can allocate specific funds for climate-related projects. This includes funding for renewable energy initiatives, climate-resilient infrastructure, and environmental conservation programs. Prioritizing climate action in budgetary planning ensures a steady flow of financial resources for critical projects.

Example: The Iraqi government could allocate a portion of its budget to develop solar power plants in regions with high solar irradiance, thereby reducing reliance on fossil fuels and enhancing energy security.

Environmental Taxes and Levies

Implementing environmental taxes, such as carbon taxes or levies on polluting industries, can generate substantial revenue for climate finance. These funds can be earmarked for projects aimed at reducing greenhouse gas emissions and promoting sustainable practices.

Example: A carbon tax on industrial emissions could incentivize companies to adopt cleaner technologies while providing funds for reforestation and ecosystem restoration projects.

Domestic Financial Institutions

Engaging domestic banks and financial institutions in climate finance initiatives can mobilize significant resources. Banks can offer green loans and investment products tailored to support renewable energy projects, energy efficiency upgrades, and sustainable agriculture.

Example: Local banks could introduce green mortgage programs that offer favorable loan terms for energy-efficient homes, encouraging homeowners to invest in sustainable building practices.

National Climate Funds

Iraq can establish its own national climate fund to pool domestic and international resources for climate action. This fund would support projects aligned with national priorities, such as water resource management, reforestation, and renewable energy development.

Example: A national climate fund could finance a comprehensive water management project in the Tigris and Euphrates River basins, improving water use efficiency and reducing the risk of drought.

- Establish dedicated climate funds or trusts at national and regional levels to pool resources, manage climate finance effectively, and fund priority projects.
- Implement transparent, accountable, and well-governed frameworks for managing these funds, ensuring proper oversight and efficient resource allocation.
- Consider involving civil society organizations in fund management committees to foster inclusivity and stakeholder engagement.

Green Bonds

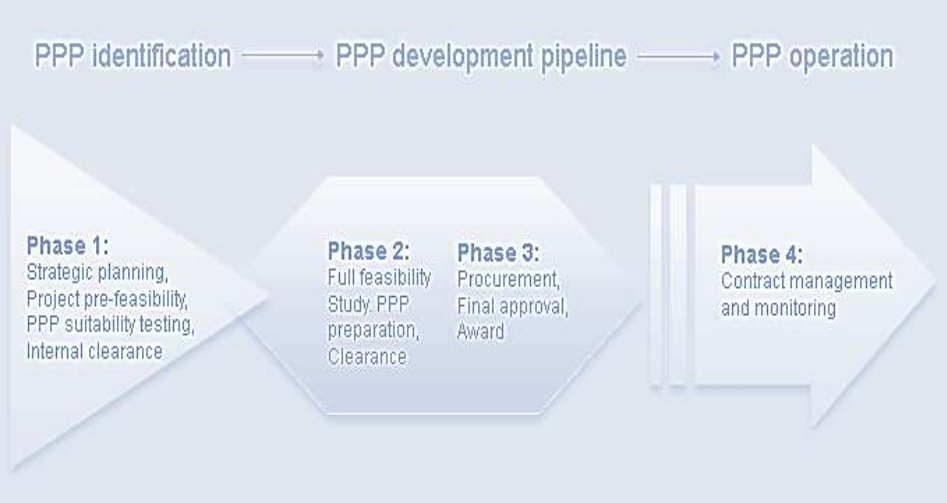
Issue sovereign or corporate green bonds to raise capital specifically for climate-friendly projects.
Ensure green bond issuance adheres to international green bond standards, promoting transparency and investor confidence.
Target environmentally conscious investors seeking to support sustainable development and generate positive returns.
Issuing green bonds allows Iraq to raise capital for specific climate projects while appealing to environmentally conscious investors. These bonds can finance initiatives such as sustainable transportation, energy efficiency, and water conservation.

Example: The Iraqi government could issue green bonds to finance the construction of energy-efficient public buildings, reducing carbon emissions and setting a benchmark for sustainable development.

6.2. Public-Private Partnerships (PPPs)

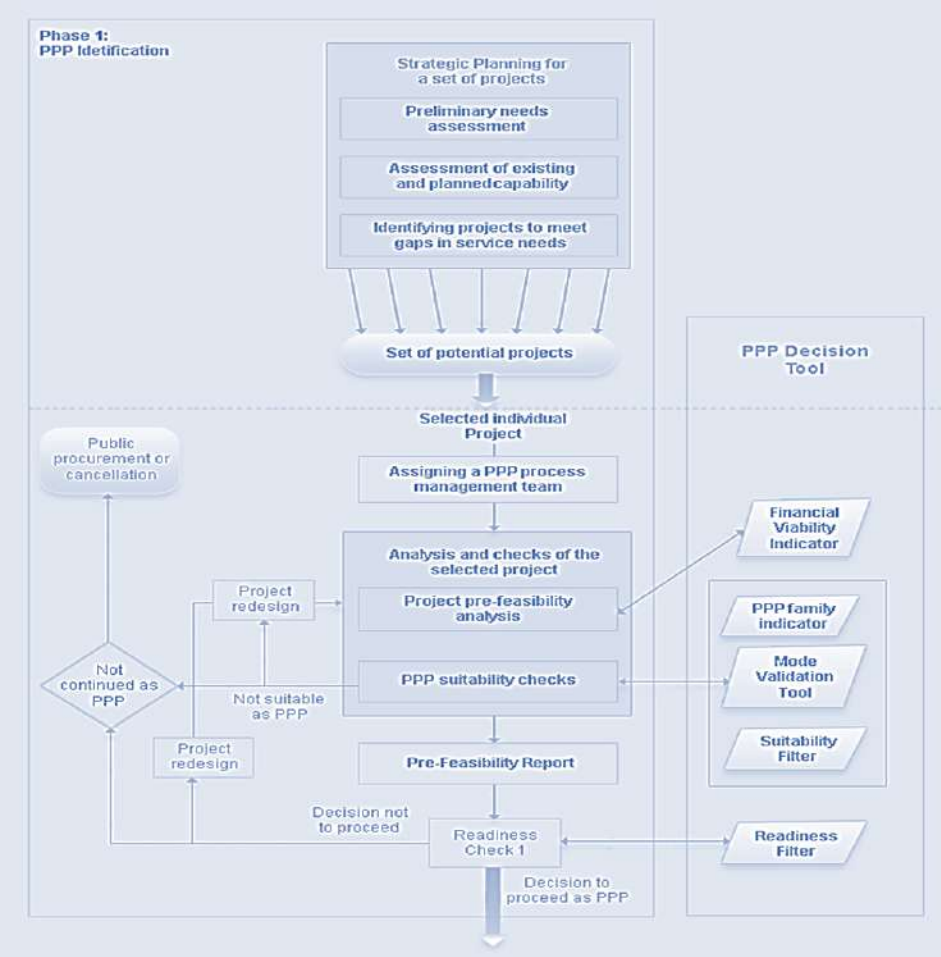
Foster partnerships between government entities, private sector investors, and development partners to leverage private capital for climate investments. Develop robust PPP frameworks with clear risk-sharing mechanisms and attractive investment incentives to attract private sector participation. Prioritize projects with strong commercial viability and potential for long-term financial returns alongside environmental and social benefits. An important work was done on Renewable energy and PPP, with a toolkit, a Private Sector Engagement report, and recommendations[169].

Figure 4: the Partnerships between the Public and Private Sectors



[169] *Facility For Economic Reform (FFER) IC-048- 22, Private Sector Engagement for Renewable Energy (PPP), Renewable energy PPP toolkit, 2023*

Figure 5:Phases of partnerships



6.3. Financial Guarantee Systems

Financial guarantees can play a crucial role in de-risking climate investments and attracting private sector participation. Implementing a comprehensive financial guarantee system tailored to the specific needs and risks of climate projects in Iraq can enhance investor confidence, unlock new sources of financing, and accelerate the transition to a sustainable and resilient economy. Here is an improved and detailed financial guarantee system incorporating the specified elements:

Partial Credit Guarantees

Partial credit guarantees involve the government or development institutions covering a portion of the loan principal in the event of project failure. This system reduces the risk for lenders and encourages them to offer more favorable loan terms for climate projects. In Iraq, this could mean:

Coverage of Loan Principal: The government could guarantee up to 50% of the loan principal, reducing the exposure of commercial banks and attracting better interest rates and terms for project developers.

Application in Renewable Energy Projects: For instance, partial credit guarantees could be used to finance large-scale solar farms in the desert regions of Iraq, encouraging banks to lend to solar energy developers with reduced risk.

Political Risk Guarantees

Political risk guarantees protect investors from non-commercial risks such as political instability, currency inconvertibility, or expropriation. This is particularly important in Iraq, where perceived political risks can deter foreign investment:

Protection Against Political Risks: These guarantees can cover risks such as government interference, breach of contract, and non-honoring of sovereign guarantees.

Attracting Foreign Investors: By providing political risk guarantees, Iraq can make climate projects more attractive to foreign investors who might otherwise be hesitant to invest due to concerns about political stability.

Loan Guarantee Programs

Dedicated loan guarantee programs can be established specifically for climate-friendly projects. These programs can offer full or partial guarantees to lenders, depending on the specific program design:

Climate-Specific Loan Guarantees: Establishing a program that provides guarantees for loans aimed at climate adaptation and mitigation projects, such as flood defenses or renewable energy installations.

Full or Partial Coverage: Depending on the project's risk profile, the program can offer either full or partial guarantees, thereby tailoring support to the specific needs of different types of projects.

First-Loss Guarantees

First-loss guarantees cover a specific portion of potential losses incurred by lenders in case of project failure, incentivizing private lenders to participate in climate projects while limiting their overall risk exposure:

Initial Loss Coverage: The guarantee would cover the first 10-20% of any potential losses, reducing the risk burden on lenders and encouraging them to finance innovative and potentially higher-risk projects.

Encouraging Riskier Investments: This can be particularly useful for pioneering climate technologies or projects in underserved areas that might carry higher initial risks but have significant long-term benefits.

Benefits of Financial Guarantees / Reduced Investment Risk

Guarantees provide comfort to lenders and investors, making climate projects more attractive and encouraging increased private sector participation. By mitigating perceived and actual risks, financial guarantees can:

Increase Lending: Encourage banks and financial institutions to extend more credit to climate projects, knowing that a portion of their potential losses is covered.

Enhance Investor Confidence: Build trust among investors so that their investments are safeguarded against specific risks.

Improved Access to Finance

By mitigating risk, guarantees can unlock new sources of financing for climate investments, particularly from commercial banks and institutional investors:

Attracting Capital: Guarantees can draw in capital from local and international sources that might otherwise avoid climate projects due to perceived high risks.

Diversifying Funding Sources: Enable access to a broader range of financing options, including private equity, venture capital, and institutional investors.

Enhanced Project Viability

Guarantees can improve the overall financial viability of climate projects, allowing them to compete more effectively for investment capital:

Lower Cost of Capital: Reduce the cost of capital for project developers, making projects more economically viable and sustainable.

Competitive Edge: Enable climate projects to better compete with traditional projects for financing by offering enhanced security to investors.

6.4. Challenges and Considerations

Guarantee Cost

The cost of providing financial guarantees needs to be carefully assessed and balanced against the potential benefits in terms of attracting private capital:

Cost-Benefit Analysis: Conduct thorough cost-benefit analyses to ensure that the long-term benefits of attracting private investment outweigh the costs of providing guarantees.

Sustainable Funding: Ensure that the guarantee programs are financially sustainable and do not impose excessive burdens on public finances.

Eligibility Criteria

Establishing clear and transparent eligibility criteria for accessing guarantees is crucial to ensure responsible use of public funds and attract high-quality climate projects:

Criteria Development: Develop well-defined criteria that specify the types of projects eligible for guarantees, focusing on projects with significant climate benefits and high potential for success.

Transparency and Accountability: Implement robust governance frameworks to ensure transparency, accountability, and equitable access to guarantee programs.

Institutional Capacity

Implementing effective guarantee programs requires strong institutional capacity for risk assessment, program administration, and monitoring:

Capacity Building: Invest in building the capacity of relevant institutions, including training staff in risk assessment, financial analysis, and project management. Build institutional capacity within government agencies, enhance financial literacy, and provide technical assistance to all stakeholders involved in climate investments.

Monitoring and Evaluation: Establish rigorous monitoring and evaluation mechanisms to track the performance and impact of guaranteed projects, ensuring that they deliver the intended climate and financial benefits.

The Joint Crediting Mechanism (JCM) facilitates diffusion of leading decarbonizing technologies, products, systems, services, and infrastructure as well as implementation of mitigation actions, and contributes to sustainable development of partner countries?

Risk Management and Mitigation

Proactively identify, assess, and mitigate financial risks associated with climate investments, including project risks, market risks, regulatory risks, and climate-related risks.

Develop comprehensive risk management strategies, consider risk mitigation instruments like insurance products, and create contingency plans to address unforeseen challenges.

A well-defined risk management framework will enhance investor confidence and ensure the sustainability of climate investments.

Monitoring and Evaluation (M&E)

Establish robust M&E frameworks with clear indicators and reporting mechanisms to track the impact, effectiveness, and sustainability of climate investments.

Utilize data-driven insights to inform decision-making on future resource allocation, optimize project design and implementation, and continuously improve climate action efforts.

Regularly share M&E findings with stakeholders to promote transparency and accountability

6.5. Innovative Financing Models

Pilot and scale up innovative financing models such as climate insurance, resilience bonds, and pay-for-performance mechanisms.

Climate insurance can help manage risks associated with extreme weather events, while resilience bonds provide upfront capital for infrastructure projects with long-term social and economic benefits.

Pay-for-performance mechanisms incentivize private sector participation by linking investments to pre-defined climate outcomes, promoting efficiency and impact.

6.5.1. Impact Investing

Impact investors seek to generate positive social and environmental outcomes alongside financial returns. Iraq can attract funds for projects that deliver tangible climate benefits by creating an enabling environment for impact investing.

Example: An impact investment fund could support small-scale renewable energy projects in rural areas, improving energy access and promoting sustainable development.

6.6 Carbon Financing

Carbon financing can be seen as a direct, market-based measure to purchase carbon credits, as one of the flexible mechanisms in Annex I parties of UNFCCC[170], as one of the tools that allow trading in emissions that arise from the business sectors to meet the quantified emission limitation and reduction commitment within the framework of the targets based on economy-wide emission limitation and reduction commitment. This financing option essentially provides a means for countries and businesses to meet their obligations under the Kyoto Protocol (KP) in a cost-effective manner since it would be less expensive to purchase credits from an entity that has already reduced emissions significantly than from an entity that has to restructure its entire facility in order to reduce emissions to the same level. Carbon financing includes a range of policy instruments aimed at reducing carbon emissions, including existing agreements such as the Kyoto Protocol and a number of voluntary projects, mostly among companies in more developed countries. However, an increased interest has been noted among developing countries, particularly those implementing some form of reforms.

Figure 6: Emission Trading[171]

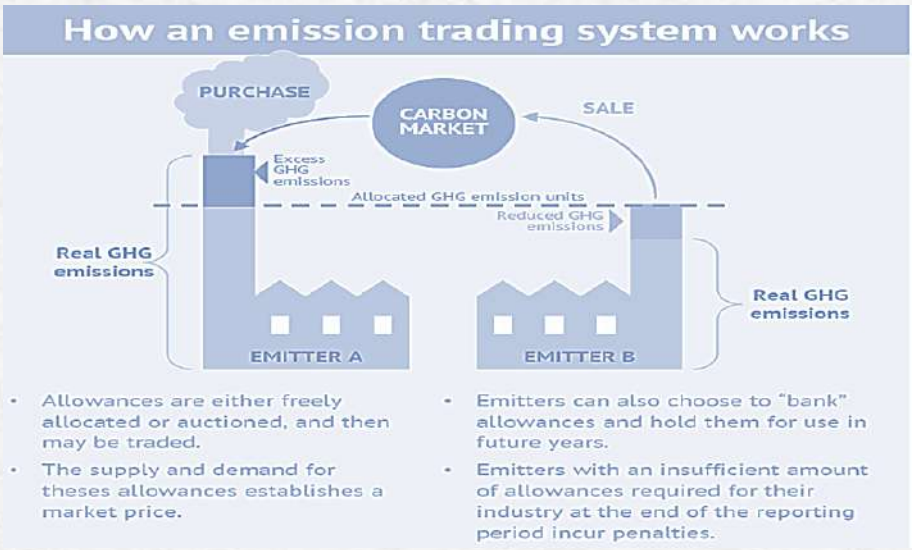
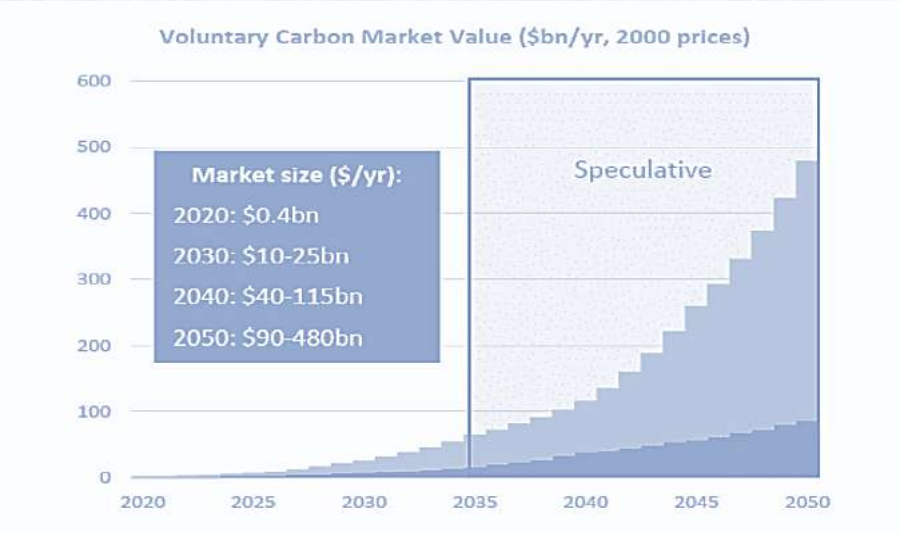


Figure 7: The voluntary carbon market values



[170] *https://unfccc.int/topics/introduction-to-climate-finance*

[171] *https://carboncredits.com/the-ultimate-guide-to-understanding-carbon-credits/?sl=carbon-credits-com-guide&msclkid=79f70d60c0651c7adeb26b127f3ad333*

6.6.1. Concepts and Instruments of Carbon Financing

Carbon Credits

Carbon credits are a crucial component of market-based mechanisms aimed at reducing greenhouse gas (GHG) emissions. They represent a permit or certificate allowing the holder to emit a certain amount of carbon dioxide or an equivalent amount of another greenhouse gas. One carbon credit typically equates to one ton of carbon dioxide equivalent (tCO2e). Carbon credits are integral to both compliance markets, driven by regulatory requirements, and voluntary markets, where entities choose to offset their emissions[172].

Carbon credits originate from projects designed to reduce, avoid, or remove GHG emissions. These projects can include renewable energy installations, such as wind or solar farms, energy efficiency improvements, afforestation and reforestation efforts, methane capture initiatives, and more. The fundamental idea is to provide a financial incentive for emissions reductions by creating a market for carbon credits[173].

In a compliance market, entities are required by law to adhere to emissions limits. If they exceed these limits, they must purchase additional credits to cover their excess emissions. Conversely, if they reduce their emissions below the required level, they can sell their surplus credits. This creates a financial motivation for companies to invest in emissions-reduction technologies and practices.

In voluntary markets, businesses, organizations, and individuals purchase carbon credits to offset their emissions voluntarily. This is often driven by corporate social responsibility goals, consumer pressure, or the desire to demonstrate leadership in sustainability.

Carbon Offsets

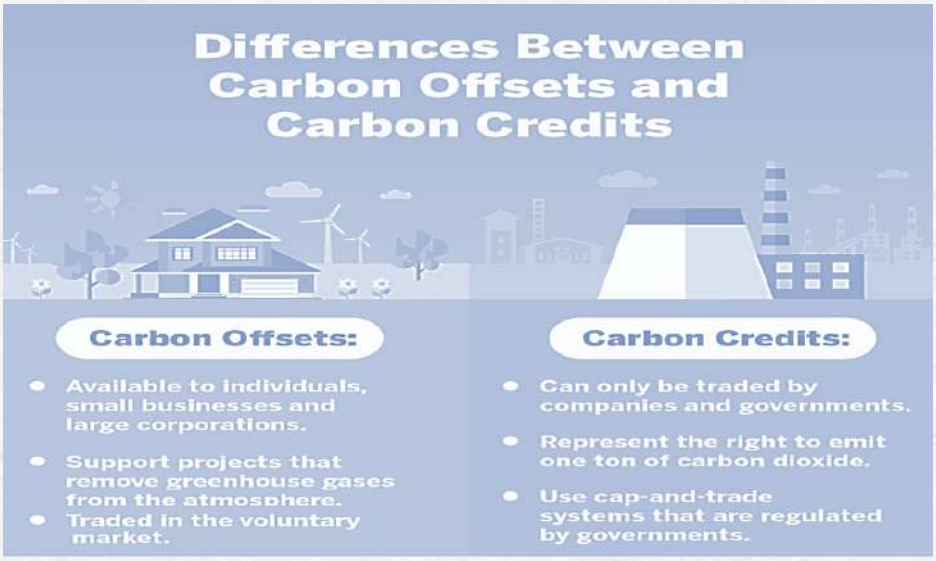
Carbon offsets are a mechanism that allows individuals and organizations to compensate for their greenhouse gas (GHG) emissions by funding projects that reduce or remove an equivalent number of emissions elsewhere. These projects can include renewable energy installations, reforestation and afforestation efforts, methane capture initiatives, and more. The concept of carbon offsets is central to voluntary carbon markets, where entities voluntarily purchase offsets to achieve carbon neutrality or meet specific sustainability goals. While carbon credits and carbon offsets are often used interchangeably, they represent different concepts within the carbon market:

Carbon Credits: These are tradable certificates or permits representing the right to emit one ton of carbon dioxide or an equivalent amount of another greenhouse gas. Credits are often associated with regulatory compliance markets, such as cap-and-trade systems, where entities must hold enough credit to cover their emissions.

Carbon Offsets: Offsets specifically refer to reductions in emissions that are used to compensate for emissions made elsewhere. They are typically associated with voluntary markets, where entities purchase offsets to neutralize their carbon footprint. Unlike credits, offsets are tied to specific projects that directly reduce, avoid or sequester emissions.

[172] *https://carboncredits.com/the-ultimate-guide-to-understanding-carbon-credits/?sl=carbon-credits-com-guide&msclkid=cc76b3715f18142150e4d503e760017c*
[173] *https://climatepromise.undp.org/news-and-stories/what-are-carbon-markets-and-why-are-they-important*

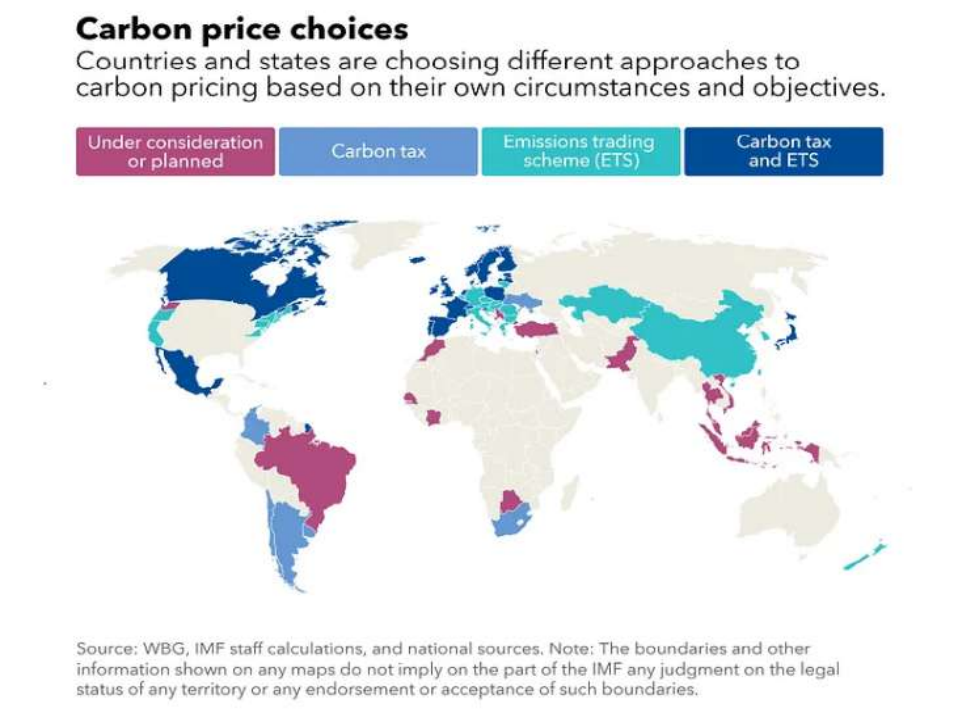
Figure 8: Difference between carbon offset and credit



Carbon Pricing Mechanisms

There are two primary approaches within carbon pricing: carbon taxes and Emissions Trading Systems (ETS). Carbon taxes establish a fixed price per ton of carbon dioxide emitted. Companies that exceed their agreed emissions threshold are then required to pay the tax, creating a direct financial incentive to reduce their carbon footprint or invest in cleaner technologies that produce fewer emissions. On the other hand, Emissions Trading Systems set a cap on the total amount of emissions allowed within a specific region or industry. Companies are allocated permits that allow them to emit a certain amount of carbon. However, if a company cannot reduce its emissions enough to stay within its allotted quota, it can purchase additional permits from those who have successfully reduced theirs. This creates a market for carbon credits, where polluters essentially pay a premium to those who have achieved greater emission reductions.

Figure 9: Choices of carbon pricing mechanism



Carbon Taxes

Carbon taxes operate by setting a fixed price per ton of carbon dioxide equivalent (tCO2e) emitted. This price is applied to fossil fuels based on their carbon content, effectively increasing the cost of using carbon-intensive fuels such as coal and heavy fuel oil. The primary goal of carbon taxes is to internalize the external costs of GHG emissions, making it more economically attractive to reduce emissions.

One of the key features of carbon taxes is price certainty. Unlike cap-and-trade systems, which provide certainty about the total level of emissions but not the price, carbon taxes provide price certainty. The tax rate is predetermined, allowing businesses and consumers to plan and make informed decisions. Additionally, carbon taxes generate revenue that can be used to fund climate mitigation and adaptation projects, reduce other taxes, or support vulnerable communities affected by the transition to a low-carbon economy. The straightforward nature of carbon taxes makes them relatively easy to implement and administer compared to more complex systems like cap-and-trade [174].

Designing an effective carbon tax involves several critical considerations. The tax rate needs to be set at a level that provides a meaningful incentive to reduce emissions. This can be challenging, as it requires balancing economic impacts with environmental goals. Some countries implement a low initial rate that increases over time to allow for gradual adjustment. The scope of the tax, or the sectors and sources of emissions it covers, is crucial. Comprehensive coverage ensures that all significant sources of emissions are taxed, maximizing the environmental and economic effectiveness of the policy.

Decisions about how to use the revenue from carbon taxes significantly impact public acceptance and the overall effectiveness of the policy. Revenues can be used to fund renewable energy projects, improve energy efficiency, support affected workers and communities, or reduce other taxes. Carbon taxes are often implemented alongside other policies and measures to address emissions that might not be adequately covered by the tax, such as regulatory standards, subsidies for clean technology, and public awareness campaigns.

Several countries and regions have successfully implemented carbon taxes, demonstrating their potential to reduce emissions and generate revenue. Sweden introduced a carbon tax in 1991, which is one of the highest in the world. The tax has contributed to a significant reduction in GHG emissions while supporting economic growth. Revenues are used to reduce other taxes and invest in renewable energy and energy efficiency[175].

British Columbia implemented a revenue-neutral carbon tax in 2008. The tax rate started at CAD USD 10 per ton of CO2e and gradually increased to CAD USD 50. All revenue from the tax is used to reduce other taxes, ensuring that the policy is revenue-neutral and gaining broad public support[176]. Finland was one of the first countries to introduce a carbon tax in 1990. The tax covers fossil fuels and is adjusted based on carbon content, providing a clear economic signal to reduce emissions. Revenue is used to fund environmental projects and reduce labor taxes.

Carbon taxes provide a clear price signal, encouraging emissions reductions where they are most cost-effective. This promotes innovation and investment in low-carbon technologies. The tax generates significant revenue that can be used for various purposes, including reducing other taxes, funding climate initiatives, and supporting vulnerable communities. The straightforward design of carbon taxes makes them easier to understand and administer compared to more complex mechanisms like cap-and-trade. However, there are concerns that carbon taxes can increase energy costs and disproportionately affect low-income households and energy-intensive industries. These impacts can be mitigated through careful design and use of revenue. Businesses in countries with carbon taxes might face competitive disadvantages compared to those in countries without such policies. Border adjustments and international cooperation can address these concerns. Implementing carbon taxes can be politically challenging due to opposition from affected industries and concerns about economic impacts. Effective communication and stakeholder engagement are crucial for building support.

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[174] *https://openknowledge.worldbank.org/entities/publication/c31d9298-30bf-55fb-acad-ad0605b06e9c*

[175] *Sweden's Carbon Tax. Government of Sweden.*

[176] *British Columbia's Carbon Tax. Government of British Columbia*

Emissions Trading Systems (ETS)

Emissions Trading Systems (ETS) are market-based approaches to controlling pollution by providing economic incentives for achieving reductions in the emissions of pollutants. They aim to limit the total level of greenhouse gas (GHG) emissions by setting a cap and allowing the market to allocate the emissions reduction efforts most cost-effectively. The key idea behind ETS is to cap the total emissions and let the market determine the most efficient way to stay under that cap.

Cap-and-Trade Programs

Cap-and-trade programs are a common form of ETS. Under a cap-and-trade system, a government or regulatory authority sets an overall limit on the amount of GHGs that can be emitted by all participating entities. This cap is typically reduced over time to achieve long-term emissions reduction goals. The total allowed emissions are divided into allowances, which are distributed to the participating entities either for free or through auctions. Each allowance permits the holder to emit one ton of carbon dioxide equivalent (tCO2e).

Participants in a cap-and-trade system can trade allowances among themselves. If a company reduces its emissions below its allocated allowances, it can sell the excess allowances to other companies that are struggling to meet their emissions targets. This creates a financial incentive for companies to reduce their emissions and invest in cleaner technologies. The flexibility of trading allows emissions reductions to occur where they are most cost-effective, thus minimizing the overall cost of achieving the cap.

A well-known example of a cap-and-trade system is the European Union Emissions Trading System (EU ETS). Launched in 2005, the EU ETS is the largest and most established carbon market in the world. It covers more than 11,000 power stations and industrial plants in 30 countries, as well as airlines operating between these countries. The EU ETS has been instrumental in reducing GHG emissions from the covered sectors by more than 40% since its inception[177].

Baseline-and-Credit Programs

Baseline-and-credit programs are another type of ETS. Unlike cap-and-trade programs, which set a fixed cap on total emissions, baseline-and-credit programs establish a baseline level of emissions for each participant. Companies that emit less than their baseline receive credits, while those that exceed their baseline must purchase credits to offset their excess emissions.

In a baseline-and-credit system, the baseline is typically based on historical emissions or an industry standard. Companies are incentivized to reduce their emissions below the baseline to earn credits, which they can sell to other companies that need them to comply with their emissions targets. This system rewards early and additional reductions, providing a continuous incentive for companies to improve their environmental performance.

The Alberta Emission Performance Credit System in Canada is an example of a baseline-and-credit program. It sets emissions intensity benchmarks for various industrial sectors. Facilities that perform better than the benchmark generate credits, while those that perform worse must buy credits or pay a compliance fee.

Setting the cap or baselines at the right level is crucial. The cap must be stringent enough to drive significant emissions reductions but not so strict that it causes economic hardship. Baselines should reflect a fair and achievable standard based on historical data or industry best practices.

Allocation of allowances is another critical aspect. Free allocation can help ease the transition for industries exposed to international competition, while auctioning can generate revenue for governments to invest in climate action or other public

[177] *International Carbon Action Partnership (ICAP). Available at: ICAP*

goods. Ensuring a robust and transparent system for monitoring, reporting, and verification (MRV) is essential to maintain the integrity of the system and prevent fraud. Market stability measures, such as price floors and ceilings or a reserve of allowances that can be released in times of high demand, can help prevent excessive price volatility and ensure that the market functions smoothly. Flexibility mechanisms, such as banking and borrowing of allowances, can provide companies with more options to manage their compliance over time.

ETS offers several benefits. By putting a price on carbon, it creates a financial incentive for companies to reduce their emissions. The trading mechanism ensures that emissions reductions occur where they are most cost-effective, leading to overall lower costs for achieving environmental goals. ETS can also stimulate innovation and investment in low-carbon technologies and practices. However, there are criticisms and challenges associated with ETS. Setting the cap or baselines at the appropriate level is complex and requires accurate emissions data and projections. Allowance allocation can be contentious, with debates over fairness and the risk of windfall profits for some companies. Ensuring robust MRV and preventing market manipulation or fraud are ongoing challenges. Additionally, ETS can lead to carbon leakage, where companies relocate their production to regions with less stringent emissions regulations, undermining the environmental benefits of the system.

6.6.2 Applications of Carbon Financing

Carbon financing plays a pivotal role in addressing climate change by providing financial resources, incentives, and market mechanisms to support activities that reduce greenhouse gas (GHG) emissions and enhance climate resilience. Carbon financing encompasses a range of financial instruments, mechanisms, and strategies aimed at mobilizing private and public investments in climate change mitigation and adaptation initiatives. These initiatives span various sectors and include renewable energy projects, forest conservation and afforestation efforts, energy efficiency improvements, methane capture projects, technological innovations in carbon reduction, and more[178].

Renewable Energy Projects

Carbon financing plays a crucial role in supporting renewable energy projects, which are essential for reducing greenhouse gas emissions and transitioning to a low-carbon economy. Renewable energy sources such as solar, wind, hydroelectric, biomass, and geothermal power generate electricity without emitting significant amounts of carbon dioxide or other greenhouse gases. Carbon financing mechanisms, such as carbon credits and carbon offset projects, provide financial incentives and funding opportunities for renewable energy developers. Renewable energy projects supported by carbon financing often involve the construction and operation of solar and wind farms, hydroelectric dams, biomass power plants, and geothermal energy facilities. These projects contribute to decarbonizing the energy sector by displacing fossil fuel-based electricity generation and reducing reliance on carbon-intensive energy sources. In addition to mitigating climate change, renewable energy investments create jobs, promote energy security, and stimulate economic development in communities where projects are implemented.

Forest Conservation and Afforestation

Carbon financing also supports forest conservation and afforestation initiatives, which are critical for sequestering carbon dioxide and preserving biodiversity. Forests act as carbon sinks, absorbing CO2 from the atmosphere through photosynthesis and storing it in trees, soil, and vegetation. Protecting existing forests from deforestation and degradation and planting new trees through afforestation and reforestation projects can significantly contribute to climate change mitigation efforts. Carbon financing mechanisms such as REDD+ (Reducing Emissions from Deforestation and Forest Degradation) provide financial incentives for countries and communities to conserve forests, manage them sustainably, and restore degraded landscapes. These projects not only help mitigate climate change by sequestering carbon but also provide multiple co-benefits, including conserving biodiversity, protecting watersheds, supporting local livelihoods, and enhancing resilience to climate impacts.

[178] *International Finance Corporation (IFC).*

Energy Efficiency Improvements

Carbon financing plays a crucial role in promoting energy efficiency improvements across various sectors, including buildings, industries, transportation, and agriculture. Energy efficiency measures reduce the amount of energy required to produce goods and services, leading to lower greenhouse gas emissions per unit of output. Carbon financing mechanisms incentivize and support investments in energy-efficient technologies, practices, and infrastructure.

Energy efficiency projects funded through carbon financing may include retrofitting buildings with insulation, energy-efficient lighting, and heating/cooling systems; upgrading industrial processes to reduce energy consumption and waste; promoting sustainable transportation modes such as public transit, electric vehicles, and cycling infrastructure; and implementing agricultural practices that optimize resource use and minimize emissions.

Methane Capture Projects

Carbon financing supports methane capture projects, which target emissions of methane, a potent greenhouse gas with a much higher global warming potential than carbon dioxide over a short time frame. Methane is emitted from various sources, including landfills, wastewater treatment plants, agricultural activities, and oil and gas production. Methane capture projects aim to capture and utilize methane emissions or prevent methane release into the atmosphere.

Carbon financing mechanisms, such as methane capture and utilization projects, provide financial incentives for implementing methane mitigation technologies and practices. These projects may involve capturing methane from landfills and using it as a renewable energy source for electricity generation or heat production, capturing methane from agricultural operations and converting it into biogas for cooking and heating, and reducing methane emissions from oil and gas operations through improved equipment and practices.

6.7. Technological Innovations in Carbon Reduction

Carbon financing supports technological innovations in carbon reduction, including research, development, demonstration, and deployment of clean technologies and solutions. Technological innovations play a crucial role in achieving deep emissions reductions across sectors and accelerating the transition to a carbon-neutral and climate-resilient future. Carbon financing mechanisms incentivize private and public investments in innovative technologies that reduce greenhouse gas emissions and enhance climate resilience.

Technological innovations in carbon reduction funded through carbon financing may include renewable energy technologies such as advanced solar panels, wind turbines, and energy storage systems; carbon capture and storage (CCS) technologies that capture CO2 emissions from industrial processes and power plants and store them underground; low-carbon transportation solutions such as electric vehicles, hydrogen fuel cells, and sustainable biofuels; and climate-smart agriculture practices that improve soil health, increase carbon sequestration, and reduce emissions from farming activities.

Challenges and Opportunities in Carbon Financing

Carbon financing has emerged as a powerful tool in the fight against climate change. By creating a financial incentive to reduce greenhouse gas emissions, it offers a promising path towards a more sustainable future. However, this innovative approach is not without its complexities. In this section, we will delve into the key challenges and opportunities that lie at the heart of carbon financing. On one hand, navigating the intricacies of regulations and policies across different countries can be a hurdle. Additionally, ensuring accurate measurement, reporting, and verification (MRV) of emission reductions is crucial for maintaining the integrity of the system. Furthermore, limited market access and liquidity can hinder the participation of some stakeholders. Finally, careful consideration must be given to the environmental and social impacts of carbon projects, ensuring they deliver real benefits alongside emission reductions.

Despite these challenges, carbon financing presents a multitude of opportunities. With continued development and refinement, it has the potential to significantly accelerate the transition towards a low-carbon economy. As we explore the various applications of carbon financing, from renewable energy projects to forest conservation, we will see its potential to unlock innovation and empower communities. By addressing the challenges head-on and harnessing the vast opportunities, carbon financing can play a pivotal role in securing a sustainable future for our planet.

Regulatory and Policy Issues

The ambitious goals of carbon financing – to incentivize emission reductions and propel us towards a low-carbon future – are undeniably commendable. However, translating these goals into reality necessitates navigating a labyrinth of complex regulations and policies. Inconsistencies across jurisdictions, policy uncertainty, and the ever-present threat of carbon leakage pose significant challenges that can hinder the effectiveness and overall impact of carbon financing initiatives.

One of the most pressing challenges lies in the lack of global uniformity. Carbon pricing schemes and regulations vary significantly from country to country. This inconsistency creates a confusing and uncertain landscape for investors. Companies and organizations considering participation in carbon financing projects may be hesitant to invest in regions with unclear regulations or fluctuating carbon prices. This uncertainty can stifle project development and limit the overall effectiveness of carbon financing as a global tool for emission reduction.

Policy uncertainty further complicates matters. Frequent changes in government regulations can create instability in the carbon market. Investors require long-term, predictable policies to make sound financial decisions and ensure the viability of carbon reduction projects. Imagine a company investing in a renewable energy project that generates carbon credits – a project with a lifespan of decades. If the government suddenly alters its carbon pricing scheme or eliminates the market for those credits entirely, the company's investment could be rendered worthless. This highlights the importance of stable, long-term policy frameworks that provide a foundation for trust and encourage investment in low-carbon solutions.

Another challenge is the phenomenon of carbon leakage. This occurs when regulations in one region drive polluting industries to relocate to areas with less stringent environmental policies. For instance, a country with a robust carbon tax may see its heavy industries migrate to a neighboring country with weaker regulations. This not only undermines the efforts of the first country but also allows the polluting industries to continue their harmful practices unabated. To prevent this from happening, well-coordinated international policies are crucial. Carbon pricing mechanisms that encompass multiple countries or regions can help create a level playing field and prevent polluters from simply hopping borders to avoid regulations.

The free allocation of emission allowances in some Emissions Trading Systems (ETS) presents another wrinkle in the system. These allowances essentially grant companies the right to emit a certain amount of greenhouse gases for free. While this approach can be seen to ease the transition for some sectors that are heavily reliant on fossil fuels, it can also weaken the overall effectiveness of the ETS. If companies receive a significant number of free allowances, the incentive to reduce emissions is lessened. Ideally, the free allocation of allowances would be phased out over time, allowing the price signal in the ETS to become stronger and incentivize greater emission reductions across all industries.

Finally, the scope of many carbon pricing schemes is currently limited. They may only target specific sectors or greenhouse gases, leaving out significant contributors to climate change. For instance, a carbon pricing scheme that only focuses on energy production from fossil fuels would neglect emissions from transportation or agriculture. To maximize the impact of carbon financing, a comprehensive approach that encompasses all major emitters and greenhouse gases is necessary. By including a wider range of sectors and pollutants in carbon pricing schemes, we can create a more holistic strategy for tackling climate change.

Monitoring, Reporting, and Verification (MRV)

The very foundation of trust and transparency in carbon financing rests upon a robust Monitoring, Reporting, and Verification (MRV) system. MRV serves as the cornerstone for ensuring the environmental integrity of carbon credits and upholding the credibility of the entire carbon market. Without a reliable MRV system, there's no way to be certain that the emission reductions being claimed by carbon projects are real, quantifiable, and additional (meaning they wouldn't have happened anyway). This lack of certainty can undermine investor confidence, discourage participation, and ultimately weaken the effectiveness of carbon financing as a tool for combating climate change.

The MRV process itself is a multi-layered one. Monitoring involves the ongoing collection of data on a project's activities and their impact on greenhouse gas emissions. This data collection can encompass a variety of methods, including field measurements, satellite imagery, and remote sensing technologies. The specific methodologies employed will depend on the nature of the project – for instance, a reforestation project will require different monitoring techniques than a renewable energy initiative.

Following the data collection phase comes reporting. Project developers must compile the collected data into a comprehensive report that details the project's activities, methodologies, and the calculated emission reductions achieved. These reports need to be clear, concise, and transparent, allowing for independent verification of the claimed results.

The final step in the MRV process is verification. This involves an independent third-party auditor meticulously examining the project report, the underlying data, and the monitoring methodologies employed. The auditor's role is to assess whether the reported emission reductions are accurate, credible, and adhere to the established carbon crediting standards. A successful verification ensures that the carbon credits generated by the project represent genuine and quantifiable emission reductions.

While a robust MRV system is essential, it also presents a set of challenges. One key challenge is the cost associated with implementing and maintaining an effective MRV system. Monitoring activities, particularly those involving field measurements or advanced technologies, can be expensive. This can pose a particular hurdle for smaller-scale projects, which may struggle to shoulder the financial burden of a comprehensive MRV system.

Another challenge lies in the technical complexity of MRV, especially for projects involving complex methodologies or land-use changes. Developing robust monitoring protocols and ensuring data accuracy requires expertise and ongoing technical support. Capacity building initiatives that equip project developers and stakeholders with the necessary knowledge and skills can help address this challenge.

Standardization of MRV methodologies also plays a crucial role. A lack of consistency across different carbon crediting standards can create confusion and make it difficult to compare projects or verify their emission reductions. Fortunately, organizations like the International Organization for Standardization (ISO) are working to develop standardized methodologies for MRV in the carbon finance sector[179]. These efforts towards standardization will help streamline the verification process and enhance the overall credibility of the carbon market.

In conclusion, a robust MRV system serves as the lifeblood of a trustworthy and effective carbon financing system. By ensuring the accuracy, transparency, and additionally of emission reductions, MRV fosters investor confidence and paves the way for a more sustainable future. While challenges in terms of cost, technical complexity, and standardization exist, ongoing efforts to improve MRV methodologies and build capacity will strengthen this crucial aspect of carbon financing.

[179] *International Organization for Standardization (ISO). Retrieved from https://www.iso.org/*

Market Access and Liquidity

For carbon financing to flourish and fulfill its potential as a transformative force in combating climate change, a vibrant and well-functioning marketplace is essential. However, two key challenges currently impede the smooth operation of this market: limited market access and inadequate liquidity. These interconnected issues can stifle project development, discourage participation, and ultimately hinder the effectiveness of carbon financing[180].

Market Access refers to the ease with which project developers can enter the carbon market and sell their carbon credits. Several factors can restrict market access. One major hurdle is the complex and fragmented nature of the carbon market itself. A multitude of carbon pricing schemes and crediting standards exist across different regions, each with its own set of rules and regulations. Navigating this intricate landscape can be daunting for project developers, particularly those operating in developing countries with limited resources and expertise.

Furthermore, the voluntary carbon market (VCM), which allows individuals and businesses to offset their emissions by purchasing carbon credits, currently faces issues with fragmentation and a lack of standardization. The heterogeneity of carbon credits, stemming from differences in project types, methodologies, and verification standards, can make it difficult for buyers to compare and assess the value of these credits. This lack of transparency can create uncertainty and discourage potential buyers from entering the market.

Liquidity, on the other hand, refers to the ease with which carbon credits can be bought and sold in the market. A liquid market is one with a high volume of transactions and relatively stable prices. Unfortunately, the carbon market, particularly the VCM, currently suffers from a lack of liquidity. The limited pool of buyers and sellers, coupled with the issues of market access and credit heterogeneity, can make it difficult for project developers to find buyers for their credits at a fair price. This lack of liquidity can discourage investment in carbon reduction projects, as developers may be hesitant to undertake projects if they are unsure whether they will be able to sell the resulting credits.

Despite these challenges, opportunities exist to improve market access and liquidity in carbon financing. One promising approach is the development of secondary markets for carbon credits. These secondary markets would allow for the trading of existing carbon credits, facilitating easier access for buyers and potentially increasing the overall volume of transactions. The establishment of clear and consistent carbon crediting standards across different regions would also play a crucial role. Standardization would enhance transparency, making it easier for buyers to compare credits and assess their value. This, in turn, could attract more buyers to the market and improve liquidity.

Technological advancements can also play a significant role in improving market access and liquidity. The development of online platforms that connect project developers with potential buyers can streamline the process of finding buyers and facilitate transactions. Additionally, blockchain technology has the potential to revolutionize the carbon market by creating a secure and transparent system for tracking carbon credits[181]. By leveraging these technological advancements, we can create a more efficient and accessible marketplace for carbon financing.

[180] *https://carboncredits.com/the-ultimate-guide-to-understanding-carbon-credits/?sl=carbon-credits-com-guide&msclkid=79f70d60c0651c7adeb26b127f3ad333*
[181] *https://www.weforum.org/publications/blockchain-for-scaling-climate-action/.*

6.8. Key International Funds and Initiatives

Several major international funds and initiatives play crucial roles in mobilizing and disbursing climate finance to developing countries. These funds provide grants, concessional loans, and technical assistance to support a wide range of climate-related projects.

6.8.1. International Public Institutions

Climate finance is essential for supporting Iraq's transition to a sustainable, resilient economy. Various sources of climate finance can be harnessed, including domestic resources, international public finance, regional and national funds, and international private finance. Each of these sources plays a critical role in addressing the multifaceted challenges posed by climate change and promoting sustainable development in Iraq. International public finance encompasses funds from international organizations, development banks, and donor countries. These sources provide critical support for large-scale climate initiatives and capacity-building efforts.

Multilateral Development Banks (MDBs)

MDBs, such as the World Bank, the Asian Development Bank (ADB), and the European Bank for Reconstruction and Development (EBRD), offer loans, grants, and technical assistance for climate projects. These institutions play a pivotal role in financing infrastructure projects that enhance climate resilience.

Example: The World Bank could finance a major flood protection project in Baghdad, incorporating advanced engineering solutions to mitigate the impact of extreme weather events.

Bilateral Aid

Donor countries often provide bilateral aid for climate projects through their international development agencies. These funds support initiatives such as renewable energy deployment, climate-smart agriculture, and disaster risk reduction.

Example: The United States Agency for International Development (USAID) could partner with Iraq to implement a nationwide program focused on enhancing agricultural resilience to climate change.

Regional Funds

Regional and national funds are established to address specific climate-related challenges within a particular region or country. These funds can be highly effective in financing targeted interventions.

Regional Cooperation

Collaborating with neighboring countries and regional organizations can unlock additional funding opportunities. Regional initiatives can address transboundary climate issues, such as water scarcity and desertification, through coordinated efforts.

Example: Iraq could partner with countries in the Middle East and North Africa (MENA) region to develop a joint strategy for combating desertification, supported by funding from regional development banks.

Climate Funds

Iraq has the opportunity to leverage global climate funds such as the Green Climate Fund (GCF) and the Global Environment Facility (GEF) to finance projects aligned with its national climate strategies. For instance, these funds could support initiatives like enhancing solar energy infrastructure across Iraq to bolster renewable energy capacity.

A. Green Climate Fund (GCF)

Establishment and Objectives: The GCF was established in 2010 as part of the UNFCCC framework. It aims to support the efforts of developing countries to respond to the challenge of climate change. The fund promotes a paradigm shift towards low-emission and climate-resilient development.

Funding Mechanisms: The GCF employs a variety of financial instruments, including grants, concessional loans, equity investments, and guarantees. It seeks to catalyze private sector investment by sharing risks and reducing perceived barriers.

Governance and Access: The GCF is governed by a Board with equal representation from developed and developing countries. Access to GCF resources can be direct (through national entities) or indirect (through international intermediaries like MDBs and UN agencies).

Examples of Funded Projects:

Mongolia: Renewable Energy Program: The GCF approved USD 145 million for Mongolia to develop its renewable energy sector, focusing on wind and solar power projects.

Senegal: Coastal Resilience Project: A USD 25 million grant was provided to enhance the resilience of Senegal's coastal zones to climate change impacts.

B. Global Environment Facility (GEF)

Background and Role: The GEF was established in 1991 to address global environmental issues, including climate change, biodiversity, and land degradation. It provides grants and co-financing to support environmental projects.

Operational Structure: The GEF operates through implementing agencies such as the World Bank, UNDP, and UNEP. It leverages additional funding by mobilizing co-financing from various sources.

Funding Priorities: The GEF focuses on cross-cutting issues, integrating climate change mitigation and adaptation into broader environmental and development projects.

Case Studies:

Brazil: Sustainable Amazon Project: The GEF funded a USD 60 million project to promote sustainable land use and protect the Amazon rainforest.

India: Solar Power Initiative: A USD 20 million grant supported the expansion of solar power installations across India.

How good to refer to 2 GEF-funded projects implemented by UNDP-Iraq. However, the total budget of them is less than USD 6 m which is very well below that of the examples of Brazil and India mentioned above.

Eligibility Criteria:-

All projects or programs must fulfill the following criteria to be eligible for GEF funding.

Eligible country: Countries may be eligible for GEF funding in one of two ways: a) if the country has ratified the conventions the GEF[182] serves and conforms with the eligibility criteria decided by the Conference of the Parties of each convention; or b) if the

[182] *https://www.thegef.org/partners/conventions*

country is eligible to receive World Bank (IBRD and/or IDA) financing or if it is an eligible recipient of UNDP technical assistance through its target for resource assignments from the core (specifically TRAC-1 and/or TRAC-2).

National priority: The project must be driven by the country (rather than by an external partner) and be consistent with national priorities that support sustainable development.

GEF priorities: To achieve the objectives of multilateral environmental agreements, it is required that the GEF support country priorities that are ultimately aimed at tackling the drivers of environmental degradation in an integrated fashion. For this reason, the focal areas (Biodiversity, Climate Change, Land Degradation, International Waters, and Chemicals and Waste) remain the central organizing feature in the GEF-8 Programming Directions and provide countries with the opportunity to participate in selected "Integrated Programs" which aim to address major drivers of environmental degradation and/or deliver multiple benefits that fall under the GEF's mandate (for more details, see the GEF-8 Programming Directions).

Financing: The project must seek GEF financing only for the agreed incremental costs on measures to achieve global environmental benefits.

Participation: The project must involve the public in project design and implementation, following the Policy on Stakeholder Engagement and the respective guidelines.

C. Adaptation Fund

Origin and Purpose: Established under the Kyoto Protocol, the Adaptation Fund finances projects that help vulnerable communities in developing countries adapt to climate change. It is unique in its direct access modality, allowing accredited national entities to receive funding directly.

Funding Sources: The fund is primarily financed through a share of proceeds from the Clean Development Mechanism (CDM) and voluntary contributions from donor countries.

Examples of Impact:

- Small Island Developing States (SIDS): Projects in SIDS focus on enhancing coastal resilience and water management. For example, a project in Samoa improved water resources management to mitigate the impact of climate change on water availability.
- African Nations: In Kenya, the Adaptation Fund supported a project to develop climate-resilient agricultural practices, benefiting smallholder farmers.

Table 15: Review Table for Adaptation Fund

Review Criteria	
1. Country Eligibility	• Is the country party to the Kyoto Protocol? • Is the country a developing country particularly vulnerable to the adverse effects of climate change?
2. Project Eligibility	• Has the government endorsed the project through its Designated Authority? • Does the project / programme support concrete adaptation actions to assist the country in addressing the adverse effects of climate change and build in climate change resilience? • Does the project / programme provide economic, social and environmental benefits, with particular reference to the most vulnerable communities, including gender considerations? • Is the project / programme cost-effective? • Is the project / programme consistent with national sustainable development strategies, national development plans, poverty reduction strategies, national communications or adaptation programs of action, or other relevant instruments? • Does the project / programme meet the relevant national technical standards, where applicable? • Is there duplication of project with other funding sources? • Does the project / programme have a learning and knowledge management component to capture and feedback lessons? • Has the project / programme provided justification for the funding requested on the basis of the full cost of adaptation? • Does the project / programme align with the AF results framework? • Has the sustainability of the project/programme outcomes been taken into account when designing the project?
3. Resource Availability	• Is the requested project funding within the cap of the country? • Is the Implementing Entity management fee at or below 8.5 per cent of the total project/programme budget before the fee? • Are the project/programme execution costs at or below 9.5 per cent of the total project/programme budget before the fee?
4. Eligibility of NIE/MIE	• Is the project submitted through an eligible NIE/MIE that has been accredited by the Board?
5. Implementation Arrangement	• Is there adequate arrangement for project management? • Are there measures for financial and project risk management? • Are arrangements for monitoring and evaluation clearly defined, including a budgeted M&E plan? • Is a project results framework included? Are relevant targets and indicators disaggregated by sex?

D. Climate Investment Funds (CIFs)

Components and Structure: The CIFs comprise two key components: the Clean Technology Fund (CTF) and the Strategic Climate Fund (SCF). The CTF provides funding for large-scale mitigation projects, while the SCF supports pilot projects and innovative approaches.

Key Programs:

Clean Technology Fund (CTF): Focuses on projects that promote clean technology and energy efficiency. It has financed large-scale solar and wind projects in countries like Mexico and South Africa.

Pilot Program for Climate Resilience (PPCR): Part of the SCF, the PPCR supports countries in integrating climate resilience into development planning. For example, in Bangladesh, the PPCR funded infrastructure improvements to reduce flood risks.

E. Loss and Damages Response Fund[183]

At the UN Climate Change Conference 2022 (COP-27) in Egypt, an agreement was reached to create a fund that will help developing countries offset the damage from natural disasters caused by climate change. This financial mechanism was designed to provide crucial support to vulnerable nations facing the brunt of climate-related challenges. To facilitate the implementation of the fund and related climate finance mechanisms, a Transitional Committee was formed, comprised of representatives from 24 nations encompassing both developed and developing countries.

The topic of climate finance for developing countries became one of the priorities on the agenda of the UN Climate Change Conference 2023 (COP-28) in Dubai, UAE. During the inaugural plenary session on the conference's first day, the participants made a historic decision to create a dedicated fund aimed at addressing and compensating for the losses and damages incurred due to climate change[184].

6.8.2. International Private Finance

International private finance involves investments from global private sector entities, including corporations, financial institutions, and impact investors. These funds are crucial for scaling up climate technologies and infrastructure.

4. Foreign Direct Investment (FDI)

Foreign Direct Investment (FDI) in Iraq presents both significant opportunities and considerable challenges. Iraq has substantial potential for FDI, especially in sectors like hydrocarbons, construction, and renewable energy. Despite the attractive opportunities, particularly in the oil sector, Iraq has struggled to attract consistent foreign investment due to ongoing security concerns, political instability, and a challenging regulatory environment.

In 2022, Iraq saw negative FDI inflows, reflecting foreign investors' difficulties. However, there have been efforts to improve the investment climate, including the implementation of the National Investment Law, which offers incentives such as tax exemptions for qualified investments and the freedom for foreign investors to repatriate profits. Nonetheless, the country continues to face significant barriers, including corruption, outdated infrastructure, and a reliance on oil revenues that leaves it vulnerable to global energy price fluctuations.

Table 16: Foreign Direct Investment, Iraq, 2020 to 2022[185]

Foreign Direct Investment	2020	2021	2022
FDI Inward Flow (million USD)	-2,859	-2,637	-2,088
FDI Stock (million USD)	0	0	n/a
Number of Greenfield Investments*	1	7	11
Value of Greenfield Investments (million USD)	1,063	1,090	1,046

For incorporation, foreign investors are required to register their businesses with the Ministry of Trade's Companies Registration Department, and those operating in the Kurdistan region have the option to register directly with the Kurdistan Regional Government. While the law provides a framework for FDI, including protections and incentives, the actual implementation is often hampered by bureaucratic inefficiencies and the need for further political and economic reforms.

[183] *https://unfccc.int/loss-and-damage-fund-joint-interim-secretariat*
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These dynamics highlight the need for cautious and well-planned investment strategies in Iraq, particularly for those entering non-oil sectors, where the growth opportunities are significant, but the risks are also considerable.

Attracting FDI into climate-related projects can significantly benefit Iraq by bringing in much-needed capital, advanced technology, and global expertise. By incentivizing foreign companies to invest in renewable energy, sustainable agriculture, and green infrastructure, Iraq can tap into international private finance to drive its climate goals. For instance, a major international energy company investing in the development of a large-scale solar park in Iraq would not only create jobs but also enhance the country's renewable energy capacity, contributing to a more sustainable and resilient economy.

A. Implementation Strategies

1. Strengthen Data Systems: Enhancing the capacity of national data systems to collect, manage, and analyze climate-related data. This involves investing in data infrastructure, training personnel, and developing data-sharing protocols.

2. Promote Research Collaboration: Fostering collaboration between government agencies, research institutions.

B. Implementation Steps

Development of Tracking Tools: Designing and implementing tools and systems for real-time tracking of climate finance expenditures. This includes the development of software applications and databases tailored to the specific needs of Iraq's financial management system.

Integration with Existing Systems: Ensuring that tracking tools are integrated with existing financial management and reporting systems. This integration facilitates seamless data flow and reduces the risk of data discrepancies.

Capacity Building: Training government officials and other stakeholders on the use of tracking tools and systems. This includes providing technical assistance and resources to ensure effective implementation and use of the tracking systems.

Public Disclosure: Making expenditure data publicly available to enhance transparency and accountability. This involves publishing regular reports on climate finance flows and making them accessible to the public through government websites and other platforms.

Climate Change Financing Scenarios

Exploring different climate change financing scenarios helps in understanding the potential impacts of various financing strategies and in making informed decisions about resource allocation.

A. Scenario Analysis

Business-As-Usual Scenario: This scenario assumes no significant changes in climate finance policies or funding levels. It evaluates the potential impacts of continuing current practices without additional investments in climate resilience and mitigation. Key considerations include:

Projected Climate Impacts: Estimating the future impacts of climate change on different sectors under current funding levels.

Economic Costs: Assessing the economic costs associated with increased climate risks, such as damage to infrastructure and reduced agricultural productivity.

Moderate Investment Scenario: This scenario assumes a moderate increase in climate finance investments. It analyzes the outcomes of enhanced funding for key sectors, such as renewable energy, water management, and agriculture. Key considerations include:

- Enhanced Resilience: Evaluating the potential improvements in climate resilience resulting from moderate investment increases.
- Cost-Benefit Analysis: Comparing the costs of additional investments with the expected benefits in terms of reduced climate risks and improved economic outcomes.

B. Implementation Steps

1. Development of Guidelines: Developing detailed guidelines for the integration of climate risk/assessment indicators into M&E processes. These guidelines should provide step-by-step instructions on how to incorporate climate considerations into project evaluation.

2. Capacity Building: Training M&E practitioners on the use of the new guidelines and indicators. This includes providing technical assistance and resources to ensure effective implementation.

3. Pilot Testing: Conducting pilot tests to evaluate the effectiveness of the new guidelines and indicators. This involves selecting a few projects for initial implementation and using the lessons learned to refine the guidelines.

4. Scaling Up: Rolling out the updated M&E guidelines and indicators across all relevant projects and programs. This involves integrating the new indicators into national M&E systems and ensuring that they are used consistently across different sectors and levels of government.

5. Continuous Improvement: Continuously improving the M&E guidelines and indicators based on feedback and evolving best practices. This includes regular reviews and updates to ensure that the indicators remain relevant and effective in measuring climate risks and resilience.

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