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Report No: PAD4461

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED GRANT

IN THE AMOUNT OF SDR 212 MILLION
(US$295 MILLION EQUIVALENT)
OF WHICH US$60 MILLION EQUIVALENT
FROM THE WINDOW FOR HOST COMMUNITIES AND REFUGEES

TO THE

REPUBLIC OF CHAD

FOR A

CHAD ENERGY ACCESS SCALE UP PROJECT

March 3, 2022

Energy and Extractives Global Practice
Western and Central Africa Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective February 8, 2022)

Currency Unit =	Special Drawing Rights (SDR) CFA Franc (CFAF)
SDR 0.718 =	US$1
CFAF 574.4 =	US$1

FISCAL YEAR

January 1 – December 31

Regional Vice President:	Ousmane Diagana
Country Director:	Clara Ana Coutinho De Sousa
Acting Regional Director:	Ashish Khanna
Practice Manager:	Kwawu Mensan Gaba
Task Team Leaders:	Yuriy Myroshnychenko, Aurelie Rossignol

ABBREVIATIONS AND ACRONYMS

ADERM	Rural Electrification, Energy Efficiency, and Renewable Energy Agency (*Agence de Développement de l'Électrification Rurale et de la Maîtrise de l'Énergie*)
ARSE	Electricity Sector Regulatory Agency (*Agence de Régulation du Secteur de l'Electricité*)
CAPEX	Capital Expenditures
CCPIP	Cameroon-Chad Power Interconnection Project
CEASP	Chad Energy Access Scale Up Project
CEN	Country Engagement Note
CERC	Contingent Emergency Response Component
CNARR	National Commission for Reception and Reintegration of Refugee and Returnees *(Commission Nationale d'Accueil de Réinsertion des Réfugies*)
CoC	Code of Conduct
CPF	Country Partnership Framework
CPI	Corruption Perceptions Index
DA	Designated Account
DFIL	Disbursement and Financial Information Letter
DHS	Demographic and Health Survey
ECOSIT	Survey on Expenditure of Households and Informal Sector in Chad (*Enquête sur la Consommation des Ménages et le Secteur Informel au Tchad)*
ERR	Economic Rate of Return
ESCP	Environmental and Social Commitment Plan
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESS	Environmental and Social Standard
FM	Financial Management
FNPV	Financial Net Present Value
GBV	Gender-Based Violence
GDP	Gross Domestic Product
GEMS	Geo-Enabling Initiative for Monitoring and Supervision
GHG	Greenhouse Gas
GoC	Government of Chad
GRM	Grievance Redress Mechanism
GRS	Grievance Redress Service
IDP	Internally Displaced Person
IFC	International Finance Corporation
IFC CTA	IFC Transaction Advisory Department
IFR	Interim Financial Report
IPF	Investment Project Financing
IPP	Independent Power Producer
IVA	Independent Verification Agency
LMP	Labor Management Procedures
LPG	Liquefied Petroleum Gas
M&E	Monitoring and Evaluation

MIGA	Multilateral Investment Guarantee Agency
MPE	Ministry of Petroleum and Energy
MSME	Micro, Small, and Medium Enterprise
NEEP	National Electricity Emergency Plan
NGO	Nongovernmental Organization
NPV	Net Present Value
O&M	Operation and Maintenance
OGS	Off-Grid Solar
PARCA	Refugees and Host Communities Support Project (*Projet d'Appui aux Réfugiés et aux Communautés d'Accueil*)
PAYGO	Pay-As-You-GO
PDO	Project Development Objective
PIM	Project Implementation Manual
PIU	Project Implementation Unit
PMC	Project Management Consultant
PPA	Power Purchase Agreement
PPSD	Project Procurement Strategy for Development
PRA	Prevention and Resilience Allocation
PUE	Productive Use of Energy
PV	Photovoltaic
RBF	Results-Based Financing
RPA	Refugee Protection Assessment
RPF	Resettlement Policy Framework
RRA	Risk and Resilience Assessment
S&I	Supply and Installation
SEA	Sexual Exploitation and Abuse
SEP	Stakeholder Engagement Plan
SH	Sexual Harassment
SHS	Solar Home System
SMG	Scaling Mini-Grids
SNE	National Electricity Company (*Société Nationale d'Electricité)*
SSS	Stand-alone Solar System
STEP	Systematic Tracking of Exchanges in Procurement
TA	Technical Assistance
TOR	Terms of Reference
UNDP	United Nations Development Programme
UNHCR	United Nations High Commissioner for Refugees
VRE	Variable Renewable Energy
WBG	World Bank Group
WHR	Window for Host Communities and Refugees
WTP	Willingness to Pay

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DATASHEET

BASIC INFORMATION

Country(ies)	Project Name	
Chad	Chad Energy Access Scale Up Project	
Project ID	**Financing Instrument**	**Environmental and Social Risk Classification**
P174495	Investment Project Financing	Substantial

Financing & Implementation Modalities

[ ] Multiphase Programmatic Approach (MPA)	[ ] Contingent Emergency Response Component (CERC)
[ ] Series of Projects (SOP)	[✓] Fragile State(s)
[ ] Performance-Based Conditions (PBCs)	[ ] Small State(s)
[ ] Financial Intermediaries (FI)	[ ] Fragile within a non-fragile Country
[ ] Project-Based Guarantee	[ ] Conflict
[ ] Deferred Drawdown	[ ] Responding to Natural or Man-made Disaster
[ ] Alternate Procurement Arrangements (APA)	[ ] Hands-on Enhanced Implementation Support (HEIS)

Expected Approval Date	Expected Closing Date
24-Mar-2022	30-Jun-2027
Bank/IFC Collaboration	**Joint Level**
Yes	Complementary or Interdependent project requiring active coordination

Proposed Development Objective(s)

The PDO is to increase access to electricity and clean cooking in Chad.

Components

Component Name	Cost (US$, millions)
Component 1: Electrification via grids	230.00

Component 2: Electrification via standalone solar systems	127.50
Component 3: Clean cooking and natural resource management	20.50
Component 4: Project management and technical assistance	17.00
Component 5: Contingent Emergency Response Component (CERC)	0.00

Organizations

Borrower:	Republic of Chad
Implementing Agency:	Societe Nationale de l'Electricite (SNE) Ministry of Petroleum and Energy

PROJECT FINANCING DATA (US$, Millions)

SUMMARY

Total Project Cost	395.00
Total Financing	395.00
of which IBRD/IDA	295.00
Financing Gap	0.00

DETAILS

World Bank Group Financing

International Development Association (IDA)	295.00
IDA Grant	295.00

Non-World Bank Group Financing

Commercial Financing	100.00
Unguaranteed Commercial Financing	100.00

IDA Resources (in US$, Millions)

	Credit Amount	Grant Amount	Guarantee Amount	Total Amount
Chad	0.00	295.00	0.00	295.00
National PBA	0.00	235.00	0.00	235.00

Refugee	0.00	60.00	0.00	60.00
Total	**0.00**	**295.00**	**0.00**	**295.00**

Expected Disbursements (in US$, Millions)

WB Fiscal Year	2022	2023	2024	2025	2026	2027
Annual	0.00	10.00	35.00	80.00	80.00	90.00
Cumulative	0.00	10.00	45.00	125.00	205.00	295.00

INSTITUTIONAL DATA

Practice Area (Lead)

Energy & Extractives

Contributing Practice Areas

Environment, Natural Resources & the Blue Economy

Climate Change and Disaster Screening

This operation has been screened for short and long-term climate change and disaster risks

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Rating
1. Political and Governance	High
2. Macroeconomic	Substantial
3. Sector Strategies and Policies	Substantial
4. Technical Design of Project or Program	Substantial
5. Institutional Capacity for Implementation and Sustainability	High
6. Fiduciary	Substantial
7. Environment and Social	Substantial
8. Stakeholders	Moderate
9. Other	High
10. Overall	High

COMPLIANCE

Policy

Does the project depart from the CPF in content or in other significant respects?

[ ] Yes [✓] No

Does the project require any waivers of Bank policies?

[ ] Yes [✓] No

Environmental and Social Standards Relevance Given its Context at the Time of Appraisal

E & S Standards	Relevance
Assessment and Management of Environmental and Social Risks and Impacts	Relevant
Stakeholder Engagement and Information Disclosure	Relevant
Labor and Working Conditions	Relevant
Resource Efficiency and Pollution Prevention and Management	Relevant
Community Health and Safety	Relevant
Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Relevant
Biodiversity Conservation and Sustainable Management of Living Natural Resources	Relevant
Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	Not Currently Relevant
Cultural Heritage	Relevant
Financial Intermediaries	Not Currently Relevant

NOTE: For further information regarding the World Bank's due diligence assessment of the Project's potential environmental and social risks and impacts, please refer to the Project's Appraisal Environmental and Social Review Summary (ESRS).

Legal Covenants

Sections and Description

Financing Agreement, Schedule 2, Section I.A.2(a): The Recipient shall establish the MPE-PIU not later than

December 31, 2022, or any other later date agreed upon in writing with the Association, to be responsible for day-to-day implementation on technical, fiduciary, environmental and social, and monitoring and evaluation aspects of Parts 1.3, 2, 3, 4.1(a), 4.2, 4.3 and 5 of the Project.

Sections and Description
Financing Agreement, Schedule 2, Section I.C.1 and Project Agreement, Schedule, Section I.C.1(c): The Recipient and the Project Implementing Entity shall each prepare separate financial management and procurement sections of the MPE Project Implementation Manual and the SNE Project Implementation Manual to be adopted within six (6) months after the Effective Date.

Sections and Description
Financing Agreement, Schedule 2, Section I.I.1: The Recipient shall, and shall cause the Project Implementing Entity to, not later than November 30th of each calendar year during the implementation of the Project (or one (1) month after the Effective Date for thefirst year of Project implementation), prepare and furnish to the Association for its approval: (a) a draft annual work plan and budget containing all proposed activities for inclusion in the Project during the following calendar year of Project implementation (including Training and Operating Costs); and (b) any instruments required by the Environmental and Social Commitment Plan ("ESCP") for the implementation of the activities included in the draft annual work plan and budget.

Sections and Description
Financing Agreement, Schedule 2, Section I.E.3: If sixty (60) days prior to the Closing Date, the Association determines that there are measures and actions specified in the ESCP which will not be completed by the Closing Date, the Recipient shall: (a) not later than thirty (30) days before the Closing Date, prepare and present to the Association, an action plan satisfactory to the Association on the outstanding measures and actions, including a timetable and budget allocation for such measures and actions (which action plan shall deemed to be considered an amendment of the ESCP); and (b) thereafter, carry out said action plan in accordance with its terms and in a manner acceptable to the Association.

Sections and Description
Financing Agreement, Schedule 2, Section I.G.3(e): The Recipient shall ensure that any concerns or grievances regarding the conduct of military, security or armed personnel are received, monitored, documented (taking into account the need to protect confidentiality), resolved through the Project's grievance mechanism; and reported to the Association no later than forty-eight (48) hours after being received.

Sections and Description
Financing Agreement, Schedule 2, Section II: The Recipient shall, and shall cause the Project Implementing Entity to, furnish to the Association each Project Report not later than forty-five (45) days after the end of each calendar semester, covering the calendar semester.

Sections and Description
Project Agreement, Schedule, Section II.A.2: The Project Implementing Entity shall provide to the Recipient not later than six (6) months after the Closing Date, for incorporation in the report referred to in Section 5.08 (c) of the General Conditions all such information as the Recipient or the Association shall reasonably request for the purposes of such Section.

Sections and Description

Financing Agreement, Schedule 2, Section IV.1: The Recipient shall: (a) open a designated account for Parts 1.3, 2, 3 and 4.1(a), 4.2, 4.3 of the Project no later than one (1) month after the Effective Date, under terms and conditions satisfactory to the Association; (b) acquire, install and customize an accounting software for the Project, with terms and specifications acceptable to the Association, no later than three (3) months after the Effective Date; (c) prepare the terms of reference for the recruitment of an internal auditor for the Project, not later than one (1) month after the Effective Date; (d) recruit an external auditor for the Project, with terms of reference, integrity, qualifications and experience satisfactory to the Association, not later than six (6) months after the Effective Date; (e) organize Training on the Procurement Regulations and the Anti-Corruption Guidelines within three (3) months after the Effective Date, in form and substance satisfactory to the Association: and (f) develop adequate contract management plans for procurement documentation subject to prior review thresholds as further defined in the Project Implementation Manuals, in form and substance satisfactory to the Association, within two (2) months after the Effective Date.

Sections and Description

ESCP: MPE-PIU, with 1 environmental specialist, 1 social specialist, and 1 specialist on OHS, shall be in place prior to any disbursements on Parts 1.3, 2, 3 and 4, unless other provided in Section III.A. of Schedule 2 to the Financing Agreement

Sections and Description

Project Agreement, Schedule, Section I.D.3: If sixty (60) days prior to the Closing Date, the Association determines that there are measures and actions specified in the ESCP which will not be completed by the Closing Date, the Project Implementing Entity shall: (a) not later than thirty (30) days before the Closing Date, prepare and present to the Association, an action plan satisfactory to the Association on the outstanding measures and actions, including a timetable and budget allocation for such measures and actions (which action plan shall deemed to be considered an amendment of the ESCP); and (b) thereafter, carry out said action plan in accordance with its terms and in a manner acceptable to the Association.

Sections and Description

Financing Agreement, Schedule 2, Section IV.2 and Project Agreement, Schedule, Section III.1: The Recipient shall ensure, and cause the Project Implementing Entity to ensure, and the Project Implementing Entity shalle ensure, that the SNE-PIU has: (a) recruited: (i) an additional accountant within three (3) months after the Effective Date, and (ii) a procurement specialist within two (2) months after the Effective Date; both with terms of reference, qualifications, integrity and experience satisfactory to the Association; (b) opened a designated account for the Project Implementing Entity's Respective Parts of the Project no later than one (1) month after the Effective Date, under terms and conditions satisfactory to the Association; (c) acquired, installed and customized an accounting software for the Project, with terms and specifications acceptable to the Association, not later than three (3) months after the Effective Date; and (d) put in place (i) adequate mechanisms satisfactory to the Association to incorporate technical inputs in procurement-related documents, (ii) adequate contract management plans for key procurement contracts under the Project and (iii) related Training; in form and substance satisfactory to the Association, within two (2) months after the Effective Date.

Sections and Description

Project Agreement, Schedule, Section I.E.1: The Project Implementing Entity shall, in consultation with the Recipient, not later than November 30th of each calendar year during the implementation of the Project (or one (1)

month after the Effective Date for the first year of Project implementation), prepare and furnish to the Association for its approval: (a) a draft annual work plan and budget containing all proposed activities for inclusion in the Project during the following calendar year of Project implementation (including Training and Operating Costs); and (b) any instruments required by the Environmental and Social Commitment Plan ("ESCP") for the implementation of the activities included in the draft annual work plan and budget.

Conditions

Type	Financing source	Description
Effectiveness	IBRD/IDA	Financing Agreement, Article IV, 5.01 (a): The Association is satisfied that the Recipient has an adequate refugee protection framework
Type	Financing source	Description
Effectiveness	IBRD/IDA	Financing Agreement, Article IV, 5.01 (b): The Subsidiary Agreement shall have been executed by the Recipient and the Project Implementing Entity, in form and substance satisfactory to the Association, and in accordance with Section I.B. of Schedule 2 to this Agreement, and satisfactory evidence shall have been provided to the Association that the Subsidiary Agreement is binding on the Recipient and the Project Implementing Entity in accordance with its terms
Type	Financing source	Description
Effectiveness	IBRD/IDA	Financing Agreement, Article IV, 5.01 (c): The Recipient shall prepare and approve the Security Management Plan, and disclose a summary thereof, in form and substance satisfactory to the Association, and in accordance with the ESCP
Type	Financing source	Description
Effectiveness	IBRD/IDA	Financing Agreement, Article IV, 5.01 (d): The Recipient shall have caused the Project Implementing Entity to recruit for the Project: (i) an environmental specialist; (ii) a social specialist; (iii) an organizational health and safety specialist; and (iv) a sexual exploitation and abuse and sexual harassment specialist; all with terms of reference, qualifications, integrity and experience satisfactory to the Association
Type	Financing source	Description
Disbursement	IBRD/IDA	Financing Agreement, Schedule 2, Section III, B.1 (b): Notwithstanding the provisions of Part A above, no withdrawal shall be made under Category (1), until and unless the Recipient has caused SNE-PIU to adopt the SNE Project Implementation Manual in form and substance satisfactory to the Association and in accordance with Section I.C.1 of Schedule 2 to this Agreement

Type	Financing source	Description
Disbursement	IBRD/IDA	Financing Agreement, Schedule 2, Section III, B.1 (c): Notwithstanding the provisions of Part A above, no withdrawal shall be made under Category (2), until and unless the Recipient has: (i) established the MPE-PIU, with staff, composition, mandate and resources satisfactory to the Association and in accordance with Sections I.A.2.(a) and I.A.3 of Schedule 2 to this Agreement and further specifications set out in the Project Implementation Manuals; and (ii) adopted the MPE Project Implementation Manual in form and substance satisfactory to the Association and in accordance with Section I.C. of Schedule 2 to this Agreement
Type	Financing source	Description
Disbursement	IBRD/IDA	Financing Agreement, Schedule 2, Section III, B.1 (f): Notwithstanding the provisions of Part A above, no withdrawal shall be made for Emergency Expenditures under Category (5), unless and until all of the following conditions have been met in respect of said expenditures: (i) (A) the Recipient has determined that an Eligible Crisis or Emergency has occurred, and has furnished to the Association a request to withdraw Financing amounts under Category (4); and (B) the Association has agreed with such determination, accepted said request and notified the Recipient thereof; and (ii) the Recipient has adopted the CERC Manual and Emergency Action Plan, in form and substance acceptable to the Association.
Type	Financing source	Description
Disbursement	IBRD/IDA	Financing Agreement, Schedule 2, Section III, B.1 (e): Notwithstanding the provisions of Part A above, no withdrawal shall be made under Category (4), in addition to the conditions set out in Section III.B.1.(d) of this Schedule above as applicable, until and unless the Recipient has engaged an independent verification agent, with terms of reference, qualifications and experience satisfactory to the Association, in accordance with Section I.D.7.(b) of this Schedule
Type	Financing source	Description
Disbursement	IBRD/IDA	Financing Agreement, Schedule 2, Section III, B.1 (d): Notwithstanding the provisions of Part A above, no withdrawal shall be made under Category (3), until and unless the Recipient has: (i) caused SNE-PIU to adopt the SNE Project Implementation Manual in form and substance satisfactory to the Association and in accordance with Section I.C.3 of Schedule 2 to this Agreement; and

		(ii) delegated to SNE-PIU, through a memorandum of understanding, the authority, under terms and conditions and in form and substance acceptable to the Association, to carry out activities covered in this Category (3)

I. STRATEGIC CONTEXT

A. Country Context

1. **Chad is a low-income, fragile country with substantial and multifaceted development challenges.** It is one of the poorest and least developed countries in the world, ranking 187 out of 189 countries and territories with respect to human development.[1] Chad's gross national income per capita in 2020 was US$660 (177th place according to the Atlas methodology) and US$1,500 (178th rank in terms of purchasing power parity).[2] The population of Chad exceeded 16 million people in 2020, out of which about 42 percent live below the national poverty line of CFAF 242,094 per year, or less than US$1.2 per day. More than three-fourth of the Chad population live in rural areas, and about nine-tenth of the country's poor are in rural areas. Chad faces a difficult geographical and geopolitical environment; it is the fifth largest country in Africa, landlocked and crossed by the Sahara, and it is prone to climate risks. The security and humanitarian situations are challenging given the security tensions along the border areas and serious threats from non-state armed groups, particularly in the Lake Chad region.

2. **Chad's economic recovery was hampered by COVID-19 and security risks.** The COVID-19 pandemic has significantly disrupted Chad's economic recovery, which started in 2018. Chad entered into recession in 2020 as the economy contracted by 0.9 percent. Both the fiscal and current account balances deteriorated substantially, and difficulties in financing the fiscal deficit may have led to further domestic arrears' buildup. The pandemic has highlighted Chad's oil dependence and vulnerability to multiple and often concurrent shocks. The passing of the Chad President in April 2021 deepened the slowdown in economic activity in the second quarter of 2021, as the new authorities shifted public resources from critical investments toward the political transition and security-related spending to curb sociopolitical tensions. Economic growth is projected to gradually rise, due to the recovery in global oil markets, international trade, and economic activity in agriculture and industry. Chad experienced another year of recession, as the economy contracted by 1.2 percent in 2021 (-4.1 percent in per capita terms), after the 2020 growth contraction of 1.6 percent, due to political and security developments and a two-month suspension of oil production in Esso plants, accounting for one-fourth of the total oil production in Chad.

3. **Security risks originating in neighboring countries have persistently destabilized the regional economy and created a situation of acute humanitarian needs and large refugee inflows into Chad.** Over the past 25 years, the number of refugees in Chad continued to grow, and many refugees have been in the country for more than a decade. By December 2021, the United Nations High Commissioner for Refugees (UNHCR) data indicated that Chad was hosting 560,000 refugees and asylum seekers, accounting for more than 3 percent of the population in the country.[3] Most of the refugees are housed in 20 refugee camps across nine provinces of Chad. In addition, more than 406,000 internally displaced persons (IDPs) reside in the Lake Chad area. Details on refugees and host communities are provided in annex 2.

4. **Chad made good progress in establishing a framework to protect refugees.** The UNHCR baseline Refugee Protection Assessment (RPA) and the updated RPA as of February 20, 2022, mentioned areas where the Government of Chad (GoC) has demonstrated an openness to improve refugee protection.

[1] *http://hdr.undp.org/sites/default/files/hdr2019.pdf*
[2] *https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=TD*
[3] UNHCR data as of December 31, 2021. *https://data2.unhcr.org/en/country/tcd,* accessed on January 21, 2022.

These mainly relate to the Global Refugees Forum policy pledges on the inclusion of refugees in sectorial plans, the out-of-camp approach, the transition from refugee camps to village structures, the issuance of ID cards and travel documents, the support for voluntary repatriation to countries of origin, and the adoption of a draft national Asylum Law and domestication of the Kampala Convention. On December 23, 2020, the GoC adopted its first ever national Asylum Law. It ensures refugees and asylum seekers fundamental protection and enjoyment of rights, including freedom of movement; the right to work; and access to health care, education, and justice. The law conforms to international standards enshrined in the 1951 Refugee Convention and its protocol and the 1969 OAU[4] Convention on Refugees. The passage of this law marks an important step in Chad's commitment to its Global Refugees Forum pledge to strengthen the legal, physical, and material protection of refugees and asylum seekers.

5. **Chad continues to meet the eligibility criteria for the IDA19 Window for Host Communities and Refugees (WHR),** which includes the following: (a) the number of UNHCR registered refugees it hosts, including persons in refugee-like situations, is at least 25,000 or at least 0.1 percent of the country's population; (b) there is adherence to an adequate protection framework for refugees; and (c) a strategy for long-term solutions is in place that benefits refugees and host communities. Chad's eligibility was originally confirmed in September 2017 and was reconfirmed under IDA19 in September 2020, with the approval of the Additional Financing to the Refugees and Host Communities Support Project (P164748).

6. **The World Bank, following consultations with UNHCR, confirms that the protection framework for refugees is adequate in Chad (UNHCR update of August 8, 2021).** It has an adequate institutional and monitoring framework to ensure the implementation of the refugee protection framework,[5] including (a) a dedicated agency, National Commission for Reception and Reintegration of Refugee and Returnees (*Commission Nationale d'Accueil de Réinsertion des Réfugies,* CNARR) set up within the GoC to manage refugee protection; (b) an action plan to implement a Comprehensive Refugee Response Framework; (c) a ministerial-level high committee integrating representatives of all sectors contributing to the refugee agenda; and (d) the Asylum Law enacted in December 2020. In 2020–2021, a reduction of food assistance in some refugee camps and the COVID-19 restrictions temporarily heightened protection risks and access to socioeconomic services but these have since been reduced or mitigated.

7. **In terms of gender equality, Chad ranks 147 out of 153 countries for the Global Gender Gap Index and 187 out of 189 for the Gender Inequality Index with significantly worsening trends in the past few years.**[6] Women are disadvantaged for productive activities due to limited agency, access to resources, and employment opportunities as well as high fertility rates that can exacerbate these challenges. In addition, female-headed households are on average more likely to be poorer than male-headed ones, with 39.2 percent of female-headed households in the bottom wealth quintile, compared to 21.2 percent of those headed by males, which also affects their opportunities to access electricity, with an apparent gap favoring male-headed households nationwide. Chad's gender gap analysis is provided in annex 3.

8. **While Chad has low greenhouse gas (GHG) emissions, it is highly vulnerable to the impacts of climate change.** It accounts for 0.21 percent of global emissions but is ranked 179 out of 188 countries in terms of its vulnerability to climate change impact.[7] Mean annual temperature projections indicate

[4] OAU = Organisation of African Unity.
[5] See annex 2 for details.
[6] Human Development Report: *http://hdr.undp.org/sites/default/files/hdr2020.pdf*
[7] Notre Dame Global Adaptation Initiative Country Index: *https://gain.nd.edu/our-work/country-index/rankings/*

increases of over a 2°C by mid-21st century. Projections for mean annual precipitation indicate increases in precipitation over Chad throughout the 21st century.[8] As detailed in annex 3, the climate and disaster risk screening indicates that Chad is at a high risk from river flood, urban flood, water scarcity, extreme heat, and wildfires.[9]

B. Sectoral and Institutional Context

9. **Chad is a global outlier in terms of energy access.** Despite the endowment of fossil fuels and excellent solar resources, Chad has among the lowest electricity access rates in the world at 6.4 percent (against a Sub-Saharan Africa average of 48 percent). Lack of electricity undermines the prospects of economic development and badly affects living standards. Many locations are also facing energy shortages with respect to fuel for cooking. This is particularly acute in the North-East region of Chad—an arid semidesert zone with limited biomass resources—that hosts more than two-thirds of refugees.

10. **Electricity access is mostly limited to cities.** The national power grid comprises city-based systems that are not interconnected, which has not supported electrification outside these cities and left most of the country without access to electricity. Therefore, there are significant disparities in electricity access between urban and rural areas (20 percent and less than 1 percent, respectively).[10] Electricity access in locations without power grid is limited to a small number of customers, who can afford the prohibitively high cost of electricity from individual diesel generators that often exceed US$0.5 per kWh. The rest of the population—more than 90 percent of the people—face acute and chronic energy deprivation and are forced to use expensive and polluting solutions—candles, kerosene lamps, and flashlights—to get some lighting as well as spend time and incur high cost when charging phones in often remote locations.

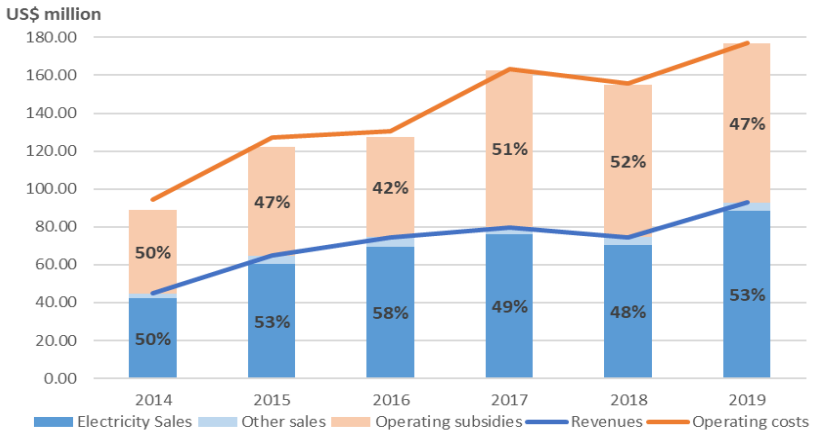
11. **Electricity access in cities with power grids is limited and unreliable.** The power system in the capital city of N'Djamena has by far the biggest capacity—of about 150 MW. Total installed capacity in a dozen of secondary cities is about 25 MW. Power systems in N'Djamena and 12 secondary cities are operated by the National Electricity Company (*Société Nationale de l'Electricité*, SNE). Power systems in a few cities are operated by a local private company. All existing power systems provide electricity access to only a fraction of customers—about one-third in N'Djamena and less than one-tenth in the secondary cities. Due to the financial distress of SNE, electricity service provision has been unreliable, with frequent and often prolonged cuts in supply, even in N'Djamena.

12. **Fundamental issues facing the national power utility badly affected its ability to increase electricity access in Chad in the past decade.** SNE has been operating at loss since its establishment in 2011 because of a series of issues that can be found in many electricity utilities in the region and beyond but in the case of Chad have particularly been acute. These include (a) a deficient framework governing the relations between the state and SNE; (b) inadequate tariffs, ranging from CFAF 85 per kWh (US$0.15 per kWh) to CFAF 125 per kWh (US$0.22 per kWh); (c) high electricity production costs (estimated on average at US$0.22 per kWh), with all the electricity coming from expensive and polluting diesel/heavy fuel oil plants; (d) high technical and commercial losses (of about 40 percent); and (e) low collections of electricity payments from customers (of only about 50 percent).

[8] *https://climateknowledgeportal.worldbank.org/country/chad/climate-data-projections*
[9] *https://thinkhazard.org/en/report/50-chad*
[10] According to the National Electricity Emergency Plan (NEEP) approved by the GoC in July 2020.

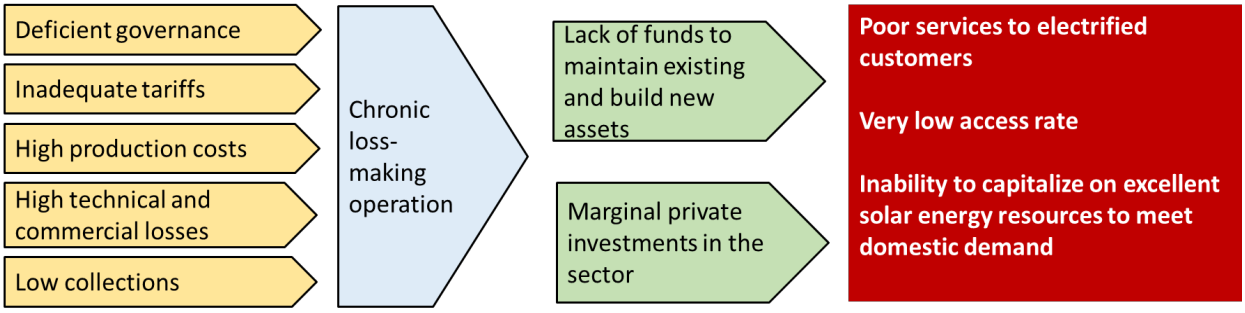
13. **With revenues well below costs and reliance on the central budget to cover a considerable share of operating costs, SNE faces chronic cash shortages and is not able to maintain its assets, let alone invest in grid expansion.** SNE increasingly relies on support from the GoC, in the form of an in-kind subsidy (fuel to the power stations), which imposes a considerable burden on the fiscal budget. The subsidies totaled US$84 million in 2019 (0.8 percent of the national gross domestic product [GDP]) and effectively translated into a subsidy per customer close to US$1,000 per year. Despite significant recurrent public subsidies, SNE faces chronic cash shortages. Public entities and a number of other categories of customers were released by the state (often implicitly) from the obligation to pay for electricity. This, together with deficient commercial practices, stripped SNE of cash and caused the accumulation of payables and receivables that now exceed SNE's annual revenue. As a result, SNE has not been in a position to properly maintain its assets or invest in access expansion. The persistent loss-making operation of SNE also badly affected private sector appetite to invest in power generation and sell electricity to SNE. Figure 2 summarizes the main issues faced by SNE that prevented the company from increasing electricity access in the past decade.

Figure 1. SNE's Cost-Revenue Gap during 2014–19



Source: Word Bank analysis based on SNE data.

Figure 2. Issues Affecting SNE's Ability to Increase Access



14. **Private sector-led electrification has not developed in Chad.** In many countries in Africa and worldwide, the private sector has played an increasingly important role in electrification in the past decade, made possible thanks to the substantial reductions in costs of solar photovoltaic (PV) and battery storage. This in turn created a vibrant market for stand-alone solar systems (SSSs) and hybrid mini-grids with the growing share of solar PV and storage for electricity generation. In addition to technological advances and economies of scale that enabled cost reductions, many countries developed policies and

regulations to support private sector participation, particularly in mini-grids. Also, countries mobilized funds, often with the help of international financial institutions, to provide affordability gap subsidies to private developers of mini-grids and suppliers of SSSs to make these electricity solutions affordable to the population. Unfortunately, Chad did not benefit from these opportunities and its market for mini-grids and SSSs remain undeveloped. Off-grid solar (OGS) suppliers in Chad have a narrow geographical coverage and relatively poor supply chains and distribution networks, preventing them from scaling up their business, let alone reaching customers in remote areas. The solar market is dominated by counterfeit and low-quality products that spoil the market and consumer sentiment. When available, high-quality solar energy products are expensive and unaffordable for the majority of end users, including both productive uses and households.

15. **The Government recognized the importance of electricity for economic development and implemented several important policy actions in the past years.** In July 2020, the GoC approved the National Electricity Emergency Plan (NEEP) that sets an ambitious objective of achieving a 53 percent access rate by 2030. In addition, the Electricity Law was enacted in August 2019, which liberalized the power sector, with notional unbundling of generation, transmission, and distribution, with the objective of promoting private sector participation in both generation and distribution segments. Also, the law created the Electricity Sector Regulatory Agency (*Agence de Régulation du Secteur de l'Electricité*, ARSE) and expanded the mandate of the Rural Electrification, Energy Efficiency, and Renewable Energy Agency (*Agence de Développement de l'Électrification Rurale et de la Maîtrise de l'Énergie*, ADERM).

16. **The World Bank's support to the Chad energy sector has significantly grown since 2018.** The World Bank reengaged in the sector in 2018 after more than a decade. A Power Sector Note prepared in 2018 looked at the main issues facing the sector, identified options, developed recommendations, and shaped a World Bank Group (WBG) strategy aiming at (a) boosting energy access; (b) improving the operational and financial viability of SNE; (c) developing sector policies and institutions; and (d) promoting regional power trade. The strategy is implemented through a combination of investment projects and a technical assistance (TA) and capacity-building program, as elaborated in the following paragraphs.

17. **The ongoing Cameroon-Chad Power Interconnection Project (CCPIP, P168185) of US$385 million, including an IDA grant of US$90 million to Chad,** will (a) enable affordable electricity imports from southern Cameroon to lower costs of electricity and green energy mix in Chad; (b) eventually enable electricity trade from Chad to northern Cameroon; (c) strengthen and expand the power distribution grid in N'Djamena to increase the number of connections, improve reliability of supply, and increase SNE's customer base; (d) improve the operational and commercial performance of SNE; and (e) provide power access to locations along the high-voltage power transmission line from Cameroon-Chad border to N'Djamena. The power interconnector between the two countries and the transmission infrastructure on the Cameroon side are expected to become operational by the end of 2027.

18. **The Regional Off-Grid Electricity Access Project (P160708)**, approved by the World Bank in 2019, provides support to 19 countries, including Chad. The project is leveraging the regional economies of scale and harmonizing policies and standards as well as business procedures to develop a regional market of stand-alone solar products and crowd in private investments.

19. **An ongoing TA program[11] supports critical energy sector reforms aimed at attracting private investments and ensuring reliable, sustainable, and affordable energy supply.** Two main issues facing private sector participation, in the form of independent power producers (IPPs), are incomplete legal status and financial insolvency of SNE. To address the legal status issue, power sector assets that used to be on the balance of an SNE predecessor will be transferred to the SNE balance sheet by the middle of 2022. The SNE financing situation will be enhanced by implementing a revenue protection program at SNE. The first phase of the program, which is planned to be implemented by the middle of 2023, will focus on ensuring electricity payment collections from the 2,000 largest customers that account for more than 60 percent of the SNE revenue. Subsequently, the second phase will improve metering, billing, and payment collections from the mass market that is responsible for the remaining 40 percent of the SNE revenue. Another TA support area that aims to improve SNE's financial viability is a reduction in cost of power generation by replacing the existing practice of unsolicited proposals with competitive procurement of new power generation capacity. Furthermore, TA will strengthen capacity of the energy regulator (ARSE) and support it in further developing a regulatory framework, including service-level, technical requirements, tariff levels, for SNE and private mini-grids. In addition, TA supports the development of a performance contract between the GoC and SNE to delineate their respective roles and responsibilities that should improve SNE operational and financial performance. These activities will help put SNE on a recovery path.

20. **The WBG's strategy to support energy access in Chad pursues a two-pronged approach: (a) off-grid electrification driven by the private sector to promptly boost access and (b) national grid-based electrification by SNE that is strategically important but will take time to materialize.** In the past, it was virtually impossible to sustainably increase energy access without addressing basic issues concerning sector institutions, policies, and regulations. These fundamentals are still valid and essential for national grid-based access and regional power trade and are supported by the WBG in Chad as outlined in the preceding paragraphs. However, international experience, including in Africa, shows that it takes significant time and effort to address sector systemic issues required for sustainable electricity supply and electrification by the national power utility, as well as regional power trade. At the same time, private sector-led off-grid electrification, and notably via SSS, which have seen a rapid development in the past decade worldwide and especially in Africa, offers an excellent opportunity to rapidly advance the access agenda despite systemic issues facing the Chad power sector and SNE in particular. The WBG energy access strategy in Chad capitalizes on this opportunity and places high importance on private sector-led off-grid electrification to efficiently achieve results on the ground and help the country meet its ambitious electricity access target of 53 percent by 2030.

21. **The proposed Chad Energy Access Scale Up Project (CEASP) aims to boost access from about 6 percent today to 30 percent or about 1 million households by 2027, mostly by the private sector.** The project design was informed by the preliminary outcomes of the ongoing national electrification analysis for Chad that prioritizes isolated power systems/mini-grids for cities and SSSs for rural areas through 2027. In addition, sectoral issues and SNE constraints and challenges were considered. SNE will only be fully in charge of expanding access in N'Djamena and delegate the expansion and operation and maintenance (O&M) of power systems in 12 secondary cities to the private sector. Collectively, 100,000 customers or less than 10 percent of the project access objective are targeted through these interventions by or with

[11] Supporting reform and investment to expand access to affordable and financially viable energy Advisory Services and Analytics (P174985).

the participation of SNE. Electricity access to the remaining households, exceeding 90 percent of the project access target, will be driven by the private sector that will operate independently from SNE. The project will maximize the role of the private sector and enable its participation through affordability gap subsidies in support of electrification via SSS, isolated power systems, and mini-grids that in addition to households will provide access to productive uses, businesses, and public entities. The project is expected to mobilize US$100 million of private capital.

22. **The project will place special attention on alleviating energy deprivation of refugees and host communities.** Refugee and host communities in Chad face severe energy shortages with respect to both electricity and fuel for cooking. The latter is a major challenge, and the consumption of firewood is a driver of environmental degradation and a major source of protection risk, especially for women and children, accounting for 55 percent of refugees, who are mostly tasked with gathering firewood. Shortage of fuel for cooking causes competition for these resources and tensions between refugees and nearby host communities. The project aims to provide electricity access to about 400,000 refugees from 20 refugee camps and 740,000 Chadians who live within 25 km from a refugee camp.[12] Interventions on clean cooking and natural resource management will target about 370,000 people from refugee camps and host community locations. Proposed interventions to alleviate energy deprivation of refugees and host communities were informed, among others, by the outcomes of the study 'Refugees in Chad: The Road Forward'.[13] Further details on the refugee and host community population and related project activities can be found in Section II (Project Description) and annex 2.

C. Relationship to CPF and Relevance to Higher-Level Objectives

23. **The project is aligned with the WBG's Country Partnership Framework (CPF) for the Republic of Chad for the period of FY16–20**[14] **as well as the WBG's Country Engagement Note (CEN) for the period of FY23--FY24 under preparation.** The CPF recognizes the importance of the energy sector as part of Engagement Theme 1 focused on strengthening the management of public resources, which includes the energy sector while the CEN envisages investment in energy sector under Focus Area 3 (Resilient Productivity and Connectivity) to address of the greatest binding constraint to Chad's growth and broader economic activity. In addition, the project is expected to support Chad to align with the Next Generation Africa Climate Business Plan, which provides a blueprint to help Sub-Saharan African economies achieve low-carbon and climate-resilient outcomes.

24. **The project will support the implementation of Chad's long-term development strategy 'Vision 2030: *Le Tchad que nous voulons*'.** Given the important role of electricity access in improving people's quality of life, the project will support the implementation of the strategy that is implemented through consecutive five-year development plans. The strategy aims to improve the quality of life of Chadians by developing human and social capital, social protection, and economic empowerment. In addition, by increasing access solely through renewable solar energy, the project will help Chad meet its Initial Nationally Determined Contributions, which sets Chad's unconditional mitigation goal of reducing GHG emissions by 18.2 percent by 2030 (41,700 $GtCO_2e$ based on a reference year of 2010) and a conditional mitigation goal of reducing GHG reductions by 71 percent by 2030 (162,000 $GtCO_2e$).

[12] The criterion of 25 km is replicated from the ongoing Refugees and Host Communities Support Project (*Projet d'Appui aux Réfugiés et aux Communautés d'Accueil* [PARCA]; P164748), with which the project in question will build synergies.
[13] *http://pubdocs.worldbank.org/en/689221633557476771/Refugees-in-Chad-The-Road-Forward*
[14] Report No. 95277-TD, discussed by the Board of Executive Directors on December 10, 2015.

25. **The project supports the World Bank's engagement under the energy pillar of the Sahel Alliance initiative by supporting economic development to combat poverty and fragility.** The initiative aims to support green economic and resilient recovery from the COVID-19 crisis, catalyze growth by mainstreaming productive-use interventions, and improve resilience to future shocks. In this context, the World Bank adheres to the following Alliance targets in the energy space for 2023: (a) double the rate of access to electricity, an intermediate objective aimed at ultimately achieving universal access by 2030 as envisaged by Sustainable Development Goal 7 and (b) double the renewable energy generation capacity. As the project is expected to mobilize significant private investments in solar-based energy, it will directly support the GoC's objective of increasing the share of renewable energy in electricity production from 1 percent today to 20 percent by 2030.[15] The project will also send the right signal to leverage financings from other donors to accelerate access to electricity in Chad. The World Bank is playing a key role in ensuring coordinated actions by energy sector donors[16] to avoid duplication and build synergies. The proposed project will be an important contributor to the priorities identified in the WBG's 'COVID-19 Crisis Response Approach Paper: Saving Lives, Scaling-up Impact and Getting Back on Track', particularly its pillar of 'Strengthening Policies, Institutions and Investments for Rebuilding Better' by embedding the post-COVID-19 recovery principles. The project also supports private sector participation and the World Bank's climate change agenda. As such, the operation will strengthen the energy sector, provide electricity to households and businesses, and contribute to human capital development and protection with the electrification of public institutions; productive uses of energy (PUEs) and empowerment of women; and improved livelihoods for the most vulnerable poor, including refugees and IDPs.

26. **The project will support implementation of the government policy aiming to help refugees and host communities.** In addition to Chad's great strides in establishing the institutional and legal framework in support of the refugee agenda, the GoC made pledges at the Global Refugee Forum, held in December 2019, to promote the use of solar energy for refugees and host communities and use solar for all existing and new infrastructure in areas hosting refugees and other displaced persons. The project will reinforce the implementation of the policy by alleviating energy deprivation of refugees and host communities.

27. **The project is well aligned with the GoC Action Plan under the Prevention and Resilience Allocation (PRA).** In particular, it supports key strategic objectives that the GoC intends to focus on in the coming three years around increasing access to basic services such as electricity (Objective 3) and preventing conflicts linked to the governance of natural resources (Objective 4) both with a focus on peripheral, conflict-affected, and at-risk regions. More generally, reinforcing a positive state presence and the social contract as well as addressing regional imbalances and social exclusion are key recommended areas of intervention from the Chad Risk and Resilience Assessment (RRA), where the project could make a positive contribution. Dedicated investments in refugee-hosting areas that are among the most fragile and peripheral parts of the country are of particular relevance from that perspective.

[15] The target of 20 percent is set in the NEEP.

[16] Other donors investing in the energy sector in Chad include the French Development Agency (*Agence Française de Développement*), the African Development Bank, the European Union, the European Investment Bank, West African Development Bank, Islamic Development Bank, Abu Dhabi Fund for Development, International Renewable Energy Agency, and the Arab Bank for Economic Development in Africa.

28. **The project is also well aligned with the goal of the WBG Strategy for Fragility, Conflict, and Violence, 2020–25.**[17] Activities will address the unique needs of the refugees and their host communities particularly by (a) strengthening the focus on the socioeconomic dimension for both the refugees and their hosts; (b) focusing on key areas for medium-term success, especially jobs and education; and (c) closing gender gaps by empowering women and girls. The strategy recognizes that the private sector lies at the center of a sustainable development model in the context of fragility, and the project purposefully supports private sector development for commercially viable private sector service delivery in the fragile contexts of displacement. In addition, the project responds to the strategy's requirements to systematize partnerships with humanitarian, development, security, and peace-building actors at the country level by drawing on the WBG's comparative advantage as a development actor, enhancing the impact of operations on the ground, and ensuring effective implementation arrangements with third parties as needed.

29. **The project is contributing to the WBG Gender Strategy.** The project will include targeted interventions to improve access to electricity for female-headed households and female-led enterprises and access of women to clean cooking solutions including in refugee camps, promote women entrepreneurship and employment opportunities, and build awareness relevant to women and girls around energy services.

II. PROJECT DESCRIPTION

A. Project Development Objective (PDO)

PDO Statement

30. The PDO is to increase access to electricity and clean cooking in Chad.

PDO-Level Indicators

31. PDO-level indicators include
    (a) People provided with access to new or improved electricity service (Corporate Results Indicator, number), out of which
        (i) Women (number);
        (ii) Refugees (number); and
        (iii) Host communities (number).
    (b) People provided with access to clean cooking (number), out of which
        (i) Refugees (number); and
        (ii) Host communities (number).

B. Project Components

32. The project comprises five components. Table 1 summarizes the five components, IDA financing, and anticipated division of labor between the public and private sectors.

[17] *https://documents.worldbank.org/en/publication/documents-reports/documentdetail/844591582815510521/world-bank-group-strategy-for-fragility-conflict-and-violence-2020-2025*

Table 1. Project at a Glance

No.	Components	IDA (US$, millions)	IDA WHR (US$, millions)	Private Sector Financing (US$, millions)	Public Sector Role	Private Sector Role
1	**Electrification via grids**	**150**	**15**	**65**		
1.1	Expanding electricity access in N'Djamena	50	—	15	Financing of distribution facilities and some battery storage	Financing and O&M of solar PV and battery storage
1.2	Expanding electricity access in 12 secondary cities	55	—	15	Financing of distribution facilities and some battery storage	Financing of solar PV and storage, O&M of power generation and distribution facilities
1.3	Electrification of additional secondary cities and towns	45	15	35	Financing of CAPEX/affordability gap subsidies	Financing and O&M of power generation and distribution facilities
2	**Electrification via SSS**	**71**	**22**	**34.5**		
2.1	Electricity access for productive uses and households	50	15	34.5	Financing of affordability gap subsidies	Financing and supply and installation (S&I) of solar PV and storage, supply and sale of solar home systems (SHSs), after-sale service
2.2	Electrification of public entities	21	7	—	Financing of solar PV and storage facilities	S&I of solar PV and battery storage and after-sale service
3	**Clean cooking and natural resource management**	**—**	**20**	0.5	Financing of studies and pilots, affordability gap subsidies for clean cookstove, and natural resource management activities	Financing and S&I of clean cookstoves, after-sale service
4	**Project management and technical assistance**	**14**	**3**	—	Financing of project management and TA	Administrating select project activities
5	**Contingent emergency response component (CERC)**	—	—	—	Financing of CERC	Implementing select activities under CERC
	Total	**235**	**60**	**100**		

Note: CAPEX = Capital expenditures.

33. **Component 1: Electrification via grids (IDA: US$150 million equivalent; IDA WHR: US$15 million equivalent; private sector financing: US$65 million equivalent).** This component will support the continued electrification of N'Djamena and 12 secondary cities,[18] as well as provide electricity access to additional secondary cities and towns, including cities in the vicinity of refugee camps.

[18] A map showing N'Djamena and the 12 cities is provided in annex 7.

34. **Subcomponent 1.1: Expanding electricity access in N'Djamena (IDA: US$50 million; private sector financing: US$15 million).** This subcomponent will provide financing to substantially increase electricity access in the capital city of Chad through public investments in the distribution facilities and supporting private investments in power generation capacity. Most of the funds will be directed to densification and expansion of the N'Djamena grid with the objective to connect about 50,000 new customers. This, together with 20,000 new connections that are planned under the ongoing CCPIP, should double electricity access in N'Djamena that is currently provided to only one-third of the city. Investments will be determined by studies that will be implemented by the Owner's Engineer that is contracted under the CCPIP. The Owner's Engineer will support SNE in implementing grid investments that are financed by both the CCPIP and this project. Female-headed households will be prioritized with respect to electricity access in line with related actions of the CCPIP to narrow existing gender gaps.

35. The existing generation capacity of about 150 MW, all thermal, is barely sufficient to meet the current demand, let alone the substantial increases in demand from the planned increase in the number of connections in the next years. Based on preliminary results of a high-level least-cost development plan for the N'Djamena grid, most of the additional capacity for the N'Djamena system should come in the form of solar PV and battery storage. There are several solar PV and storage utility scale IPPs at various stages of development, including Djermaya (28 MW) and Quadran (30 MW) projects supported by the African Development Bank under the Desert to Power program.[19] Also, containerized solar PV and storage projects (of 10–15 MW) that can rapidly be deployed are considered by SNE, including the ones supported by the International Finance Corporation (IFC). Additional privately financed IPPs that will be required to meet the increased demand in N'Djamena could be supported by financing and guarantee instruments from the IFC and the Multilateral Investment Guarantee Agency (MIGA), depending on the risk allocation structure and sector reforms, which will help make SNE an acceptable off-taker for IPPs and implement non-recourse project financing. An amount of US$10 million under this subcomponent is tentatively allocated to finance battery storage capacity, to reduce the cost of solar-based power generation financed by the private sector and accelerate the penetration of renewable energy, and for greening the N'Djamena power grid.[20]

36. **Subcomponent 1.2: Expanding electricity access in 12 secondary cities (IDA grant: US$55 million; private sector financing: US$15 million).** This subcomponent will provide financing to boost electrification in 12 secondary cities of Chad hosting about 950,000 people. These cities have small, isolated power systems, operated by SNE. The systems cover only a fraction of the demand due to limited generation capacity (10 MW available versus 29 MW installed, all thermal) and small distribution networks that serve in total about 22,000 customers. The subcomponent will connect an additional 50,000 customers in the cities. SNE will retain ownership of the existing assets and the legal status of electricity service providers in the cities. However, the private sector will be involved in both power generation and distribution through a contractual relationship with the GoC/SNE. The private sector may hold two contracts (one for generation power purchase agreement [PPA] and one for distribution) or one for the whole mini-grid (such as a concession or a franchise).

[19] *https://www.afdb.org/en/topics-and-sectors/initiatives-partnerships/desert-power-initiative*

[20] The *Plan d'Urgence d'Accès a l'Electricité* 2021–2023, which includes a target of 20 percent for the share of renewables by 2030 and preliminary results of a dispatch model that forecasts economic investment and dispatch up to 2030 for the N'Djamena grid, shows a significant potential to reduce fuel generation toward solar PV and battery and hence increase the share of renewable energy to close to 70 percent by 2030.

37. Rehabilitation of the existing thermal power generation units (as needed) and construction of new solar PV and storage capacity will be tendered out to the private sector that will finance investments and subsequently operate the power generation assets and possibly sell electricity through PPA to SNE (or, depending on the final contractual arrangements chosen, sell electricity directly to the users). Rehabilitation of existing and construction of new distribution facilities (to the amount of US$40 million) and battery storage (to the amount of US$15 million) will be financed by the subcomponent. Rehabilitation and construction works will be combined with O&M of distribution facilities under a single package that will be competitively procured from the private sector. For spreading risk and benchmarking, tendering for the 12 cities will be divided into two lots. Each lot will comprise a power generation IPP package and a construction and O&M package for distribution facilities. A private operator can bid for a single lot or a package or both of them. As some of the cities are close to petroleum gas flaring sites, including in Moundou and Doba, the benefits and implications of using flared gas to produce electricity will be considered as part of the climate agenda. Private sector investments in power generation and distribution could be supported by financing and guarantee instruments from IFC and MIGA depending on the final business model, risk allocation structure, and sector reforms and, as such, IFC and MIGA have expressed interest in leveraging their experience in similar jurisdictions and supporting the design of the business model and the overall de-risking strategy for the projects.

38. **Subcomponent 1.3: Electrification of additional secondary cities and towns (IDA: US$45 million; IDA WHR: US$15 million; private sector financing: US$35 million).** This subcomponent will provide financing to electrify additional secondary cities via isolated power systems and nearby towns via mini-grids.[21] These include cities[22] and towns located within 25 km from refugee camps; electrification of these urban settlements will be funded from IDA WHR. The subcomponent will provide connections to 55,000 customers, including 15,000 customers in host communities. The private sector will be invited to finance CAPEX in power generation and distribution and subsequently operate and maintain them. All power systems will mostly be energized through solar PV and battery storage, with a backup diesel generation accounting for less than 10 percent in the energy mix.

39. For tendering, the GoC will delineate geographical areas (or lots), comprising cities selected by the GoC for electrification and surrounding departments where the winning bidder will have the option to identify and implement mini-grids. The geographical areas will be selected based on objective economic criteria while focusing also on peripheral, border, and fragile areas in line with the PRA. Mini-grid developers will also take into account the outcomes of a social analysis, to be provided by the GoC, to ensure that marginalized populations in each area can benefit from the investments and that these do not increase any preexisting intracommunal tension. Several lots will be grouped for tendering to have the scale attractive for reputable private sector operators. To make electricity tariffs more affordable, the subcomponent will co-finance CAPEX through competitively provided mechanisms, such as results-based financing (RBF)[23] subsidies for CAPEX.

[21] For this project, mini-grids are defined as power systems with capacity under 0.5 MW.
[22] A list of cities located within 25 km from the project-targeted refugee camps is provided in annex 1.
[23] RBF is an umbrella term referring to a program or an intervention that provides rewards to individuals or institutions after agreed-upon results are achieved and verified. Under the project, RBF subsidies/grants are project payments against well-defined results, such as energized connections in the case of grid-based electrification and SHSs sold and in use in the case of off-grid electrification. The payment of RBF subsidies is made after an independent verification agent verifies and confirms the electrification results reported by the private sector.

40. Private sector participation in Subcomponent 1.3 will be supported by IFC and MIGA under the WBG program 'Scaling Mini-Grids' (SMG). The program offers a 'turnkey' solution to governments for the rapid deployment of private sector-led mini-grids at scale by combining relevant WBG financing and guarantee instruments under a single engagement. The GoC will sign an agreement with IFC so that IFC's Transaction Advisory Department (CTA) could act as a transaction adviser supporting the GoC in deploying the SMG program in Chad. IFC CTA will work alongside IDA starting with co-financing and supervising project preparation studies covering technical, economic, environmental, social, and legal aspects. IFC CTA will also assist the GoC in adapting the SMG templates to the specifics of Chad and carrying out the SMG tender with the aim of allowing the provision of financing and guarantee offers from IFC and MIGA as part of the tender—ultimately aimed at reinforcing certainty, speed, and competition of the mini-grid PPP projects. To accelerate implementation of this subcomponent, studies are expected to be initiated well before project effectiveness, upon signing the agreement between the GoC and IFC CTA.

41. MIGA's suite of non-commercial risk mitigation solutions (for example, Breach of Contract, Expropriation, Currency Inconvertibility and Transfer Restriction, and War and Civil Disturbance) could be deployed to facilitate foreign private sector investment in all three subcomponents. MIGA's War and Civil Disturbance coverage, in particular, can address certain risks associated with the challenging local operating environment by protecting investors against losses arising because of military action or civil disturbance, including sabotage and terrorism, which destroys or damages tangible assets of the project or interferes with its operations (business interruption).

42. To enhance the sustainability of project investments, all power sector assets financed or supported by the component will need to meet design specifications and requirements with respect to climate change risks.

43. In support of gender equality and to narrow existing gaps in employment opportunities for women, SNE and all private operators of power grids will be required to employ at least 20 percent of women in O&M activities, as well as during construction subject to the available expertise.

44. **Component 2: Electrification via SSS (IDA: US$71 million equivalent; IDA WHR: US$22 million equivalent; private sector financing: US$34.5 million equivalent).** The component will provide electricity access for productive uses, public entities, and households, including the areas housing refugees and host communities with a focus on rural and peri-urban areas that will unlikely be electrified through grids during this decade.

45. **Subcomponent 2.1: Electricity access for productive uses and households (IDA: US$50 million; IDA WHR: US$15 million; private sector financing: US$34.5 million).** This subcomponent will support income-generation activities by providing electricity access and equipment for productive uses. Given that 75 percent of the Chad population live in rural areas and most of them are involved in farming, the subcomponent will prioritize support for solar water pumps and solar-powered equipment for agriculture processing and storage. Another focus area is the strengthening of existing micro and small businesses and the creation of new ones by providing solar energy and productive-use equipment. The business model selected for this subcomponent is based on pay-as-you-go (PAYGO), supported by RBF subsidies to make monthly PAYGO payments affordable. The RBF subsidies will be paid to the supplier upon verification by an independent verification agent. It will be accompanied by awareness raising and capacity building to create demand and actions targeted specifically for women-led businesses. Options

for bulk procurement, for instance of popular-size solar water pumps, will be explored to reduce costs through economies of scale. Furthermore, the subcomponent will support related awareness-raising activities and technical assistance for the adoption of technical standards.

46. In addition, the subcomponent will provide financing to electrify about 1,000,000 households, including about 200,000 households residing in refugee camps and host communities and with targeted actions to support female-headed ones. The project design is informed by the outcomes of the Survey on Expenditure of Households and Informal Sector in Chad (*Enquête sur la Consommation des Ménages et le Secteur Informel au Tchad* [ECOSIT 4] 2019) and a survey on ability and willingness of rural households to pay for electricity services, conducted in three provinces of Chad in the first half of 2021.[24] The outcomes include the following information: (a) 70 percent of the rural population and 27 percent of the urban population have financial constraints to spend more than US$10 per month for electricity;[25] (b) about 70 percent of rural households are interested in acquiring Tier 1 SHSs, assuming that these are of good quality and can be made available at the price equivalent to up to three months of household expenditures on lighting and phone charging, that is about CFAF 10,000 (US$17.4 equivalent).

47. In an effort to kick-start the market and discover market prices, the first intervention will be organized in the form of bulk procurement of up to 200,000 Tier 1 SHSs, split into several lots to attract reputable suppliers to the Chad SHS market. These SHSs will be sold in cash with the cost split between households and the project, in line with the outcomes of the survey referred to in the preceding paragraph. Project co-financing of SHSs will be in the form of an RBF subsidy per SHS paid to the supplier upon verification by an independent verification agent. Efforts will be made to find an effective solution to offer higher subsidies for Tier 1 SHSs sold to female-headed households. Based on the results of this procurement, a decision will be made with respect to a business model for the rest of the SHSs. Higher tier SHSs are likely to be marketed through PAYGO and will be supported by the same RBF subsidy per SHS as Tier 1 SHSs.

48. To ensure sustainability of SHSs, only systems meeting VeraSol quality standards,[26] will be supported by the project. Also, efforts will be made to mobilize Energy Sector Management Assistance Program (ESMAP) funding under the Collaborative Labeling and Appliance Standards Program to provide technical support to the GoC in adopting the Lighting Global Standards and thus driving away substandard SHSs from the market altogether. Furthermore, suppliers will be requested to provide warranties of three to five years. The use of PAYGO for SHSs of Tier 2 and higher will retain suppliers in the market; they will be best placed to provide after-warranty maintenance services. For Tier 1 SHSs sold in cash, after-warranty services could be contracted out, on a competitive basis**,** to the local private sector, initially supported by the project.

49. **Subcomponent 2.2: Electrification of public entities (IDA grant: US$21 million; IDA WHR grant: US$7 million).** This subcomponent will provide financing to electrify 850 medical centers and 700 schools, including 150 medical centers and 200 schools for refugees and host communities, by supporting the supply, installation, and maintenance of solar PV-based energy systems, storage, and related necessary appliances. The design of the intervention is informed by the outcomes of and lessons learned from the United Nations Development Programme (UNDP) project that electrified 150 rural medical centers in

[24] Select outcomes of the survey are in annex 6.
[25] Assuming that a household can spend up to 5 percent of its total expenditure for electricity.
[26] *https://verasol.org/solutions/quality-standards*

Chad during 2019–20 through bulk procurement of S&I contracts. In consultation with the Ministry of Health and Ministry of Education, 200 rural medical centers and 150 schools in five provinces[27] have been selected for the first procurement round. It will be initiated during the first half 2022 with the objective of implementing S&I shortly after effectiveness to achieve first results early in implementation and generate lessons for subsequent procurement rounds that will cover additional provinces.

50. To enhance the sustainability of SSSs supported by the project, all SSSs will need to meet industry standards and be designed in view of climate impacts. For medical centers and schools, all S&I contracts will include maintenance for the duration of a warranty period. Subsequently, maintenance of SSSs will competitively be contracted out to the local private sector. Initially, maintenance contracts will be financed from the project. However, the GoC will be expected to take over the financing of maintenance contracts by the end of the project and discussions have already started to that effect.

51. To narrow existing gaps in employment opportunities for women within the sector, SSS installation and maintenance companies employed under Subcomponents 2.1 and 2.2 will be required to employ at least 20 percent women. In addition, options will be explored to combine electrification of schools with internet access and a light library model, donate pico-solar lights to families with school-age girls to support their schooling, and thereby help narrow gender gaps. These activities will be implemented in collaboration with the World Bank Digital Development Global Practice.

52. **Component 3: Clean cooking and natural resource management (IDA WHR grant: US$20 million equivalent; private sector financing: US$0.5 million equivalent).** The component will provide financing to (a) reduce demand of fuelwood; (b) promote sustainable supply by optimizing fuelwood consumption and diversifying fuel substitution options, including via solar and liquefied petroleum gas (LPG) cookstoves; and (c) restore degraded forests/areas affected by fuelwood collection and strengthen the national and local institutions or stakeholders involved in the sustainable management of natural resources in areas affected by refugee inflows. The component will be implemented in two phases: the first phase (Subcomponent 3.1) is expected to last up to 1.5 years and should lead to an integrated national strategy[28] with specific actions identified for funding and implementation in some of the nine provinces, housing refugees and host communities, under the second phase (Subcomponents 3.2 and 3.3).

53. **Subcomponent 3.1: Assessment of fuelwood demand and supply chains in Chad and institutional setting - Phase 1 (IDA WHR grant: US$2 million).** This subcomponent will focus on studies, fact-finding, planning, mapping, institutional setting and capacity building , with respect to supply and demand of fuelwood as well as other cooking options, including solar and LPG cookstoves. It will also support piloting of various modern/clean cooking options.

54. **Subcomponent 3.2: Clean cooking solutions - Phase 2 (IDA WHR grant: US$7 million; private sector financing: US$0.5 million).** This subcomponent will support a transition toward improved and modern/clean cooking solutions to reduce energy needs of 70,000 households in refugee camps and host communities. The subcomponent comprises (a) sensitization and promotion of efficient cooking equipment, prioritizing solar, biogas, and improved biomass stoves and (b) RBF subsidies to make clean

[27] These are Ennedi Est, Kanem, Logone Oriental, Mayo Kebbi Ouest, and Wadi Fira.
[28] This could be an action-oriented version of neighboring Niger - *Programme National des Energies Domestiques*.

cookstoves more affordable for households. The outcomes of this subcomponent will largely be beneficial to women who are the primary users of these appliances. Switching to improved biomass stoves only (a conservative scenario) is expected to result in net emission reduction of 0.135 million tCO_2eq over the project lifetime. Beyond reduction in emissions and health benefits, due to increased efficiency, the use of improved biomass stoves is expected to reduce consumption of woody biomass by up to 91,500 tons of wood. Reduced consumption of woody biomass can lead to a decrease in deforestation rates and thus promote building climate resilience by maintaining forest cover. Considering that forest covers help protect communities against the impact of climate hazards, these interventions can further improve the adaptive capacity of communities. Another mechanism through which this subcomponent helps build adaptive capacity is by increasing the disposable income of households switching to improved biomass stoves. Depending upon the current fuel use and tier level of improved biomass stoves, the annual savings per household are estimated at US$28–US$37. Finally, by prioritizing solar, biogas, and improved biomass stoves, clean cooking solutions will reduce fuelwood consumption. Moreover, biomass to feed improved stoves will be sourced from forests that are sustainably managed under Subcomponent 3.3 and in line with the Environmental and Social Framework (ESF)/Environmental and Social Standards (ESS) 6 requirements.

55. **Subcomponent 3.3: Restoration and sustainable natural resource management - Phase 2 (IDA WHR grant: US$11 million).** This subcomponent will support two main sets of activities: (a) integrated and participative community forest resources management through community management of natural resources and restoration of degraded forests and (b) technical support and capacity building through (i) institutionalization of forestry-based geographical information system in the Directorate of Forests and (ii) TA to strengthen capacities and support sustainable fuelwood supply, as well as the monitoring and verification of environmental, social, and climate change impacts of the project activities. The subcomponent is expected to result in carbon sequestration. It is estimated that three years after planting, trees will be sequestrating about 9,600 tCO_2 per year per hectare.

56. **Component 4: Project management and technical assistance (IDA: US$14 million; IDA WHR: US$3 million equivalent).**

57. **Subcomponent 4.1: Project management and supervision (IDA: US$8 million; IDA WHR: US$2 million).** This subcomponent will finance the Ministry of Petroleum and Energy (MPE) PIU (4.1 (a)) and SNE PIU (4.1 (b)) for day-to-day management and supervision of the project, including technical, fiduciary, environmental and social, and M&E aspects, as well as operating cost and training.

58. **Subcomponent 4.2: Consultancies and studies in support of project implementation and preparation of new projects (IDA: US$2 million equivalent; IDA WHR: US$0.5 million equivalent).** The subcomponent will finance project-related safeguards studies including preparation of environmental and social instruments, as well as the implementation of gender and gender-based violence (GBV) baseline assessments and action plans, citizen engagement, grievance registration mechanism (GRM), and satisfaction surveys. It may also support the preparation of new energy projects.

59. **Subcomponent 4.3: Institutional strengthening and technical assistance of Chad energy entities (IDA: US$4 million; IDA WHR: US$0.5 million).** The project will finance measures to strengthen the institutional capacity of the MPE in the following areas: (a) planning capacity; (b) preparation and implementation of competitive procurement of solar PV and battery storage IPPs; and (c) promotion of

low-carbon and climate-resilient technologies. As part of the MPE institutional strengthening directly related to the project, the MPE will establish a monitoring unit, comprising local technical experts, who will assist the ministry in carrying out regular close supervision of project implementation and coordinate with government entities involved in project implementation. ADERM will be supported on issues pertaining to rural electrification, including programs for refugees and host communities. The energy regulatory body, ARSE, will be strengthened with respect to a regulatory framework for grid- and mini-grid-based power systems. The subcomponent will also support capacity building of SNE to improve the company's operational and financial performance.

60. **Component 5. Contingent emergency response component (CERC) (estimated cost: US$0).** The CERC is included in the project in accordance with Investment Project Financing (IPF) Policy, paragraphs 12 and 13, for Situations of Urgent Need of Assistance and Capacity Constraints. This will allow for rapid reallocation of credit/grant uncommitted funds in the event of an eligible emergency as defined in OP 8.00.[29] An Annex to the Project Implementation Manual (PIM) (CERC Annex) will be prepared to guide the activation and implementation of the CERC, and a CERC Environmental and Social Management Framework (ESMF) will be prepared as an addendum to the project's ESMF to cover the CERC activities when preparing the CERC Annex. For the CERC to be activated, and financing to be provided, the GoC will need to (a) submit a request letter for CERC activation and the evidence required to determine the eligibility of the emergency, as defined in the CERC Annex; (b) submit an Emergency Action Plan, including the emergency expenditures to be financed; and (c) meet the environmental and social requirements as agreed in the Emergency Action Plan and Environmental and Social Commitment Plan (ESCP). IDA WHR funds reallocated to the CERC will only be used to benefit refugees and host communities.

C. Project Beneficiaries

61. The beneficiaries of the project will include the following:

(a) **Households.** More than 6 million people in Chad will benefit from new or improved electricity services, including 400,000 refugees and about 740,000 Chadians from host communities. Improved or new electricity access will generate economic benefits for end users through the reduction in cost and increase in quality of supplied services. It will also result in health benefits owing to the reduction of indoor air pollution due to reduced use of kerosene lamps and candles for lighting. In total, 70,000 families from refugee camps and host communities will also benefit from clean cooking solutions and related economic and health benefits.

(b) **Businesses and farmers.** New or improved access to electricity, mostly based on solar PV and storage for irrigation and water pumping, micro and small enterprises, and commerce, will increase productivity and income of farmers and micro, small, and medium enterprises (MSMEs) and thus boost the local economy.

(c) **Public facilities.** The project will improve the delivery of health and education services by electrifying about 850 medical centers and 700 schools, mostly in rural areas, including 150 medical centers and 200 schools in locations housing refugees and host communities. In addition, medical and educational facilities, together with administrative entities, located in the cities that will be electrified through isolated systems or mini -grids will benefit from new or improved electricity services.

[29] An eligible emergency is defined as an event that has caused, or is likely to imminently cause, a major adverse economic and/or social impact associated with natural or man-made crises or disasters. Such events include a disease outbreak.

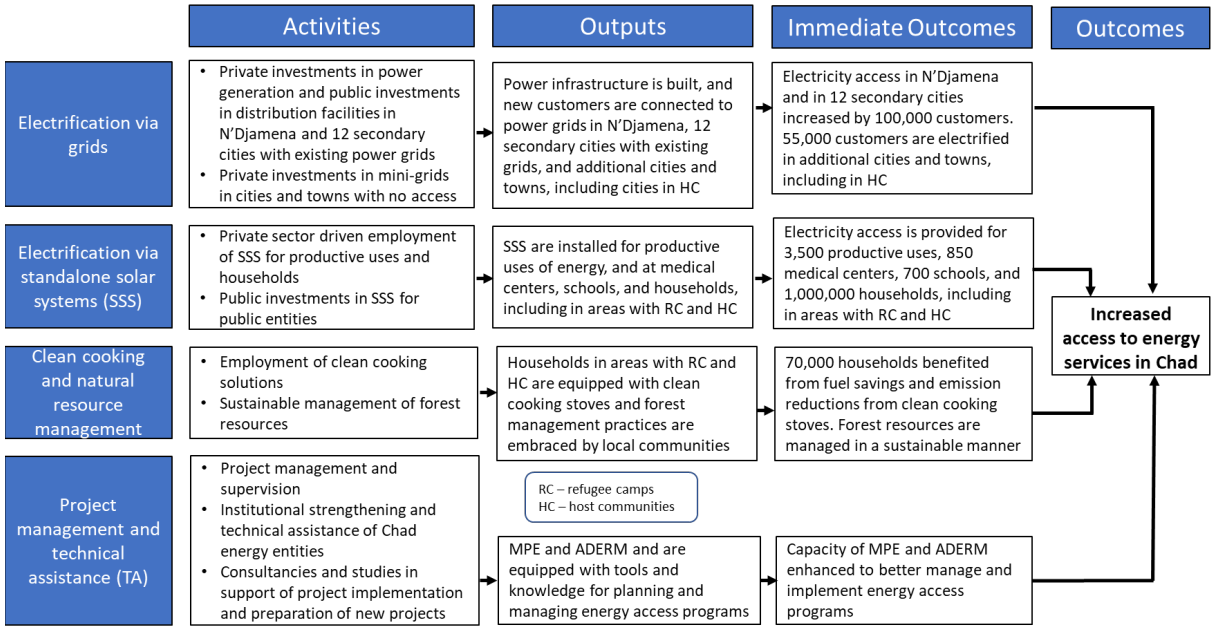
(d) **Women.** Providing female-headed rural households and women-led enterprises with electricity has the potential to promote gender equality, create employment and business opportunities for women, and improve development outcomes, for example, in areas such as education. In addition, all project components aim to create employment opportunities for female technicians and engineers to carry out installation and O&M activities. In this regard, the contracts of private O&M companies will include clauses requiring them to train and employ female professionals.

(e) **OGS companies.** The solar companies will benefit from increased access to financing for business development support and working capital allowing them to expand their businesses by building inventory, widening distribution channels, increasing training for distribution agents, improving after-sales services through increasing technicians and introduction of trouble-shooting technologies, extending their product line, and introducing innovations.

(f) **Electricity sector institutions.** All main energy sector entities, including the MPE, SNE, ADERM, and ARSE, will benefit from institutional development and capacity strengthening. The project will also support the rehabilitation of existing and the construction of new assets of SNE in N'Djamena and secondary cities.

D. Results Chain

Figure 3. Results Chain/Theory of Change



E. Rationale for World Bank Involvement and Role of Partners

62. **The participation of the WBG in the electrification of developing countries makes a difference.** Chad is well behind all countries in West Africa and beyond in terms of energy access. The World Bank, with its ability to design a customized electrification program drawing from decades of global experience and its ability to harness recent technological advancements to provide reliable, affordable, and sustainable energy services to consumers, is well placed to assist the GoC in designing and implementing the project. With this experience in hand, there is an unparalleled opportunity for the WBG, to support

Chad boost electricity access with a focus on the poor. The WBG's involvement can (a) help design an electrification program against the principles of sustainability and social justice; (b) achieve efficiency and hence reduce the cost of electricity access for the population; (c) enable pooling of resources from diverse donors for access expansion; (d) help develop the market and establish an enabling environment for the increased participation of the private sector in the provision of off-grid electricity service; and (e) draw on global experiences in the design of market-based incentives for the deployment of stand-alone systems and more broadly the design of a robust electrification program.

63. **Coordinated and sustained efforts on energy access by development partners are required.** In view of the remarkable energy access challenges faced by Chad, development partners have an important role to play on policy, investment, and capacity-building fronts. However, support from various development partners on energy access has so far been rather fragmented without a clear and coherent strategic direction. With its growing program in the energy sector, the WBG is well positioned to help the GoC in coordinating the energy sector activities of the main donors to avoid overlap and instead achieve synergies and results on the ground. Besides the WBG, the following development partners are present in the Chad energy sector: African Development Bank, European Union, French Development Agency (*Agence Française de Development*), Islamic Development Bank, and Abu Dhabi Fund for Development.

F. Lessons Learned and Reflected in the Project Design

64. The project reflects lessons learned from international and regional best practices with respect to off- and on-grid electrification, integration of variable renewable energy (VRE), and alleviation of energy deprivation of refugees and host communities.

65. **Electrification Technologies and Business Models.** The choice of electrification technologies should be based on a least-cost geospatial electrification planning and consider the continued reductions in costs of off-grid solutions that are based on solar and storage. In addition to techno-economic considerations, willingness and ability to pay for electricity services need to be considered in determining the choice and sequence of electrification technologies. Otherwise, electrification investments will face sustainability issues or require significant operational subsidies, which will seriously undermine the ability of the country to make material progress in electrification. Off-grid solutions, and in particular lower tiers of SHSs, can address energy deprivation of the poor in a cost- and time-efficient manner, while helping households to gradually climb the energy ladder. Business models for off-grid solutions should be market specific while leveraging private sector capital, experience, and innovation. Flexibility should be embedded in the project design to adjust business models during the first years of implementation as needed based on the market response.

66. **Isolated Power Systems and Mini-Grids.** Mobilizing the private sector into electrification by isolated power systems and mini-grids will build on global and regional experience. Given the high investment needs to boost electricity access, private financing should be leveraged where feasible. RBF/performance-based financing has been found to be an effective mechanism for leveraging private sector investment, innovation, and efficiencies. Developing mini-grids one at a time is not financially optimal. Therefore, several sites will be bundled under the project to reach the scale required to attract qualified developers. To attract private capital while maintaining service affordability, subsidies will be provided to developers at a level determined through detailed feasibility study based on target equity rate of return. CAPEX subsidies have been favored (rather than recurrent operating subsidies) to limit the risk perceived by operators on timely subsidies payment. In the absence of a well-developed regulatory framework for mini-grids, initially, regulation will be arranged by contract. Lessons learned from regulation by contract will inform the regulatory framework. PUE is a key element for making the mini-grid business sustainable and reducing tariffs and subsides. Therefore, mini-grid projects should include capacity-building and TA activities to develop PUE.

67. **Integration of VRE.** Proper planning and efficient grid dispatch are key to increasing VRE penetration in the grid. Proper VRE integration needs to consider multiple issues including (a) dispatch issues related to the flexibility of conventional plants (ramp rates, part-load, and so on) to address the variability of VRE plants and (b) stability issues related to the inertia of the grid. These issues are particularly critical for the Chad power system with little spinning reserves, weak grids, and outdated network operation. Therefore, Component 3 of the project aims to support investments in dispatch and battery storage. These, together with investments in the N'Djamena grid reinforcement under the CCPIP, as well as capacity building of the line ministry and SNE on power system planning, will pave the way for VRE integration in the N'Djamena grid.

68. **Facilitating private sector involvement is crucial for fiscal sustainability and technical quality of large-scale solar development.** Consistent with the Maximizing Finance for Development approach, strategically using public funding to leverage private sector investment and expertise is a key element of this project. Experience has shown that in solar parks, a relatively small amount of public investment in land, permits, and evacuation help de-risk project development. The competitive award of PPAs in solar parks to private developers and operators then results in high-quality solar plants that can deliver power at low tariffs, as demonstrated by many countries around the world.

69. **Energy access for refugees and host communities requires a combination of approaches and innovations to address specificities of displacement settings.** The majority of interventions on humanitarian energy have been driven and led by nongovernmental organizations (NGOs), foundations, and humanitarian organizations with funding from donors. A number of case studies published by the Energizing Development[30] spanning West Africa (Nigeria and Burkina Faso); East Africa (Kenya, Uganda, and Rwanda); Jordan, and India highlighted several lessons that were considered in designing the project: (a) to avoid any conflict, the design of interventions in displacement settings should be inclusive and balanced between refugees and host communities to promote engagement of the wider community; (b) several business and governance models can coexist in the implementation of activities (refugees, community-based organizations, or private sector led), building on available capacity within the settings and targeting different profiles of beneficiaries; (c) flexibility is key to enable continuous adjustment of

[30] *https://endev.info/wp-content/uploads/2021/04/EnDev_Learning_and_Innovation_Humanitarian_Energy.pdf*

activities and innovation to integrate new learning from research and early lessons learned; and (d) inclusion of refugees should be translated into national development and energy planning.

70. **Clean cooking.** Key lessons learned from the World Bank's lending experience over the last 10 years in the clean cooking sector, which have been incorporated into the project design, are as follows:

(a) **A systems approach is needed to promote access to modern energy cooking services.** To make the cooking process clean, the whole system of interactions of cooking technologies (the combination of stove and fuel) with human behavior (e.g. what to cook, how to cook, and how often and long to cook) and housing conditions (e.g. kitchen location, arrangement of rooms and size, construction materials, and quality of ventilation) needs to be considered.

(b) **RBF has been demonstrated to be an effective approach to using public resources to incentivize the market and can be designed to fit the country context and market conditions.** The World Bank has implemented the RBF framework to support efficient clean cooking and heating solutions in 10 client countries with variations based on country conditions (for example, in Bangladesh, China, Indonesia, Kenya, Lao People's Democratic Republic, Mongolia, and Uganda). The results demonstrate that RBF is an effective instrument to incentivize private sector investment and deliver clean and efficient cooking and heating solutions with predefined result levels and triggers for payment. In addition, its flexibility allows for designing and adjusting the predefined results and associated incentives based on the country context, market conditions, and feedback from program implementation.

III. IMPLEMENTATION ARRANGEMENTS

A. Institutional and Implementation Arrangements

71. **The MPE will provide the overall policy, strategic guidance, and steering of the entire project while SNE will be the implementing entity for subcomponents 1.1, 1.2, and 4.1(b) as these will support grid electrification falling under the responsibility of SNE.** The ministry will serve as a high-level implementing entity of all project components, except for subcomponents 1.1, 1.2, and 4.1(b), and will coordinate implementation with all concerned agencies and ministries. The ministry will establish a project monitoring unit that will be staffed with local experts, competitively selected according to terms of references (TORs) to be agreed with the World Bank. The MPE will delegate day-to-day project implementation to a competitively selected entity that will be contracted by the ministry before the project effectiveness. It will serve as a ministry PIU and handle the payment of RBF subsidies. Until that time, the existing SNE PIU can support the MPE on select project activities. With regard to SNE activities, day-to-day implementation and supervision will be carried out by the SNE PIU that is responsible for the implementation of the CCPIP and supported by a PMC. The SNE PIU will also be supported by an Owner's Engineer who will be hired under the CCPIP to carry out studies and help SNE prepare bidding documents and supervise investments in the N'Djamena power system that will be financed by both the CCPIP and the proposed CEASP. Additional details of implementation arrangements are presented in annex 1.

72. **The MPE and SNE will prepare a PIM detailing the organizational and technical procedures that govern the project**, including financial management (FM), procurement, social and environmental safeguards procedures, and GRM. It will also include detailed TOR for all the PIUs' staff. The GRM will

facilitate citizen engagement and timely resolutions of project-related issues and concerns expressed by the public.

B. Results Monitoring and Evaluation Arrangements

73. **Project results will be monitored against the PDO and intermediate indicators elaborated in the project's Results Framework.** The MPE PIU will carry out M&E of the project, except for subcomponents 1.1, 1.2 and 4.1 (b). The SNE PIU will be responsible for M&E of subcomponents 1.1, 1.2 and 4.1(b). M&E activities will include (a) monitoring physical progress; (b) carrying out M&E of delivered outcomes; (c) reviewing and supervising the environmental and social issues identified and any mitigation measures; and (d) alerting the PIU management about project issues revealed during M&E. The MPE PIU consultants responsible for M&E will collect M&E inputs from the SNE PIU and prepare quarterly reports that will be submitted to the MPE and the World Bank.

74. **Digitizing the M&E system will complement the physical supervision of the project activities.** The volatile security situation in the country requires a layered approach to project management and supervision as World Bank staff and consultants are unable to travel to many of the subproject sites. The World Bank team will use Geo-Enabling Initiative for Monitoring and Supervision (GEMS) and integrate its remote supervision capacities in the M&E system of the project for the mapping and monitoring of the subproject. The project may also use GEMS to conduct surveys in hard-to-reach areas.

75. **A midterm review of the project will be conducted two to three years after project effectiveness to assess the performance of the project in achieving its development objectives.** The midterm review will also offer an opportunity to reflect on the progress made thus far, distill lessons learned, and adjust the project design, as necessary. At the end of the project, the World Bank team will prepare a project Implementation Completion and Results Report. The MPE, supported by consultants, will perform its own evaluation of the project at the end of implementation and prepare a project evaluation report.

C. Sustainability

76. **Sustainability of energy access mostly depends on the reliable functioning and durability of energy access assets that will be supported by the project.** The durability of assets will be ensured by the combination of business models and additional measures tailored to the electrification options:

(a) **The national grid and isolated power systems.** Sustainability of grid-based electricity supply hinges on the financial viability of utilities/providers of services. The latter in turn, require cost-recovery tariffs and adequate operation and financial performance of utilities. The World Bank provides a multicomponent TA and investment program in the Chad energy sector in these areas, including (i) advisory and capacity-building support to the newly established regulatory body in developing a tariff methodology for grid-based electricity supply; (ii) an advisory and investment program to SNE, which is responsible for both the national grid and isolated systems, to improve its performance through reduced cost of generation, improved collections, and reduced network losses; and (iii) an advisory support on a performance contract between the GoC and SNE to clearly delineate their respective roles and responsibilities, which should improve transparency in the sector and among other things make it more attractive for IPPs. Furthermore, the business model elected by the project to expand existing power systems and build the new ones should result in the least cost of grid investments while harnessing expertise and experience of the

private sector in operating and maintaining generation and distribution facilities. This will have a positive impact on tariffs and subsequently on sustainability of the project investments.

(b) **SSSs.** Sustainability of SSSs mostly depends on the quality of installed SSSs and post-warranty maintenance. Only SSSs that are certified by VeraSol will be supported by the project to ensure the quality of installed SSSs in the first place. Post-warranty maintenance of SSSs that are sold via PAYGO will naturally be provided by the suppliers that because of the PAYGO scheme are likely to remain on the market for an extended period. Post-warranty maintenance of SSSs that are installed at public utilities will be arranged through private local companies that will initially be financed by the project, but in time, the maintenance cost will need to be assumed by the respective ministries (and discussions are already ongoing to that effect). Post-warranty maintenance of SHSs that will be sold to households in cash will be arranged through local private companies that will initially be financed by the project but in time should become self-sustainable. It is expected that local private companies that will be involved in the installation of solar energy systems at public entities and in the distribution and sale of SHSs will be interested in and well placed to provide post-warranty services.

(c) **Isolated power systems and mini-grids.** The financial sustainability of mini-grids will be supported through capital cost grants and RBF subsidies. Technical sustainability will rely on strict qualification criteria for private mini-grid developers, who will have flexibility in setting cost-recovering tariffs (subject to a ceiling) and selecting the appropriate generation, distribution, and metering technologies (subject to minimum standards). The project will provide capacity-building support to ARSE, with respect to regulation of grid- and mini-grid-based systems.

(d) **Clean cooking.** Local innovation and localized solutions are critical for long-term sustainability. Cooking is a contextualized system with no one-size-fits-all solution. Although projects share common barriers, the best solutions will vary by location owing to differences in cooking behavior, culture, resources, institutions, and market conditions. Therefore, the project will empower the development of localized solutions, based on lessons from international experience, including the latest technology innovations.

IV. PROJECT APPRAISAL SUMMARY

A. Technical, Economic and Financial Analysis

Technical Analysis

77. The choice of technical solutions for electrification was informed by the preliminary outcomes of the ongoing national electrification analysis for Chad that prioritized isolated power systems for cities, mini-grids for towns, and SSSs for rural areas. The analysis considered the density of population, the existing and potential loads, the existing power systems, the planned construction of the high-voltage transmission line connecting the Chad and Cameroon power systems, and the ability and willingness of households to pay for electricity services.

78. Component 1 will support grid-based electrification in N'Djamena, 12 cities with existing grids, and cities and towns with no grids. It will rely on well-established and commercially available technologies that do not pose any major technical challenges. A technical design of the continued electrification of N'Djamena will be prepared by a competitively selected owner's engineer hired under the CCPIP. The Owner's Engineer will subsequently accompany SNE in supervising construction works and ensuring their

compliance with the national and World Bank requirements. The same technical requirements will apply to the construction of the power systems in the secondary cities that will be supported by the project. Under Component 2, SSSs for productive uses and public entities will adhere to Lighting Global Quality Assurance Guidelines, while SHSs will need to meet VeraSol quality standards. The clean cooking solutions, supported through Component 3, will also adhere to government guidelines, which will be enhanced under the project in line with international good practices.

79. All technical requirements for grid-based electrification equipment, SSSs, and clean cooking solutions will be elaborated in tender documents and/or the PIM and will be strictly applied during tendering, as well as closely monitored by the project implementing entities and their PIUs throughout implementation.

Economic and Financial Analysis

80. **The proposed project is expected to bring positive economic benefits to the Chadian population through the provision of new and improved energy solutions.** An economic analysis was carried out to assess the development impact in terms of expected benefits and costs. The economic analysis is confined to the project activities that generate quantifiable benefits for which an economic value can be clearly identified and measured. In this respect, the analysis focuses on Components 1 and 2 and Subcomponent 3.2. As the benefits of Subcomponents 3.1 and 3.3 are likely to go beyond the direct project beneficiaries, the economic analysis considers only costs and benefits associated with Subcomponent 3.2. The cost of Component 4 is apportioned across the other subcomponents.

81. **The economic analysis shows that the project is economically viable.** Using a social discount rate of 6 percent, the baseline Net Present Value (NPV) of the project is estimated at US$233 million, corresponding to an Economic Rate of Return (ERR) of 21 percent. Furthermore, when considering the impact of the project on reduction of CO_2 emissions, the net benefits are estimated to increase to between US$363 and US$492 million, depending on the assumptions around the social cost of carbon. Table 2 provides a summary of the project economic analysis, with further detail provided in annex 5.

Table 2. Summary of Project Economic Analysis

Key Metrics and Results	Unit	Value
Discount rate	percent	6
ERR	percent	21
ERR + GHG @ World Bank guidance values (low)	percent	34
ERR + GHG @ World Bank guidance values (high)	percent	51
Total costs	US$, millions	505
Total benefits	US$, millions	738
NPV, before GHG benefits	US$, millions	233
Lifetime GHG emissions reduction	$MtCO_2e$	4.4
Avoided GHG emissions @ shadow price of carbon (low)	US$, millions	130
Avoided GHG emissions @ shadow price of carbon (high)	US$, millions	259
NPV (including shadow price of carbon - low)	US$, millions	363
NPV (including shadow price of carbon - high)	US$, millions	492

82. **While the analysis does not consider other indirect benefits, it is expected that the project will contribute toward other economic benefits that are more difficult to quantify and monetize.** These

indirect benefits include improved air quality from reduced consumption of kerosene, reduced poisoning and accidental fires, and wider benefits that can be linked to access to modern electricity solutions such as improved health and improved connectivity. Access to modern energy solutions is also expected to increase income-generating opportunities and improve the socioeconomic situation of households and small businesses, with expected positive impact on education and lifestyle. Access to modern cooking solutions has benefits related to reductions in particulate matter and potential improved health outcome, reduced time spent collecting fuel which affects women and children, and reduced fuel wood consumption contributing to forest degradation and climate change. This means that the results from the economic analysis are rather conservative estimates of the overall economic benefits of the project.

83. **In addition to the economic analysis, a financial analysis of the project has been undertaken from the point of view of the national utility, SNE.** The financial analysis from the utility perspective compares cash flows to the utility with and without the project to arrive at a financial net present value (FNPV). As with the economic analysis, the financial analysis is confined to the project activities that generate quantifiable benefits for which a financial value can be clearly identified and measured. Because only Subcomponents 1.1 and 1.2 will have a direct impact on the financial situation of SNE, the financial analysis is limited to these subcomponents. At the time of undertaking this analysis, tariffs paid by end consumers were considerably below the costs of supply. This means that while the initial CAPEX for the new connections connected by the project is going to be provided in the form of a grant, SNE tariffs will need to be revised upward, which will be supported by the project.[31] The results of the financial analysis are summarized in table 3 and detailed in annex 5.

Table 3. Summary of Project Financial Analysis from the Point of View of SNE

		No Tariff Increase (that is, Real Tariff Decrease)	Tariffs Adjusted Upward (1 percent per year)	Tariffs Adjusted Upward (2 percent per year)
Assumed real tariff increase	% per year	0	1	2
Discount rate	%	10	10	10
Financial rate of return	%	5	10	21
Total costs (incremental cost of supply)	US$, millions	257	257	257
Total benefits (tariff revenues)	US$, millions	228	257	290
NPV benefit/(loss)	US$, millions	(29)	0	33

84. **There is a strong rationale for public sector financing.** The Government's NEEP adopted in July 2020, set an ambitious target of achieving a 53 percent electricity access rate by 2030. Providing access to modern energy solutions is also a key part of the Government's efforts to reduce environmental pollution and GHG emissions. Achieving such an ambitious target compared to the low access rate of 6.4 percent today means that there is a need to significantly scale up both public and private investments and hence significantly depart from the business-as-usual trajectory observed today. The high poverty incidence imposes serious affordability constraints, while landlocked geographical location, nascent stage of off-grid markets, high costs of limited financing options, and macroeconomic and security risks translate into the high capital and operational costs. In view of the above, public support/subsidies will be necessary

[31] It is noted that the state currently provides subsidy in the form of subsidy in nature (fuel). If the amount of fuel provided to SNE is increased to also cover the demand of those newly connected, the cash flow to the utility would be positive.

to mobilize private investments and expertise and make electricity services supported by the project affordable and sustainable.

B. Fiduciary

(i) Financial Management

85. **FM arrangements.** The FM action plans are detailed in annex 1. After implementing the plans, the FM arrangements of the two PIUs will satisfy the World Bank's minimum requirements under the World Bank Policy and Procedure for IPF operations and will provide, with reasonable assurance, accurate and timely information on the status of the project as required by IDA. The assessment concluded that after implementing the proposed mitigation measures, the FM residual risk is Substantial.

86. **Budgeting**. The annual project budgets will be based on a Procurement Plan agreed with the World Bank, developed by the ministry PIU and the SNE PIU and approved yearly by the MPE, SNE, and IDA and will be available by November 30 each year. Budget implementation will be monitored through the consolidated quarterly unaudited interim financial reports (IFRs).

87. **Fund flow.** Each of the two PIUs will open a Designated Account (DA) in a commercial bank under terms and conditions acceptable to IDA. The DAs will be managed according to the disbursement procedures described in the FM Procedures Manual, the Disbursement and Financial Information Letter (DFIL), and a Subsidiary Financing Agreement signed between the MPE and SNE. The initial advance to the DAs would cover approximately four months of expenditures and would be specified in the DFIL. The minimum value of direct payment and special commitment is 20 percent of outstanding advance made to the DA. Disbursement procedures arrangement will be detailed in the FM Procedures Manual and the DFIL. Replenishment through Statements of Expenditures, Direct Payment methods, and special commitments will apply to the project. The option to disburse against the submission of quarterly unaudited IFRs (also known as the report-based disbursements) could be considered, as soon as the project meets the criteria. Project flow of funds is depicted in figure 4.

88. **Accounting and financial reporting**. The ministry PIU and the SNE PIU will maintain books of accounts in a computerized environment. The two PIUs will use an FM manual to guide staff on internal control principles. Separate ledger accounts will be opened for the project in the accounting system, and a chart of accounts will be configured to classify expenditures based on project components/major activities. Consolidated IFRs on the use of funds will be submitted to the World Bank through the ministry PIU within 45 days from the end of each calendar quarter. The expenditure statements/ledger accounts generated from the accounting system will be used for the preparation of the consolidated IFRs.

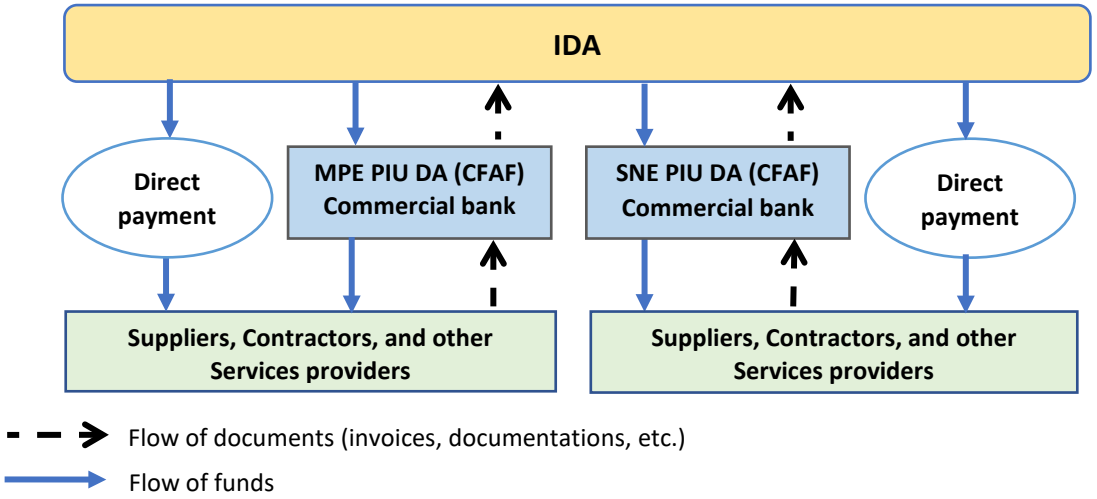
89. **Staffing**. The MPE will recruit an entity to serve as the PIU. The MPE PIU will be staffed, among others, with fiduciary specialists. Under the ongoing CCPIP, the SNE PIU is staffed with FM experts satisfactory to the World Bank, including a finance officer and an accountant. In support of the CEASP, the SNE PIU will recruit an additional accountant within three months of project effectiveness. Adequate provision for staff costs will be made in the project budget. The project FM staff will be provided the requisite training on WBG FM and disbursement procedures.

90. **Internal audit and controls**. The MPE and SNE will prepare a PIM documenting the project implementation arrangements and controls to ensure (a) that the project funds are used only for the intended purposes along economy and efficiency principles; (b) the preparation of accurate, reliable, and timely periodic financial reports; and (c) that the project's assets are adequately safeguarded. In addition, the SNE PIU will update its project FM manual currently in use for the ongoing CCPIP to include specificities related to the CEASP. The MPE PIU, once recruited, will prepare its project FM manual. An internal auditor will be recruited by the MPE and will cover both the ongoing CCPIP and the CEASP.

91. **RBF verification.** The MPE will hire an independent verification agency (IVA) to evaluate and monitor the achievement of results for the granting of RBF subsidies, including CAPEX. Details on the verification protocol will be included in the PIM.

92. **Payment to RBF beneficiaries.** Under subcomponents 1.3, 2.1, and 3.2, the project will finance RBF subsidies in the form of CAPEX and payment to suppliers. Upon satisfactory verification of the achievement of the RBF by an independent verifier, the subsidy payments may be made by financial intermediaries and/or financial institutions ('payment agent') hired on terms in conditions satisfactory to the World Bank. The GoC will sign an agreement ('agency agreement') with each of the recruited payment agents on terms and conditions satisfactory to the World Bank. The agency agreements will include the payment agents' responsibility for, among others, (a) verification of selected beneficiaries; (b) (electronic) trail payments; (c) establishment of payment centers, automatic teller machines, and/or point of sales in publicly accessible places; (d) provision of monthly reconciliations of RBF subsidies or CAPEX subsidies amounts withdrawn or outstanding by the beneficiaries; (e) reporting arrangements; and (f) balance of payments management. The detailed arrangements for payments will also be provided in the PIM.

Figure 4. Flow of Funds



93. **Implementation support plan.** FM implementation support intensity and frequency will be in line with the risk-based approach and will involve a collaborative approach. A first comprehensive implementation support mission will be performed six months after project effectiveness. Afterward, the missions will be scheduled depending on the risk and will include the following diligences: (a) monitoring of the FM arrangements during the implementation support process at intervals determined by the risk rating assigned to the overall FM assessment at entry and subsequently during implementation

(Implementation Status and Results Report); (b) integrated fiduciary review of key contracts; (c) review of IFRs; and (d) review of audit reports and management letters from the external auditors and follow-up on material accountability issues by engaging with the project task team leader, recipient, and/or auditors. The quality of the audit (internal and external) also is to be monitored closely to ensure that it covers all relevant aspects and provides enough confidence on the appropriate use of funds by recipients.

(ii) Procurement

94. **Applicable procurement rules and procedures.** Procurement will be carried out in accordance with the procedures specified in the World Bank 'Procurement Regulations for IPF Borrowers' (Procurement Regulations), dated November 2020 under the New Procurement Framework and the World Bank's Anti-Corruption Guidelines: Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants, dated October 15, 2006 and revised in January 2011 and as of July 1, 2016, as well as the provisions stipulated in the Financing Agreement.

95. **The proposed project will use the Systematic Tracking of Exchanges in Procurement (STEP) tool.** The project will be implemented using STEP, a planning and tracking system, in accordance with clause 5.9 of the Procurement Regulations. Procurement Plans and their updates and requests for prior reviews will be sent to the World Bank for clearance through this tool. Procurement activities not requiring World Bank prior reviews will be recorded in STEP as well. Use of STEP is mandatory for all procurement transactions subject to post and prior review under the project.

96. **All procuring entities as well as bidders and service providers, that is, suppliers, contractors, and consultants will need to observe the highest standard of ethics during the procurement and execution of contracts financed under the project** in accordance with paragraph 3.32 and Annex IV of the Procurement Regulations. When procurement is done in the national market, as agreed in the Procurement Plan, the country's own procurement procedures may be used with the requirements set forth or referred to in paragraphs 5.3–5.6 related to National Procurement Procedures. For all works contracts, procurements that apply standard procurement documents will adopt the provisions of the World Bank related to environmental, social (including sexual exploitation and abuse [SEA] and GBV), and health and safety risks and impacts. This includes codes of conduct (CoCs) that include prohibitions against sexual harassment (SH) and sexual abuse.

97. **Assessment of procurement capacity.** The procurement activities will be executed by SNE and the MPE, through their respective PIUs. The SNE PIU is supported by a PMC and will also be assisted by an Owner's Engineer that will be hired under the CCPIP to carry out studies and help SNE prepare bidding documents and supervise investments in the N'Djamena power system, which will be financed by both the CCPIP and the CEASP. The MPE will delegate day-to-day management of the project, including procurement, to a competitively selected firm/NGO that will function as the MPE PIU. The outcomes of the procurement assessment for both PIUs as well as action plans to strengthen them are in annex 1.

98. **Procurement risk of the project.** The overall procurement risk is Substantial. It will be regularly assessed and adjusted as needed based on the outcomes of risk mitigation measures. These measures include, for each designated implementing agency, (a) having a full-time procurement specialist, who is experienced and familiar with the World Bank procurement procedures and policies, to be located in each PIU; (b) training all project staff involved in Procurement Regulations; (c) organizing procurement red flags

training in collaboration with the Integrity Vice Presidency (Preventive) for implementing agencies at the appropriate time including onboarding the owners' engineer with procurement and contracts management experts from the early stage of project; (d) developing a section on procurement procedures as part of the PIM to clarify roles of each team member involved in the procurement process and define the maximum delay for each procurement stage (specifically with regard to review and approval systems and the signing of contracts); (e) developing contract management plans for prior review contracts; (f) transferring the major risks identified in the Procurement Risk Assessment and Management System exercise to a day-to-day monitoring matrix and monitoring it through project implementation monthly meetings with the client during the first two years of the project, to ensure things are on track; and (g) improving the filing system to ensure compliance with the World Bank Procurement Filing Manual.

99. **Considerations of risk of forced labor in the supply chain for solar systems.** The project will involve the procurement and installation of solar panels for isolated power systems and mini-grids as well as SSSs for households, public institutions, and PUEs, mostly in rural areas. There are allegations of forced labor risks associated with the polysilicon suppliers. Prior to beginning the procurement process, the Recipient will undertake a market analysis to identify the possible sellers of solar panels to the project. The bidding documents will emphasize forced labor risks in solar panels and components and will require that sellers of solar panels to the project not engage or employ any forced labor among their work force. Bidders will be required to provide two declarations: a Forced Labor Performance Declaration (which covers past performance) and a Forced Labor Declaration (which covers future commitments to prevent, monitor, and report on any forced labor, cascading the requirements to their own subcontractors and suppliers). In addition, enhanced language on forced labor will be included in the procurement contracts. The World Bank will prior review procurements of solar panels and components to ensure that enhanced provisions are used by the recipient.

100. **Project Procurement Strategy for Development (PPSD).** The MPE and SNE PIUs have prepared a PPSD, which was found satisfactory to the World Bank. The PPSD describes how fit-for-purpose procurement activities will support project operations for the achievement of the PDOs and deliver value for money. The PPSD ensures that procurement activities are packaged and will be prepared to minimize the risk. It considers institutional arrangements for procurement, roles and responsibilities, thresholds, procurement methods, and prior review, as well as special arrangements such as direct contracting, use of Statements of Expenditures, United Nations agencies, third-party monitors, local NGOs, Force Account, civil servants needs, results-based arrangements, need for prequalification, and PPP contracts.

101. **The market analysis carried out as part of the PPSD shows that taking into account the economic conditions and general instability of the country, the possibility of attracting large reputable international companies to bid could be limited.** However, communicating and consulting with reputable bidders, suppliers, and consultants will be important in improving competition. Open international competition will be the preferred approach for high-value and complex contracts. Consultancy services relate mainly to classic assignments and studies to be selected using QCBS.[32] While the mobility of foreign consultants is limited by the COVID-19 pandemic, partnerships with local consultants remains an alternative for international consultants to compete and use national expertise. The procurement of goods vary from office equipment to control equipment and software for which the local market is reasonably competitive. Capacities constraints of beneficiaries in terms of adequately expressing needs

[32] QCBS = Consultants Quality and Cost-Based Selection.

constitute a potential risk for efficient procurement of products. For lower-value contracts, the procurement plan may adopt a simple procurement approach as appropriate.

102. The S&I-related to the rehabilitation, densification, and extension of the N'Djamena electricity network will be procured using open international competition using RFB following prequalification or post qualification depending on the level of competition. Rehabilitation, extension, and exploitation of the N'Djamena electricity network in many localities (similar to mini subvention for the private sector) will use 'multi-lot bidding' with an 'open, international, one-stage' approach without prequalification for contracts with a cost estimate equal to or greater than US$5,000,000 and 'open, national and one-stage' for contracts below US$5,000,000. The lots will be grouped together in contracts, preferably in the same area. For the S&I of solar mini-grids, competition will be limited to candidates who already have experience for which prequalification could be used followed by open international competition.

103. **Procurement Plan.** The Procurement Plan covering the first 18 months of implementation has been prepared. Any updates of the Procurement Plan shall be submitted for the World Bank's approval and include for each contract (a) a brief description of the activities/contracts; (b) the selection methods to be applied; (c) the cost estimates; (d) time schedules; (e) the World Bank's review requirements; and (f) any other relevant procurement information. In accordance with paragraph 5.9 of the Procurement Regulations, the recipient shall use the World Bank's online procurement planning and tracking tools to prepare, clear, and update its Procurement Plans and conduct all procurement transactions.

C. Legal Operational Policies

	Triggered?
Projects on International Waterways OP 7.50	Yes
Projects in Disputed Areas OP 7.60	No

104. **OP/BP 7.50 has been triggered for the project because the project will finance activities that may use groundwater connected to international waterways, namely the Niger River, the Lake Chad, and/or their tributaries.** The exception to the riparian notification requirement, according to paragraph 7 (a) of the policy, applies because activities are limited to the upgrade and modernization of existing, small-scale schemes which will not cause a change in the existing use of water or in the water quality. The exception to the notification requirement was approved by the World Bank Regional Vice-President on December 23, 2021.

D. Environmental and Social

105. **The environmental and social risk classification for the project is Substantial, based on the nature and scale of the project activities.** The project is expected to have overall positive environmental and social impacts as it will contribute to expand access to electricity services in urban and rural areas through off-grid solutions, including mini-grids and SSSs, and in the N'Djamena grid through solar PV plants and storage. The deployment at scale of off-grid and mini-grid technologies would also serve as a catalyst for improved access to basic services (health and education), economic development, and electricity services of the population in areas affected by energy poverty, which entrenches fragility. The

primary environmental and social risks identified include (a) environmental- and community health-related risks from inadequate storage, transportation, and disposal of waste; (b) occupational health and safety issues related to civil works; (c) sociopolitical and security risks specifically related to insecurity especially in the north and center regions of the country; (d) low trust in the GoC that could lead to the rejection of project interventions; and (e) some economic displacement or physical resettlement due to civil works. There are also specific vulnerabilities associated with forced displacement, and both refugees and IDPs may require additional adjustments that will be reflected in the various frameworks and plans that will be prepared. Close cooperation will be required with CNARR, UNHCR, and other implementation partners and civil society organizations that work with displaced populations. Finally, investments in solar PV panels could also face risk regarding potential use of forced labor by suppliers of polysilicon.

106. **SEA/SH, health and safety.** As the exact scope of the project activities and the specific sites have not yet been defined, an ESMF[33] including an analysis of the SEA/SH risks and an associated SEA/SH Mitigation and Response Plan as an annex was prepared to provide guidance regarding the instruments that may need to be prepared during project implementation, such as Environmental and Social Impact Assessments (ESIAs)/Environmental and Social Management Plans. The ESMF makes use of the general and sector-specific World Bank Environmental Health and Safety Guidelines for the subprojects identified. When project sites are identified, site-specific ESIAs will be prepared. Furthermore, the ESMF incorporates relevant parts of World Health Organization guidelines establishing good international industry practice for COVID-19 response.

107. **Land acquisition and resettlement.** The planned construction of power distribution infrastructure and the construction of utility-scale solar PV plants could result in land acquisition leading to some physical resettlement or the loss of assets or disruption of income or livelihood activities as well as restricting access to natural resources. Given that the specific sites for these investments are not known yet, the recipient prepared a Resettlement Policy Framework (RPF)[34], which will guide the preparation of any site-specific Resettlement Action Plans during project implementation. The RPF was disclosed in-county on December 14, 2021 and on the World Bank's website on February 25, 2022. Social exclusion is a risk if consultations are not properly conducted with all stakeholders. A Stakeholder Engagement Plan (SEP)[35] was prepared and disclosed in-county on December 16, 2021 and on the World Bank's website on February 26, 2022. It provides stakeholder mapping and details for inclusive and continuous engagement with the identified stakeholders and other interested parties. It also describes the project grievance mechanism, which will include specific provisions for reporting of SEA/SH complaints. Some of the project interventions will be in remote or areas that are difficult to access and where supervision may be a challenge and security risks are also prevalent.

108. **Labor management.** The Recipient has prepared Labor Management Procedures (LMP)[36] as part of the ESMF, which includes working conditions and GRM for all categories of project workers including within the supply chains and the roles and responsibilities of contractors and PIUs in managing the requirements of ESS2; nondiscrimination and equal opportunity, worker's organizations, occupational

[33] Disclosed in-country on December 14, 2021 and on the World Bank's website on February 25, 2022: *https://documents1.worldbank.org/curated/en/099425102252236984/pdf/CGES0PAAET0Rapport0final.pdf*
[34] *https://documents1.worldbank.org/curated/en/099430002252217583/pdf/Rapport0CPR0PAAET0final.pdf*
[35] *https://documents1.worldbank.org/curated/en/099115002012289467/pdf/Stakeholder0En0Up0Project000P174495.pdf*
[36] Disclosed in-country on December 14, 2021 and on the World Bank's website on February 25, 2022: *https://documents1.worldbank.org/curated/en/099425002252285404/pdf/Annexe020du0CGES0PAAET0PGMO0final.pdf*

health and safety measures, the prohibition of child and forced labor, and a CoC. The CoC will require that each worker undergoes SEA/SH training to guide workers' conduct toward local communities, children, and women. The project will require contractors (both local and international), including the private sector's contractors, to reflect the requirements of the project LMP in the management of their workers.

109. **Security management.** There are significant contextual security risks outside of project control that may affect environmental and social performance and outcomes in the north and the northeast, where the GoC has been countering insurgencies by armed groups for many years. Increasing attacks from Boko Haram have been observed in the Lake Chad area. New arrivals of refugees and continued internal displacement may also affect the project activities. Tension and conflict between pastoralists and farmers continue to rise, while violent crimes such as armed robbery, carjacking, and muggings have been reported in many parts of the country, and these are generally thought to be associated with access to resources, marginalization, and social exclusion. These risks for the project activities have been assessed in the ESMF with a chapter on security risk assessment, prepared by the Recipient. In case security personnel are required to protect work sites, the security personnel will be required to follow a strict CoC regarding workers and affected communities to avoid any situation escalation. Any security personnel deployed to provide security or other services as part of implementing activities related to the project will be managed consistent with the requirements of ESS1, ESS4, and World Bank guidance on Use of Military Forces. The Recipient will prepare a Security Management Plan (SMP) by project effectiveness and a summary will be disclosed in-country and on the World Bank's external website.

110. **The risk associated with institutional capacity on environmental and social management is considered Substantial** because the Recipient has little experience or capacity to manage some of the social risks identified in the ESF, and significant efforts will be required to help build the Recipient's capacity with the expanded social and environmental remit of the ESF. The Recipient also prepared, consulted upon, and approved an ESCP[37], which details the material measures and actions to be undertaken by the Recipient during project implementation to ensure compliance with the provisions of the ESF as well as the timeline and the responsible party.

111. **The project has been screened for SEA/SH risks using the World Bank SEA/SH risk screening tool for projects with civil work.** The assessment concluded that the SEA/SH risks are Substantial. Drivers of risk in the context include high rates of child marriage and female circumcision, general social acceptability of GBV, conflict, high risks of human trafficking, and lack of legislation on domestic violence and sexual harassment. GBV is highly prevalent, and it is estimated that 28.6 percent of women nationwide have experienced physical or sexual violence by an intimate partner at some point in their lives.[38] SEA/SH requirements have been reflected in the ESCP, in contracts, and in the contractor's ESCP. The recipient will develop a budgeted SEA/SH Action Plan annexed to the ESMF that will outline the project's mitigation strategies, response protocols, and accountability mechanisms. The Recipient will map GBV services in areas of implementation and will develop a referral protocol for the timely, safe, and ethical referral of all survivors who may disclose GBV/SEA/SH incidents to the project. In addition, the recipient will design and implement an SEA/SH-sensitive grievance mechanism for the safe and confidential documentation, response, and management of SEA/SH complaints and will include targeted, enabling, and regular involvement of women and other groups at risk in stakeholder engagement. The Recipient's supervision

[37] *https://documents1.worldbank.org/curated/en/099115102012230317/pdf/P17449507045c20b70a0b20cbd9ac3ae22d.pdf*
[38] Chad, Demographic Health Survey (DHS), 2014–15 (in French).

capacity will be strengthened by integrating a GBV specialist as part of the implementing agency and of the supervision consultant/supervising engineer. Awareness-raising activities on project-related risks of SEA/SH and mitigation strategies have been included in the SEP and will target communities and project workers, while contractual obligations in terms of SEA/SH mitigation will be enforced through the integration of specific provisions and sanctions in CoCs addressing SEA/SH and training of workers.

112. **Stakeholder engagement.** The project will ensure early, continuous, and inclusive (including vulnerable/disadvantaged groups) stakeholder engagement as documented in the SEP. Stakeholder and citizen engagement is at the heart of the project design and implementation by the nature of activities which require up-front consultation and effective participation and mobilization of beneficiaries in grid connections, customers identification and connection in mini-grids areas, electrification of public institutions, promotion of OGS for households and PUEs, and dissemination of clean cooking solutions. During implementation, beneficiaries' feedback will be sought through annual stakeholder surveys, and a database will be put in place to desegregate beneficiaries in women-headed households and businesses, refugees, and host communities, and urban and rural. The objective is to establish a systematic approach for stakeholder engagement, maintain a constructive relationship with them, build ownership, and consider stakeholders' views including refugees and host populations. The project will promote and provide the means for effective and inclusive engagement with project-affected parties and ensure that appropriate project information is disclosed to stakeholders in a timely, understandable, accessible, and appropriate manner. Consultations at the community level will be organized on an ongoing basis to involve communities in implementation, inform about implementation progress of the project interventions, and solicit beneficiaries' feedback. Findings and feedback from the consultations will be integrated into the project interventions.

113. **GRM.** The project will set up a project-specific GRM that will be specially designed to collect, review, and address stakeholders' complaints and grievances. The GRM, with multiple uptake locations, will be accessible to all stakeholders to report concerns or complaints if they feel affected by any of the subproject interventions. It will include specific procedures to address SEA/SH-related complaints with multiple accessible entry points; referral to GBV service providers; and confidential, survivor-centered complaint management protocols.

E. Gender

114. **Nearly all dimensions addressed by the project represent different aspects of gender gap in Chad.** Women in Chad are disadvantaged for education, employment opportunities, and asset ownership, among others. This is also true for the refugee population that is targeted by the project. Moreover, there is a higher ratio of females to males among the refugee population in Chad and a large number of children (54 percent of refugee population) in refugee camps and host villages, many of them living in female-headed households, which puts them at a further disadvantage. Female-headed households are on average more likely to be poorer than male-headed ones, affecting their opportunities to access electricity, with an apparent gap favoring male-headed households nationwide. Further barriers, such as lack of access to information and low financial inclusion, also lower female headed households' capacity to access services. Their income, productivity, and potentials for entrepreneurship are also negatively affected due to the lack of access to information and financing opportunities, as detailed in annex 3.

115. **The project will narrow several gender gaps.** Based on the analysis in annex 3, as well as planned further assessments, the project will narrow identified gender gaps by:

(a) Reducing disparity of access to electricity of poorer urban households and in particular female-headed households for mini-grid and off-grid operations. In addition to the already identified factors, including affordability challenges and low information access, which will be addressed through specific subsidies as well as targeted communication and awareness-raising efforts, a baseline assessment will be undertaken to determine further barriers and choose the most appropriate approach to alleviate them, such as loans or payment by installments;

(b) Increasing the uptake of productive uses to enhance women's livelihoods through the promotion of women-led businesses, for example, through business development programs. In addition, project-supported communication efforts will aim to target and potentially alter embedded perceptions and social norms by showcasing the possibility and advantages of entrepreneurship for women in general and in particular for women-owned and operated firms, with an added focus on specific activities more likely to be undertaken by them;

(c) Providing access to modern cooking solutions for women and in parallel sensitizing men and women on the importance and benefits of clean cooking solutions; and

(d) Assessing all project activities through a gender lens to ensure that activities do not inadvertently exclude women and find ways to incentivize their participation including through sensitization of males. The project will seek to include females proportionally in all activities. This means that because there are more women than men in refugee areas, the target for female beneficiaries will be higher than that for male beneficiaries. Women will be targeted for inclusion in planning committees, where relevant, and they will be incentivized to participate in and use all project-funded services and activities.

116. **The project will also support women's employment in the energy sector.** Employment opportunities will be created for female technicians and engineers in O&M activities. Limited sex-disaggregated data are available, but global data indicate that women are underrepresented in both technical and nontechnical roles and that the sector as a whole is male dominated. Field evidence further reports a near-complete lack of women in similar operations in Chad, which explains the baseline to be assessed as zero. The key barriers for accessing these jobs were assessed to stem primarily from lack of skills/education and social norms/lack of targeted recruitment. Therefore, private O&M companies will be mandated to train and employ female professionals to boost women's opportunities for joining the sector and help them overcome the key barrier of school-to-work transition and access to technical skills and men-dominated jobs. They will also be expected to accommodate women through a more equitable employment policy, which is currently lacking in most operations and limits employment possibilities.

117. **M&E.** Several indicators will monitor project progress with respect to gender, including

(a) A percentage of female-headed households provided with electricity access under the project. This indicator will track progress toward raising the share of electrified households that are female headed to 15 percent. This percentage is based on the level of their prevalence recently measured by the survey on the ability and willingness of households to pay for electricity, provided in annex 6, updating earlier data. This indicator will be applied to Component 1 and Subcomponent 2.3;

(b) A percentage of women technicians employed in O&M under Component 1 and Subcomponents 2.1 and 2.2, with a target of 20 percent; and

(c) Number of women-owned or operated MSMEs provided with solar PV-based electricity, with a target percentage that is closer to the Sub-Saharan average than the current lower share of these firms in Chad.

118. Additional output and gender-related indicators will be included in the PIM.

V. GRIEVANCE REDRESS SERVICES

119. Communities and individuals who believe that they are adversely affected by a World Bank supported project may submit complaints to existing project-level GRMs or the World Bank's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the World Bank's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of World Bank non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and World Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate GRS, please visit http://www.worldbank.org/en/projects-operations/products-and-services/grievance-redress-service. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

VI. KEY RISKS

120. The overall project risk is rated High due to high political and governance, institutional capacity for implementation and sustainability, security and fragility, and refugee-related risks, as well as substantial macroeconomics, sector strategies and policies, technical design, fiduciary, and environmental and social risks.

121. **Political and governance risk is rated High** due to (a) the political and security developments in Chad in April 2021 that resulted in establishment of a transition Government, and (b) the risk of the new Government pursuing the policy of maintaining political stability through alliances with influential stakeholders, which include security forces and powerful interest groups. This system has resulted in the past in an inefficient governance and kept Chad at the bottom of the Corruption Perceptions Index (CPI) for years. The country ranked 160 out of 180 countries in 2020 on CPI.[39]

122. **Macroeconomic risk is rated Substantial.** GDP contracted by 0.9 percent in 2020, and the poverty rate increased by 1 percentage point to 41.7 percent. The impact of containment measures on domestic supply chains pushed up prices, and inflation rose from −1.0 percent in 2019 to 3.5 percent in 2020. Both the fiscal and current account balances deteriorated substantially, and difficulties in financing fiscal deficit may have led to further domestic arrears' buildup. The pandemic has highlighted Chad's oil dependence and vulnerability to multiple and often concurrent shocks. However, economic growth is projected to gradually rise, due to the recovery in global oil markets, international trade, and economic activity in agriculture and industry. Chad experienced another year of recession, as the economy contracted by 1.2

[39] *https://www.transparency.org/en/cpi/2020/index/tcd*

percent in 2021 (-4.1 percent in per capita terms), after the 2020 growth contraction of 1.6 percent, due to political and security developments and a two-month suspension of oil production in Esso plants. Adverse macroeconomic developments may negatively impact the interest of the private sector in participation in the project activities. It is expected that combined interventions of the World Bank, IFC and MIGA will provide certain level of comfort to the private sector which will be reinforced by incentive scheme under the project.

123. **Sector strategies and policies risks are Substantial.** While the previous GoC made energy access a key priority and passed a framework electricity law that notionally liberalized the sector as well as created a regulatory body, implementation of these sector strategies has been slow. The reform and development agenda of a new Government that is expected to be in place in fall 2022 is being developed. Even if it maintains energy access and energy sector reforms among its top priorities, significant efforts and time will be required to develop the legal and regulatory framework of the sector with respect to by-laws, rules, and regulations that will have an impact on project outcomes. The World Bank has a significant TA program to support Government in developing and reforming the sector and increasing access.

124. **Technical design risks are Substantial.** While the project will only support well-established commercially available technologies with the combined interventions of the World Bank, IFC, and MIGA, there are significant uncertainties with respect to business models given the nascent stage of SSSs and mini-grids and markets that collectively are expected to play a major role in achieving the project target of boosting energy access from about 6 percent to 30 percent. The project will test different business models and scale up the ones that work the best in Chad.

125. **Institutional capacity for implementation and sustainability risks are High** as the two implementing entities—the MPE and SNE—have little experience with World Bank projects and overall would benefit from capacity strengthening. The two other energy bodies that will be involved in the project—the regulatory agency ARSE and the rural electrification agency ADERM—are relatively new and will require significant capacity building and support. To mitigate risks associated with the lack of experience and capacity constraints by the energy sector bodies, the MPE will delegate day-to-day implementation of the project activities (except for Subcomponents 1.1, 1.2, and 4.1 (b)) to a competitively selected experienced company that will serve as the MPE PIU and will need to be staffed as detailed in the section about project institutional arrangements. Subcomponents 1.1, 1.2, and 4.1 (b)) will be implemented by the SNE PIU, which was put in place in 2021 to implement the ongoing CCPIP. The SNE PIU is supported by a PMC that will assist SNE on both projects. The World Bank will provide close implementation support to both implementing agencies and their respective PIUs to ensure compliance with World Bank fiduciary, safeguards, and other requirements.

126. **Fiduciary risk is rated Substantial** as the energy sector agencies have limited experience in the new Procurement Regulations. This is accentuated by the lack of experience of the MPE in implementing fiduciary requirements in World Bank operations, by the fact that fiduciary staff are not yet in place, and the fact that the project will implicate many new/reorganized entities (SNE, SNE/PIU, CCPIP, the MPE/PIU, and so on) with low capacity in fiduciary-related matters. To mitigate those risks, PIUs will be set up under the MPE and SNE, and experienced fiduciary staff will be hired. The project will finance significant implementation support to the PIUs and to SNE and the MPE. In addition, the World Bank will closely monitor the procurement and FM aspects of the project.

127. **Environmental and social risks are rated Substantial given the scope and nature of investments, the risks and impacts arising from the activities, and the capacity of the implementing entity on implementing projects under the ESF.** While the project will result in reduction of GHG emissions, there are environmental risks and impacts identified relate to (a) vegetation clearing; (b) nuisances such as dust and noise; (c) poor construction-related waste management and disposal during the construction and exploitation phase including disposal of used batteries containing hazardous waste; (d) the potential impact of line construction and excavations on cultural heritage sites; (e) occupational health and safety issues related to civil works; (f) water use for solar PV; (g) impacts on birds and wildlife of distribution lines; (h) community health and safety; (i) occupational health and safety of workers and risks related to COVID-19; (j) water use for solar PV. The social risks include (a) the social context with high fragility and conflicts prevailing in the project areas; (b) anticipated land acquisition of proposed activities, expected economic displacement during civil works, disruptions on people's livelihoods, impacts on income-generating activities, and restrictions of access to resources; (c) potential community health and safety issues, including security; and (d) labor-related impacts including labor influx and child labor. In addition to this, the risk of SEA/SH has also been assessed to be Substantial using the World Bank SEA/SH screening tool.

128. Investments in solar PV panels could also face risk regarding the potential use of forced labor by suppliers of polysilicon. Under ESS2, where there is a significant risk of forced labor related to primary supply, the Recipient requires the primary supplier to identify those risks and if forced labor cases are identified, the recipient will require the primary supplier to take appropriate steps to remedy them. Ultimately, where remedy is not possible, the recipient will, within a reasonable period, shift the project's primary suppliers to suppliers that can demonstrate that they are meeting the relevant requirements of ESS2. Before beginning the procurement process, the Recipient will undertake a market analysis to identify the possible sellers of solar panels to the project. The bidding documents will emphasize forced labor risks in solar panels and components and will require that sellers of solar panels to the project not engage or employ any forced labor among their work force. Bidders will be required to provide two declarations: a Forced Labor Performance Declaration (which covers past performance) and a Forced Labor Declaration (which covers future commitments to prevent, monitor and report on any forced labor, cascading the requirements to their own subcontractors and suppliers). In addition, enhanced language on forced labor will be included in the procurement contracts. The World Bank will prior review procurements of solar panels and components to ensure that enhanced provisions are used by the Recipient.

129. **Other risk. Security and fragility-related risks are High.** Chad has been struggling with insecurity, conflict, and fragility for decades despite the long period of political stability, which however came under stress due to the violent death of the former Chad President in April 2021. Underscored by the 2021 Chad RRA, the underlying drivers of fragility, conflict, and violence include the elite capture of power and resources, geographical and social exclusion, lack of security and justice, or tension around access to resources. Since the first Boko Haram attack in Chad in 2015, there has been a dramatic rise in violence, particularly in the border areas with targeted and indiscriminate attacks on local authorities and leaders, security forces, and civilians with the Lake Chad region particularly affected. Inter and intracommunal conflicts, notably between farmers and herders, is also on the rise particularly in the south and east. Considering the security and fragility dimensions that in particular affect the poor, accounting for 42 percent of the Chad population, the bulk of access will be provided by SSSs that have proved to be one of the most adapted electrification options in high security risk and fragile environments with high poverty

incidence (for example, in Afghanistan). Project-supported investments in power systems will mostly be located in relatively secure areas. If infrastructure investments, requiring prolonged construction works are needed in high-risk locations, for instance, in the area of Lake Chad, the project may consider covering certain costs relating to the security arrangements to be carried out in the construction sites to ensure the safety of the crew and equipment. The security situation will be regularly reviewed and, whenever necessary, security recommendations will be updated.

130. **Other risks. Refugee-related risks are High**. Under the IDA19 eligibility process to the WHR, the World Bank, in consultation with the UNHCR, has confirmed that Chad's protection framework is adequate. However, the protection context remained complex and worsened with the outbreak of the COVID-19 pandemic. There was limited self-reliance and community resilience in refugee-hosting areas, as well as a recurrence of emergencies in the southern and eastern regions affected by intercommunal conflicts in Sudan and political tensions in the Central African Republic. These developments gave rise to domestic and gender-based violence and badly affected economic and financial opportunities for refugees. Furthermore, refugees keep facing multiple challenges related to poor agricultural practices, limited access to land, weak technical support, climate change, and poor water management. The project will work closely with the GoC and the UNHCR to improve the livelihood of refugees through the provision of energy services to households and community and public facilities, thus reducing security and GBV risks, as well as clean cooking to reduce the burden on women and girls. Citizen engagement and participation of host communities and refugees in the delivery of services will be of the highest importance to reinforce their protection.

VII. RESULTS FRAMEWORK AND MONITORING

Results Framework
COUNTRY: Chad
Chad Energy Access Scale Up Project

Project Development Objectives(s)

The PDO is to increase access to electricity and clean cooking in Chad.

Project Development Objective Indicators

Indicator Name	PBC	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
Increase access to electricity and clean cooking in Chad								
People provided with access to new or improved electricity service, out of which (Number)		0.00	265,000.00	1,139,500.00	1,563,500.00	1,574,100.00	1,579,400.00	6,121,500.00
Women (Number)		0.00	132,500.00	569,750.00	781,750.00	787,050.00	789,700.00	3,060,750.00
Refugees (Number)		0.00	0.00	100,000.00	100,000.00	100,000.00	100,000.00	400,000.00
Host communities (Number)		0.00	0.00	165,000.00	191,000.00	192,000.00	192,000.00	740,000.00
People provided with access to clean cooking, out of which (Number)		0.00	0.00	0.00	106,000.00	132,000.00	132,000.00	370,000.00
Refugees (Number)		0.00	0.00	0.00	53,000.00	66,000.00	66,000.00	185,000.00
Host communities		0.00	0.00	0.00	53,000.00	66,000.00	66,000.00	185,000.00

Indicator Name	PBC	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
(Number)								

Intermediate Results Indicators by Components

Indicator Name	PBC	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
Component 1: Electrification via grids								
New electricity connections in N'Djamena (Number)		0.00	0.00	5,000.00	15,000.00	15,000.00	15,000.00	50,000.00
New electricity connections (predominantly energized by solar PV and battery storage) in 12 secondary cities (Number)		0.00	0.00	5,000.00	15,000.00	15,000.00	15,000.00	50,000.00
Electricity connections (predominantly energized by solar PV and battery storage) in new cities and towns, out of which (Number)		0.00	0.00	5,000.00	15,000.00	17,000.00	18,000.00	55,000.00
In cities housing host communities (Number)		0.00	0.00	0.00	5,000.00	5,000.00	5,000.00	15,000.00
Female-headed households electrified under subcomponents 1.1 - 1.3 (Percentage)		0.00	15.00	15.00	15.00	15.00	15.00	15.00
Women technicians employed in O&M operations under		0.00	0.00	20.00	20.00	20.00	20.00	20.00

Indicator Name	PBC	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
subcomponents 1.1-1.3 (Percentage)								
Component 2: Electrification via standalone solar systems								
MSME provided with solar PV electricity, out of which (Number)		0.00	50.00	300.00	800.00	1,150.00	1,200.00	3,500.00
In areas housing refugees and host communities (Number)		0.00	0.00	50.00	100.00	150.00	200.00	500.00
Medical centers provided with solar PV electricity, out of which (Number)		0.00	100.00	230.00	240.00	240.00	40.00	850.00
In areas housing refugees and host communities (Number)		0.00	0.00	30.00	40.00	40.00	40.00	150.00
Schools provided with solar PV electricity, out of which (Number)		0.00	50.00	150.00	300.00	150.00	50.00	700.00
In areas housing refugees and host communities (Number)		0.00	0.00	50.00	50.00	50.00	50.00	200.00
SHS delployed, out of which (Number)		0.00	50,000.00	200,000.00	250,000.00	250,000.00	250,000.00	1,000,000.00
In areas housing refugees and host communities (Number)		0.00	0.00	50,000.00	50,000.00	50,000.00	50,000.00	200,000.00
Female-headed households (Number)		0.00	7,500.00	30,000.00	37,500.00	37,500.00	37,500.00	150,000.00
Component 3: Clean cooking and natural resource management								
Community forest resources under integrated		0.00	0.00	100.00	100.00	100.00	100.00	400.00

Indicator Name	PBC	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
and participative management (Hectare(Ha))								
Component 4: Project management and technical assistance								
Project related grievances registered and addressed within the project's GRM timeframe (Percentage)		0.00	90.00	95.00	100.00	100.00	100.00	100.00
ADERM developed an energy access program, including refugees and host communities (Yes/No)		No	No	Yes	Yes	Yes	Yes	Yes

Monitoring & Evaluation Plan: PDO Indicators

Indicator Name	Definition/Description	Frequency	Datasource	Methodology for Data Collection	Responsibility for Data Collection
People provided with access to new or improved electricity service, out of which		Quarterly	Sales reports of SHS suppliers, verification reports of verification agents, progress reports of PIU	Data provided by suppliers of SHS and verified by an independent verification agent	PIU of the Ministry of Petroleum and Energy

Women		Quarterly	Sales reports of SHS suppliers, verification reports of verification agents, progress reports of PIU	Data provided by suppliers of SHS and verified by an independent verification agent	PIU of the Ministry of Petroleum and Energy
Refugees		Quarterly	Sales reports of SHS suppliers, verification reports of verification agents, progress reports of PIU	Data provided by suppliers of SHS and verified by an independent verification agent	PIU of the Ministry of Petroleum and Energy
Host communities		Quarterly	Sales reports of SHS suppliers, verification reports of verification agents, progress	Data provided by suppliers of SHS and verified by an independent verification agent	PIU of the Ministry of Petroleum and Energy

			reports of PIU		
People provided with access to clean cooking, out of which		Quarterly	Reports of verification agents, progress report of PIU	Data provided by PIU and verified by an independent verification agent	PIU of the Ministry of Petroleum and Energy
Refugees		Quarterly	Reports of verification agents, progress report of PIU	Data provided by PIU and verified by an independent verification agent	PIU of the Ministry of Petroleum and Energy
Host communities		Quarterly	Reports of verification agents, progress report of PIU	Data provided by PIU and verified by an independent verification agent	PIU of the Ministry of Petroleum and Energy

Monitoring & Evaluation Plan: Intermediate Results Indicators					
Indicator Name	**Definition/Description**	**Frequency**	**Datasource**	**Methodology for Data Collection**	**Responsibility for Data Collection**
New electricity connections in N'Djamena		Quarterly	Reports of SNE, progres s reports of PIU	Data provided by SNE operational units and Owner's Engineer	PIU of SNE

New electricity connections (predominantly energized by solar PV and battery storage) in 12 secondary cities		Quarterly	Reports of SNE, progres s reports of PIU	Data provided by SNE operational units and Owner's Engineer	PIU of SNE
Electricity connections (predominantly energized by solar PV and battery storage) in new cities and towns, out of which		Quarterly	Progress reports of the PIU of the Ministry of Petroleum and Energy	Data will be collected by M&E specialists of the PIU of Ministry of Petroleum and Energy from progress reports made by private operators and checked through site visits.	PIU of the Ministry of Petroleum and Energy
In cities housing host communities		Quarterly	Reports of SNE, progres s reports of PIU	Data provided by SNE operational units and Owner's Engineer	PIU of SNE
Female-headed households electrified under subcomponents 1.1 - 1.3		Quarterly	Reports of SNE, progress reports of PIU	Data provided by SNE operational units and Owner's Engineer	PIU of SNE
Women technicians employed in O&M operations under subcomponents 1.1-1.3		Quarterly	Reports of SNE, progress reports of PIU	Data provided by SNE operational units and Owner's Engineer	PIU of SNE

MSME provided with solar PV electricity, out of which		Quarterly	Sales reports of SSS suppliers, reports of verification agents, progress reports of PIU	Data provided by suppliers of SSS and verified by an independent verification agent	PIU of the Ministry of Petroleum and Energy
In areas housing refugees and host communities		Quarterly	Sales reports of SHS suppliers, verification reports of verification agents, progress reports of PIU	Data provided by suppliers of SHS and verified by an independent verification agent	PIU of the Ministry of Petroleum and Energy
Medical centers provided with solar PV electricity, out of which		Quarterly	Sales reports of SSS suppliers, reports of verification agents, progress reports of PIU	Data provided by suppliers of SSS and verified by an independent verification agent	PIU of the Ministry of Petroleum and Energy

In areas housing refugees and host communities		Quarterly	Sales reports of SSS suppliers, verification reports of verification agents, progress reports of PIU	Data provided by suppliers of SSS and verified by an independent verification agent	PIU of the Ministry of Petroleum and Energy
Schools provided with solar PV electricity, out of which		Quarterly	Sales reports of SSS suppliers, reports of verification agents, progress reports of PIU	Data provided by suppliers of SSS and verified by an independent verification agent	PIU of the Ministry of Petroleum and Energy
In areas housing refugees and host communities		Quarterly	Sales reports of SSS suppliers, verification reports of verification agents, progress reports of PIU	Data provided by suppliers of SSS and verified by an independent verification agent	PIU of the Ministry of Petroleum and Energy

SHS delployed, out of which		Quarterly	Sales reports of SHS suppliers, reports of verification agents, progress reports of PIU	Data provided by suppliers of SHS and verified by an independent verification agent	PIU of the Ministry of Petroleum and Energy
In areas housing refugees and host communities		Quarterly	Sales reports of SHS suppliers, reports of verification agents, progress reports of PIU	Data provided by suppliers of SHS and verified by an independent verification agent	PIU of the Ministry of Petroleum and Energy
Female-headed households		Quaterly	Reports of verification agents, progress reports of PIU	Data provided by PIU and verified by an independent verification agent	PIU of the Ministry of Petroleum and Energy
Community forest resources under integrated and participative management		Quaterly	Reports of verification agents, progress reports of	Data provided by PIU and verified by an independent verification agent	PIU of the Ministry of Petroleum and Energy

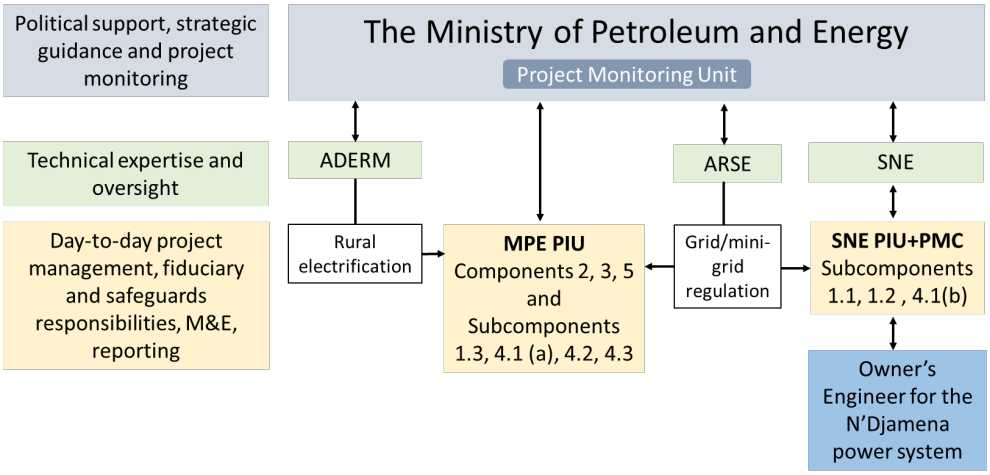
			PIU		
Project related grievances registered and addressed within the project's GRM timeframe		Quarterly	progress reports of PIU	Data provided and verified by an independent verification agent	PIU of the Ministry of Petroleum and Energy
ADERM developed an energy access program, including refugees and host communities		Quarterly	Progress reports of PIU	Data provided and verified by an independent verification agent	PIU of the Ministry of Petroleum and Energy

ANNEX 1: Implementation Arrangements and Support Plan

Project Institutional and Implementation Arrangements

1. **The MPE will provide the overall policy, strategic guidance, and steering of the entire project.** In addition, the ministry will serve as a high-level implementing entity of all project components, except for Subcomponents 1.1, 1.2, and 4.1(b). The ministry will establish a project monitoring unit that will be staffed with local experts, competitively selected according to terms of references (TORs) to be agreed with the World Bank. The monitoring unit will assist the ministry to closely supervise project implementation and coordinate project activities with government agencies involved in the project. The ministry will be supported by ARSE and ADERM. The MPE will delegate day-to-day project implementation to a competitively selected entity that will be contracted by the ministry and will serve as a ministry PIU. The PIU will be staffed with fiduciary specialists and technical and safeguards experts and specialists in other areas required for project implementation, including, rural electrification, mini-grids, energy access for refugees and host communities, and clean cooking. Also, the PIU would need to have a unit to handle the payment of RBF subsidies. Alternatively, this function can be contracted out to a payment agent. Procurement of the MPE PIU is expected to commence before project effectiveness with the objective of completing it and signing the contract shortly after effectiveness. Until that time, the existing SNE PIU can support the MPE on select project activities. To ensure coordination and smooth implementation, all concerned agencies and ministries, including the ARSE; ADERM; CNARR; and the Ministries of Education, Health, and Agriculture will appoint a focal point for the project.

Figure 1.1. Project Implementation Arrangements



Note: M&E = Monitoring and Evaluation; PMC = Project Management Consultant.

2. **SNE will be the implementing entity for subcomponents 1.1, 1.2, and 4.1(b) as these will support grid electrification falling under the responsibility of SNE.** Furthermore, subcomponent 1.1 concerns electrification of N'Djamena that is also supported under the ongoing CCPIP that is implemented by SNE. Day-to-day implementation and supervision will be carried out by the SNE PIU that is responsible for the implementation of the CCPIP and supported by a PMC. The SNE PIU will also be supported by an Owner's Engineer who will be hired under the CCPIP to carry out studies and help SNE prepare bidding documents and supervise investments in the N'Djamena power system that will be financed by both the CCPIP and

the proposed CEASP. For environmental and social risk management, the SNE PIU is already staffed with key specialists in environmental and social safeguards. A capacity assessment was conducted during preparation to assess the PIU's ability to implement this project under the ESF and this confirmed that further capacity building will be required to strengthen the PIU in this area. In addition, to ensure proper O&M of transmission lines and substations constructed, SNE will require capacity building to strengthen their management and monitoring of occupational safety risks, environmental and social risks, and impacts related to transmission lines and substations. SNE will remain responsible for ensuring that environmental and social commitments are met throughout the life of the proposed project. The SNE PIU can assist the MPE with carrying out fiduciary and safeguards functions with respect to select project priority activities, until the MPE PIU is contracted and mobilized. This temporary arrangement between the MPE and the SNE PIU will need to be formalized in line with the practice established under some other projects supported by the World Bank in Chad.

3. **The MPE and SNE will prepare a PIM detailing the organizational and technical procedures that govern the project**, including financial management (FM), procurement, social and environmental safeguards procedures, and GRM. It will also include detailed TOR for all the PIUs' staff. The GRM will facilitate citizen engagement and timely resolutions of project-related issues and concerns expressed by the public.

Financial Management

4. FM action plans for MPE and SNE are presented below.

Table 1.1. FM Action Plan (MPE)

No.	Activity	Deadline	Responsible Entity
1	Recruit an entity to serve as the PIU, including an FM specialist and an accountant with qualification and experience acceptable to the World Bank.	Before disbursements under components managed by the MPE[40]	MPE
2	Open one DA in a commercial bank under terms and conditions acceptable to IDA.	No later than one month after the Effective Date	MPE
3	Acquire and install an accounting software acceptable to the World Bank.	No later than three months after the Effective Date	MPE PIU
4	Elaborate and adopt a PIM, including RBF subsidy procedures and verification protocols, in form and content satisfactory to World Bank	Before disbursement, as defined in point 1 above	MPE
5	Adopt the project FM manual.	Before disbursement, as defined in point 1 above	MPE PIU
6	Recruit an IVA to evaluate and monitor the achievement of results for the granting of RBF subsidy.	Before payment of any RBF subsidies including CAPEX subsidies	MPE
7	Prepare the TORs of the internal auditor for the CCPIP and CEASP.	Within one month following effectiveness	MPE

[40] Disbursements for consulting services under subcomponent 1.3 and goods, works, and non-consulting and consulting services under Subcomponent 2.2 can be supported by the SNE PIU until the MPE PIU is in place but no later than December 31, 2022.

No.	Activity	Deadline	Responsible Entity
8	Recruit an independent external auditor for the CCPIP and CEASP, with TOR and qualifications acceptable to the Association.	Within six months following effectiveness	MPE

Table 1.2. FM Action Plan (SNE)

No.	Activity	Deadline	Responsible Entity
1	Sign the Project Agreement between the Republic of Chad and SNE defining the conditions of implementation of Subcomponents 1.1, 1.2, and 4.1(b) of the project.	Before effectiveness	SNE
2	Open one DA in a commercial bank under terms and conditions acceptable to IDA.	Within one month of effectiveness	SNE
3	Elaborate and adopt an SNE part of the PIM and update the existing SNE FM manual by including the CEASP.	Before disbursement	SNE
4	Recruit an accountant fully dedicated to the project.	Within three months of effectiveness	SNE
5	Tailor current accounting software in use by the SNE PIU to fit project needs and generate useful information and financial statements.	Within three months following effectiveness	SNE PIU

5. The table below specifies categories of eligible expenditures.

Table 1.3: IDA Grant Categories of Eligible Expenditure

Category	Amount of the Grant Allocated (expressed in SDR)	Percentage of Expenditures to be Financed (inclusive of Taxes)
(1) Goods, works, non-consulting services, consulting services, Operating Costs and Training for Parts 1.1, 1.2 and 4.1(b) of the project	77,614,000	100%
(2) Goods, works, non-consulting services, consulting services, Operating Costs and Training for Part 1.3 (except consulting services under Part 1.3(a)), Part 2 (except goods, works, non-consulting and consulting services under Part 2.2(a)), Part 3, Part 4.1(a) (except consulting services, Operating Costs and Training under Parts 4.1(a)(ii) and (iii)), and Part 4.3 of the project	38,088,000	100%
(3) Consulting services under Part 1.3(a); goods, works, non-consulting and consulting services under Part 2.2(a); consulting services, Operating Costs and Training under Part 4.1(a)(ii) and (iii); and goods, consulting and non-consulting services, Operating Costs and Training under Part 4.2 of the project	7,186,000	100%
(4) Capital Expenditures Subsidies and RBF Subsidies under Parts 1.3(b), 2.1(a) and 3.2 of the project	89,112,000	100%
(5) Emergency Expenditures under Part 5 of the project	0	100%
Total amount	212,000,000	

Procurement

6. **Goods works and non-consulting services will be procured** in accordance with the requirements set forth or referred to in 'Section VI. Approved Selection Methods: Goods, Works, and Non-Consulting Services of the Procurement Regulations', and the consulting services will be procured in accordance with the requirements set forth or referred to in 'Section VII. Approved Selection Methods: Consulting Services of the Procurement Regulations'. All these requirements have been reflected in the PPSD and are reflected in the Procurement Plan approved by the World Bank.

7. **Procurement information and documentation, filing, and database.** Procurement information will be recorded and reported by the PIUs as follows: (a) complete procurement documentation for each contract, including bidding documents, advertisements, bids received, bid evaluations, letters of acceptance, contract agreements, securities, and related correspondence will be maintained at the level of respective PIUs in an orderly manner, readily available for audit: and (b) contract award information will be promptly recorded and contract rosters, as agreed, will be maintained.

8. **Training, workshops, study tours, and conferences.** Training (including training material and support), attendance to workshops and conferences based on individual or group needs, and on-the-job training, will be carried out based on an approved annual training and workshop/conference plan, which will identify the general framework of training activities for the year. A detailed plan and TOR providing the nature of training/workshop, number of trainees/participants, duration, staff months, timing, and estimated costs will be submitted to IDA for review and approval before initiating the process. The appropriate methods of selection will be derived from the detailed schedule. After the training, each beneficiary will be requested to submit a brief report indicating what skills have been acquired and how these skills will contribute to enhance his/her performance and contribute to attainment of the PDO. Reports by the trainees, including completion certificate/diploma upon completion of training, shall be provided to the project coordinators, will be kept as parts of the records, and will be shared with the World Bank if required.

9. **Operating costs.** Operating costs financed by the project are incremental expenses, incurred by the PIUs or its regional representations, based on the annual work plans and budgets as approved by IDA, on account of project implementation, management, and M&E, including office supplies; bank charges; vehicles operation; maintenance and insurance; maintenance of equipment and buildings; communication costs; travel and supervision costs (that is, transport, accommodation, and per diem); costs related to utilities and office space rental; and salaries of contracted and temporary staff. The related goods/services will be procured using the procurement procedures specified in the PIM and accepted and approved by the World Bank.

10. **Procurement assessment of the SNE PIU.** Procurement capacity of the existing SNE PIU is overall satisfactory. It is currently rated Moderately Satisfactory according to the last PRAMS.[41] Table 1.4 summarizes the main risks/issues and mitigation actions to be taken by SNE.

[41] PRAMS = Procurement Risk Assessment and Management System.

Table 1.4. Procurement Assessment of the SNE PIU

Risk/Issue	Action	Timeline
Insufficient procurement staffing to manage both the CCPIP and CEASP.	Reinforce the procurement team of the PIU by hiring a procurement specialist, satisfactory to the World Bank.	Within two months after effectiveness
Delays in (a) bidding process due to delay in preparation of technical inputs, (b) approval of bid evaluation reports, and (c) contracts execution.	Put in place (a) mechanisms to anticipate the preparation of technical inputs in bidding documents: TOR for consulting services, technical specifications for goods (and eventually works) and (b) contract management plans for major contracts or critical contracts. Train all the new members of the SNE tender committee. Ensure that (a) the World Bank's prescriptions in fighting fraud and corruption are included in all bidding documents and contracts and (b) there are mechanisms to enforce it for borrower's staff involved in procurement processes and for private sector operators.	Within two months after effectiveness Throughout project implementation

11. **Procurement assessment of the MPE PIU.** The MPE will delegate day-to-day management of the project, including procurement, to a competitively selected entity that will function as the MPE PIU. The main procurement-related risks identified at appraisal are related to the country procurement system, which may cause delays, inadequate communication, insufficient competition, and poor contract management and filling. Table 1.5 summarizes main risks/issues and mitigation actions.

Table 1.5. Procurement Assessment of the MPE PIU

Risk/Issue	Action	Responsibility	Timeline
Inadequate procurement capacity of the PIU	Agree with the World Bank on TOR for the PIU, including requirements for a senior procurement specialist	MPE	End of March 2022
National administrative routines may result in procurement delays	Exercise quality control on all aspects of the procurement process, including developing TORs, technical specifications, bidding documents, proposals, request for quotations, evaluation, and award. Monitor, on a regular basis, the Procurement Plan's implementation and set up a close follow-up in relation with beneficiaries to ensure that appropriate actions are taken on time. Ensure that all government approvals related to project procurement are obtained on time.	MPE/PIU	Throughout project implementation
Inadequate communication and interaction between the beneficiaries and the PIU, which may lead to delays in procurement	Develop a procurement section in the PIM to clarify the role of each team member involved in the procurement process of the project and the maximum delay for each procurement stage, specifically concerning	MPE/PIU	Within six months after effectiveness

Risk/Issue	Action	Responsibility	Timeline
processes and poor estimation of the costs	the review, approval system, and signature of contracts.		
Procurement in a specialized market in a fragile area with few bidders can restrict competition and possibly increase prices and collusion risks	Organize training on the Anti-Corruption Guidelines in collaboration with Integrity Vice Presidency (Preventive) for the PIU.	MPE/World Bank	Within three months after effectiveness
Poor contract management and administration of big contracts	Develop contract management plans for prior review. Keep large-value works on team's radar for regular follow-ups with support from technical and safeguard team members, as may be needed for review.	MPE/PIU/World Bank	Within two months after effectiveness
Poor filing which can lead to loss of documents	Put in place a filing system at the PIU l to ensure compliance with World Bank procurement filing manual.	PIU	Throughout project implementation

12. **Frequency of procurement reviews and implementation support.** The World Bank's prior and post reviews will be carried out based on thresholds indicated in table 1.6. IDA will conduct six-monthly implementation support missions and annual post-procurement reviews. The standard post-procurement reviews by the World Bank should cover at least 10 percent of contracts subject to post review. Post reviews consist of reviewing technical, financial, and procurement reports on project procurement actions by the World Bank. Project implementation support missions shall include a World Bank procurement specialist or a specialized consultant. The World Bank may also conduct an independent procurement review at any time until two years after the closing date of the project.

13. **Procurement prior review.** The procurement risk is rated Substantial. Table 1.6 summarizes the procurement prior review for Substantial risk. These prior review thresholds can evolve according to the variation of procurement risk during the life of the project.

Table 1.6. Procurement Prior Review Thresholds (US$, millions)

Type of Procurement	Thresholds
Works	10.0
Goods, Information technology, and non-consulting services	2.0
Consulting firms	1.0
Individual consultants	0.3

14. **PPSD and Procurement Plan.** The different approaches, the selection methods for prequalification, estimated costs, prior review requirements, and time frame are agreed between the recipient and the World Bank in the Procurement Plans.

15. **All procurement approaches may be subject to revision and subsequent PPSD and Procurement Plan updated along the project life based on ground realities**. A contract management plan must be drawn up as soon as each prior review contract is signed.

Overall Implementation Support Plan

16. The project will require a substantial level of implementation support, particularly in the early years. Technical specialists and consultants from the World Bank will continue to be involved in supporting the participating agencies in implementation of the activities under the project. Implementation support will be provided through regular mission (two missions per year at minimum) as well as continuous hand-holding support. On an as-required basis, additional technical and thematic missions could also be organized to support MPE and SNE on specific issues. During implementation support missions, PDO and the results framework will be used for monitoring progress; evaluating impact and effectiveness; and adjusting the project design, when necessary.

17. Tables 1.7 and 1.8 outline the expected skills mix and staff weeks and travel required to make sure the actions and schedule are appropriately resourced.

Table 1.7. Overall Implementation Support Plan

Time	Focus	Skills Needed	Annual Resources Estimate (US$)
Years 1–2	• Establish working arrangements • Build capacity (safeguards, FM, and procurement) • Finalize investments design, ToR, and bidding documents • Procurement • Safeguard assessments and implementation • Gender and GBV action plans	Engineering (power systems), solar technology, mini grid, clean cooking, procurement, environmental and social, gender, SEA/SH	300,000
Years 3–5	• Technical implementation support • Social and environmental safeguard implementation support • Gender and GBV activities (training, baseline assessment and data collection, and enhancing productive and social services) • M&E implementation support • FM and procurement • Implementation support	Specialists in power systems; solar electrification (households, public institutions, and productive uses of energy); mini grids; clean cooking; environmental and social; gender and SEA/SH; M&E; FM; and procurement	250,000

Source: World Bank staff.

Table 1.8. Team Skills Mix

Skills Needed	Annual Number of Staff Weeks	Annual Number of International Trips	Comments
Senior energy specialist (task team leader)	10	3	International
Energy specialist	12	0	Field based

Skills Needed	Annual Number of Staff Weeks	Annual Number of International Trips	Comments
Off-grid electrification	8	3	International
Mini grid	5	2	International
Clean cooking	5	2	International
Procurement	4	0	Field based
FM	3	0	Field based
Social	4	0	Field based
Environmental	4	0	Field based
Gender	2	1	International
SEA/SH	2	1	International
M&E	3	0	Field based

Source: World Bank staff.

ANNEX 2: Refugees and Host Communities

1. As of December 2021, Chad was hosting more than 560,000 refugees and asylum seekers settled in 20 camps and a city in the East, South, and Lake Chad regions across nine provinces, as detailed in Table 1.1 and the UNHCR map provided at the end of the annex. Five provinces host about 80 percent of the refugees. These include four eastern provinces: Ouaddai (26 percent), Wadi Fira (24 percent), and Sila (12 percent), Ennedi Est (6 percent), and a southern province: Logone Oriental (11 percent). In the East, around 376,000 Sudanese refugees are settled along the border having fled violence in Darfur, many living there for more than a decade. In the south, Chad hosts around 123,880 refugees from the Central African Republic, the majority of whom have been in exile for more than a decade. In Lake Chad, some 19,650 Nigerian refugees who fled Boko Haram now reside in the area on Chad's western border with Nigeria, Niger, and Cameroon. More recently, intercommunity tensions led to the arrival (August 2021–January 2022) of about 35,900 refugees from Cameroon. An additional number of about 4,970 refugees of different origins live scattered in the different camps as well as around 406,570 IDPs in the Lake Chad area. Camps are managed by CNARR and the UNHCR.

2. CNARR works with the UNHCR and other partners to register new arrivals, issue documentation, and administer refugee camps and sites. It also serves as a technical adviser to the GoC on durable solutions, notably on voluntary repatriation agreements or resettlement. Refugees receive support from a variety of donors including the World Bank; European Union's Humanitarian Office; the United States Bureau of Population, Refugees, and Migration; the United Nations Central Emergency Response Fund; Canada; Switzerland; Educate a Child Programme; Germany; and the Bill and Melinda Gates Foundation.

3. The Government Development Policy for Refugees and Host Communities was shared with the World Bank in July 2017 as part of the initial eligibility process. Substantial progress has been made to support refugees since then, as confirmed by the GoC in an update to the GoC Development Policy, shared with the World Bank on August 7, 2021, and comprising the following elements:

(a) The dedicated agency (CNARR) was set up within the GoC to manage refugee protection with support from line ministries, local authorities, and the UNHCR. It is present in all 20 refugee camps and most refugee-hosting areas. It is housed at the Ministry of Territorial Administration and Decentralization.

(b) Chad developed an action plan to implement a Comprehensive Refugee Response Framework in September 2018. The plan includes[42] (i) out-of-camp strategy: 65 percent of new arrived refugees from Central African Republic were placed directly in hosting villages; (ii) alternative to camps: CNARR launched the process of 'villagization'(this was done through a pilot phase whereby refugee groups in the three camps of Amboko, Gondje, and Djabal were moved to host communities to live alongside them); (iii) integrated education: 108 schools and 10 vocational and training centers, which were built in refugee's camps and integrated in the National Education System; and (d) integrated health: refugees were included in the national health system following an agreement signed by the Ministry of Health and the UNHCR.

(c) A ministerial-level high committee integrating representatives of all sectors contributing to the refugee agenda was established in 2019 through a Presidential Decree to provide policy, strategic, and technical guidance 'for better protection and treatment of refugees and host communities as

[42] *https://globalcompactrefugees.org/article/chad*

well as for the harmonious development of refugee reception areas'. A technical-level working group has also been put in place.

(d) The Asylum Law was enacted in December 2020. The law significantly advances protection practices for refugees and asylum seekers, including freedom of movement; the right to work; and access to health care, education, and justice.

4. Poverty is as widespread among refugees as it is among their host communities. Food insecurity poses a serious threat to all refugees and their hosts; it is particularly acute for Central African refugees. Refugees and host communities have the same opinion on the causes of poverty: the scarcity of jobs and, especially among Sudanese refugees, the lack of access to land. The well-being of most refugees and host communities is highly sensitive to shocks (health shocks, food insecurity/ food price increases, natural disasters, climate change, and food insecurity), which exacerbates their precarious conditions. Although health care, education, and other services benefiting to refugees have since been extended to host communities, some disparities persist in these areas, with refugees being occasionally better served. A combination of initial assets, share capital, and human capital is required for long-term improvement of living condition of communities.

5. Refugees and host communities lack access to electricity and modern/clean cooking. Energy access-related issues are especially acute in the northeast region of Chad that hosts more than two-thirds of refugees. This geographical zone is arid semidesert with limited biomass resources, which causes a chronic lack of access even to primary energy resources, causing negative impacts on the refugee safety, health, nutrition, and livelihoods. Access to sufficient fuel for cooking is a major challenge, and the consumption of firewood is a driver of environmental degradation and a major source of protection risk, especially for women and children who are mostly tasked with gathering firewood. Shortage of fuel for cooking causes competition for these resources and tensions between refugees and nearby host communities. Alleviating energy deprivation can provide significant benefits associated with better lighting, protection, gender equality, food security, water, sanitation and health, education, livelihoods, connectivity, and environmental protection.

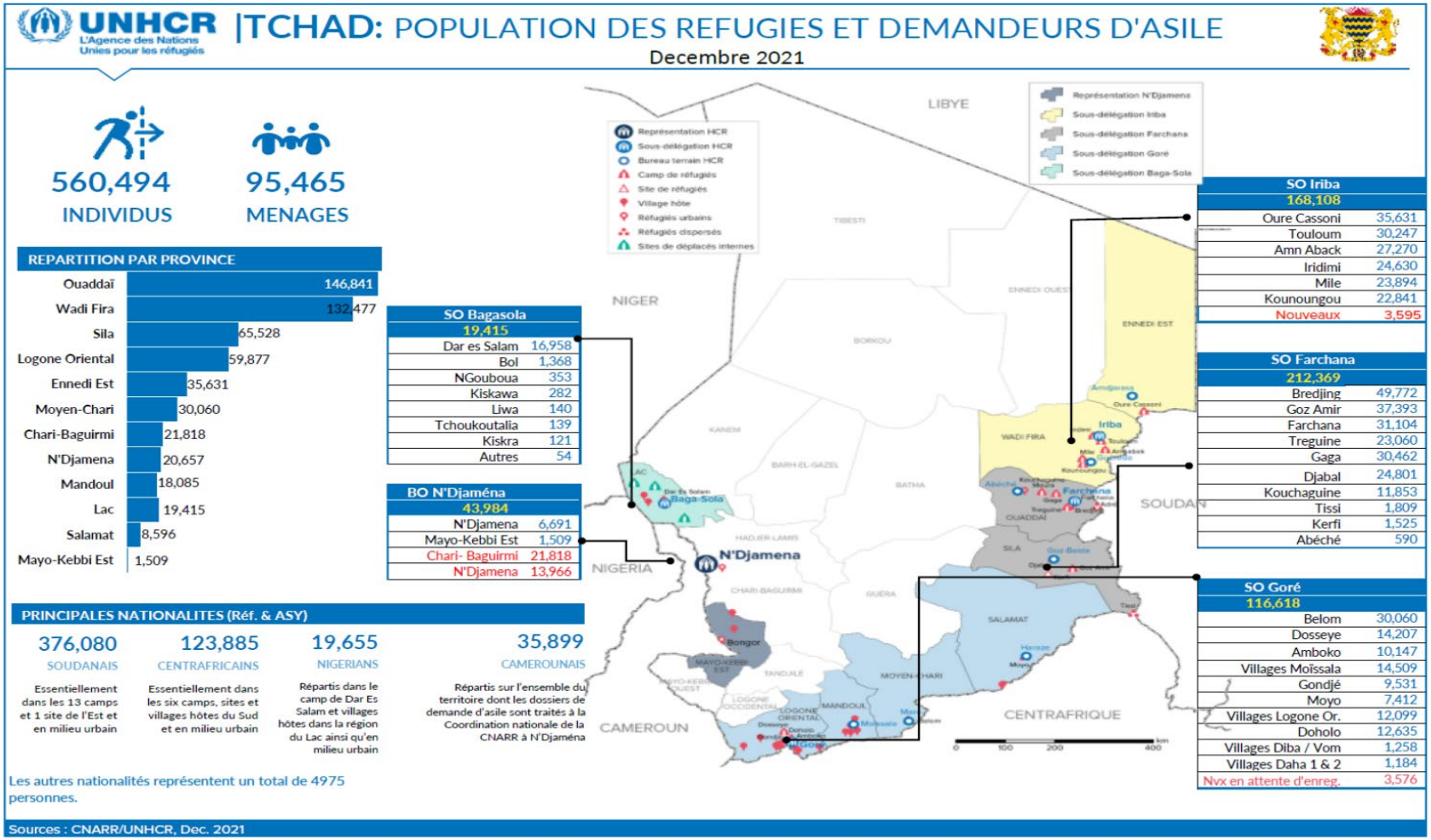
6. The project aims to alleviate energy deprivation of about 400,000 refugees from 20 refugee camps and a city and 740,000 people from host communities located within 25 km from refugee camps, including both rural areas and cities. In addition, it will provide electricity access for 150 medical centers and 200 schools that are located in areas comprising refugee camps and host communities, as well as for 500 PUEs. The eligibility criteria of 25 km for host communities was replicated from the ongoing PARCA that aims to (a) improve access of refugees and host communities to basic services, livelihoods, and safety nets in seven provinces and (b) strengthen country systems to support refugees. Synergies will be exploited between the project and PARCA. The activities of the project will align with preexisting and ongoing initiatives from the UNHCR and implementing partners toward better energy access for refugees. In particular, targeting of refugees will be coordinated with them through already available data, and capacity building of refugees in implementation and maintenance could be provided by the UNHCR. The project will adapt as needed to changing circumstances during implementation with respect to focus sites/areas, including the ability to serve new refugee camps and nearby host communities.

Table 2.1. Population in Refugee Camps and Host Communities

#	Province	Refugee Camps	Population of Refugee Camps as of December 2021	Population of Host Communities within 25 km from Refugee Camps
1	Ennedi Est	Ouré Cassoni	35,631	51,750
2	Lac	Dar Es salam	16,958	55,580
3		Out of camps	2,457	—
4	Logone Oriental	Dosseye	14,207	64,754
		Doholo	12,635	25,934
5		Amboko	10,147	20,088
7		Gondje	9,531	12,302
8		Out of camps	13,357	—
9	Mandoul	Moissala	14,509	92,778
10	Moyen Chari	Belom	30,060	74,457
	Salamat	Moyo	7,412	17471
11		Out of camps	1,184	—
12	Sila	Goz Amir	37,393	25,814
13		Djabal	24,801	49,637
14		Out of camps	3,334	—
15	Ouaddai	Bredjing	49,772	30,358
16		Farchana	31,104	99,487
17		Gaga	30,462	92,969
18		Treguine	23,060	73,910
19		Kouchaguime Mora	11,853	49,658
20		Out of camps	590	—
21	Wadi Fira	Touloum	30,247	28,329
22		Iridimi	24,630	45,599
23		AmnAback	27,270	39,230
24		Mile	23,894	49,651
25		Kounoungou	22,841	55,134
26	Other out of camps	South new arrivals	3,576	—
27		Chari Baguirmi new arrivals	21,818	—
28		N'Djamena	20,657	—
29		East new arrival	3,595	—
30		Mayo-Kebbi Est	1,509	—
	Total	**560,494**	**1,054,890**	

Source: CNARR/UNHCR, December 2021.

Figure 2.1. UNHCR Data on Refugees and Asylum Seekers in Chad



ANNEX 3: Gender Gap Analysis

Rationale: Why a Focus on Gender in Energy Matters

1. Access to reliable household energy, clean and efficient cookstoves, or productive-use equipment can reduce energy poverty and time spent on drudgery and give women and men additional income-earning opportunities. In Chad, some key elements to consider include the following:

(a) **Distribution of household heads.** About 22.1 percent of households in Chad are headed by females. The share is slightly higher in urban areas in general (23.6 percent); it is lower in N'Djamena (19.3 percent),[43] as detailed in Table 3.1. However, the project target with respect to electrification of female-headed households is set at 15 percent according to more recent data on the share of female-headed households in Chad that are provided in annex 6.

Table 3.1. Households by Sex of Head and Location

Location	Male (%)	Female (%)
Nationwide	78.0	22.1
Urban	76.5	23.6
Rural	78.4	21.6
N'Djamena	80.7	19.3

Source: Chad DHS (2015) and author's calculations.

(b) **Access to electricity by sex, location, and wealth.** About 7.7 percent of all households have access to electricity in Chad. Male-headed households present higher access to electricity (8.3 percent of all male-headed households versus 5.7 percent of female-headed households). This gender gap persists when looking at urban and rural locations or wealth quintiles. In the urban areas, the rates of male- and female-headed households with access are 35.5 percent and 22.6 percent, respectively. In rural areas, the rates are 0.8 percent and 0.4 percent. Last, the rates in N'Djamena are 51 percent for male-headed households and 43.8 percent for female-headed households.

Table 3.2. Households with Access to Electricity, by Sex of Head and Location

Location	Male (%)	Female (%)	All (%)
Nationwide	8.3	5.7	7.7
Urban	35.5	22.6	32.5
Rural	0.8	0.4	0.7
N'Djamena	51.0	43.8	49.6

Source: Chad DHS (2015) and author's calculations.

2. The gap in electricity access is also visible when looking at quintiles of wealth, although it only becomes sizable for the highest quintile. From all male-headed households in the top quintile, 40.9 percent have access to electricity while the same figure is 29.79 percent for female-headed households.

Table 3.3. Households with Access to Electricity, by Sex of Head and Wealth Quintile

Location	Male (%)	Female (%)	All (%)
Poorest	0.01	0.03	0.01

[43] The data on the distribution of household heads were updated by a survey on ability and willingness of households to pay for electricity services, completed in 2021. Details are provided in annex 6.

Location	Male (%)	Female (%)	All (%)
Poorer	0.22	0.01	0.18
Middle	0.54	0.05	0.46
Richer	1.52	1.52	1.52
Richest	40.86	29.79	38.50

Source: Chad DHS (2015) and author's calculations.

3. **Access to electricity for cooking.** Most households in Chad rely on wood for cooking (87.8 percent) followed by charcoal (6.5 percent of all households). Only 2.9 percent of households use electricity, LPG, or natural gas as their main fuel for cooking. About 3.1 percent of male-headed households rely on either of these fuels compared to 2.1 percent of female-headed households.

4. **Income and productive asset ownership.** Women see their productive activities constrained due to high fertility and limited agency and access to resources. Chad has one of the highest fertility rates in the world (5.8 births per women), which severely affects women's capacity to participate in the labor market.[44] Women also lack agency for personal decisions; only 23 percent of women were responsible for deciding whether or not to work.[45] In addition, women have lower access to factors of production, such as land, farming inputs, and livestock.

5. **Poverty.** In both Chad's Household Consumption and Informal Sector Surveys from 2003 and 2011, the monetary poverty rate among female-headed households was lower than the rate for male-headed households. In the most recent one (2011), the poverty rate for female-headed households was 42.6 percent, compared with 47.4 percent for households headed by men.[46] However, despite the lower monetary poverty rate, female-headed households experienced slightly higher multidimensional poverty than male-headed households. Multidimensional poverty is measured as an index that includes information about education, health, housing, employment, empowerment, dignity, and personal security, among many others.[47] Similarly, 39.2 percent of female-headed households are in the bottom wealth quintile, compared to 21.2 percent of those headed by males.

6. A statistical analysis of Chad's Household Consumption and Informal Sector Surveys by the World Bank identified a number of factors influencing household poverty, including some that disproportionally affect female-headed households. For example, employment of heads of households in the public service or in nonagricultural activities (which is less common among female heads) is correlated with lower poverty incidence. Livestock ownership (which is also less common among female-headed households) is also correlated with lower poverty rates.[48] Women's vulnerability within households is due to their lack of financial autonomy. ECOSIT 3 found that only 23 percent of women were responsible for deciding

[44] United Nations fertility data (2017).
https://www.un.org/en/development/desa/population/publications/dataset/fertility/wfd2017.asp
[45] World Bank. 2015. *Systematic Country Diagnostic, Chad*. Report No. 96537-TD. Washington, DC: World Bank.
[46] *https://repository.uneca.org/ds2/stream/?#/documents/b47f8dc9-8948-5d3e-bae5-bc8ff64fa7ba/page/3*
[47] World Bank. 2013. *Chad - Poverty Note: Dynamics of Poverty and Inequality Following the Rise of the Oil Sector*.
http://documents.worldbank.org/curated/en/201821468015589462/Chad-Poverty-note-dynamics-of-poverty-and-inequality-following-the-rise-of-the-oil-sector
[48] World Bank. 2015. *Systematic Country Diagnostic, Chad*. Report No. 96537-TD. Washington, DC: World Bank.

whether or not to work, and 21 percent were responsible for deciding whether or not to access financing.[49]

7. **Financial inclusion.**[50] Males in Chad present higher levels of financial inclusion than females when looking at account ownership (29 percent versus 14.9 percent), saving money (3.5 percent versus 1.6 percent), or borrowing money from a financial institution (3.5 percent versus 2.2 percent). These gaps give males more financial tools to operate or expand a farm or business or to access health and education.

Table 3.4. Financial Inclusion Indicators Disaggregated by Gender

Financial inclusion indicators, percent of population age 15+	Female	Male	Gap male minus female
Owns an account	14.9	29.0	14.2
Mobile money account	10.9	19.8	8.9
Borrowed any money in the past year	36.4	39.9	3.5
Borrowed for education or school fees*	2.9	6.9	4.0
Borrowed for health or medical purposes	17.6	21.1	3.4
Borrowed from a financial institution	2.2	3.5	1.3
Borrowed from family or friends	25.5	30.1	4.6
Borrowed to start, operate, or expand a farm or business	10.1	13.7	3.6
Saved at a financial institution	1.6	3.5	1.9
Saved using a savings club or a person outside the family	17.6	12.3	-5.3
Saved to start, operate, or expand a farm or business	9.7	15.5	5.8
Saved for education or school fees*	8.8	19.8	11.1

Source: World Bank Findex Survey (2017). *Note:* *Findex 2014.

8. **Entrepreneurship.** The World Bank Enterprise Survey collects data from firms in the manufacturing and service industries around the world. In Chad, only 13.1 percent of all firms have female participation in ownership and 9.0 percent have a majority of female participation in ownership. As a benchmark, 29.6 percent have female participation in ownership and 12.3 percent have a majority of female participation in ownership in Sub-Saharan Africa. Moreover, only 1.9 percent of permanent full-time production workers are female in Chad, compared to 19.0 percent in the region.

Table 3.5. Female Participation in Ownership

Indicator	Chad	Sub-Saharan Africa	All Countries
Percent of firms with female participation in ownership	13.1	29.6	35.8
Percent of firms with majority female ownership	9.0	12.3	14.4
Percent of firms with a female top manager	12.0	15.4	18.0
Proportion of permanent full-time workers that are female (%)	14.8	28.2	33.3
Proportion of permanent full-time production workers that are female (%)[a]	1.9	19.0	26.8
Proportion of permanent full-time non-production workers that are female (%)[a]	9.6	29.4	37.0

Source: World Bank (2018) Enterprise Survey. https://www.enterprisesurveys.org/en/data/exploretopics/gender.
Note: a. Using data from manufacturing firms only.

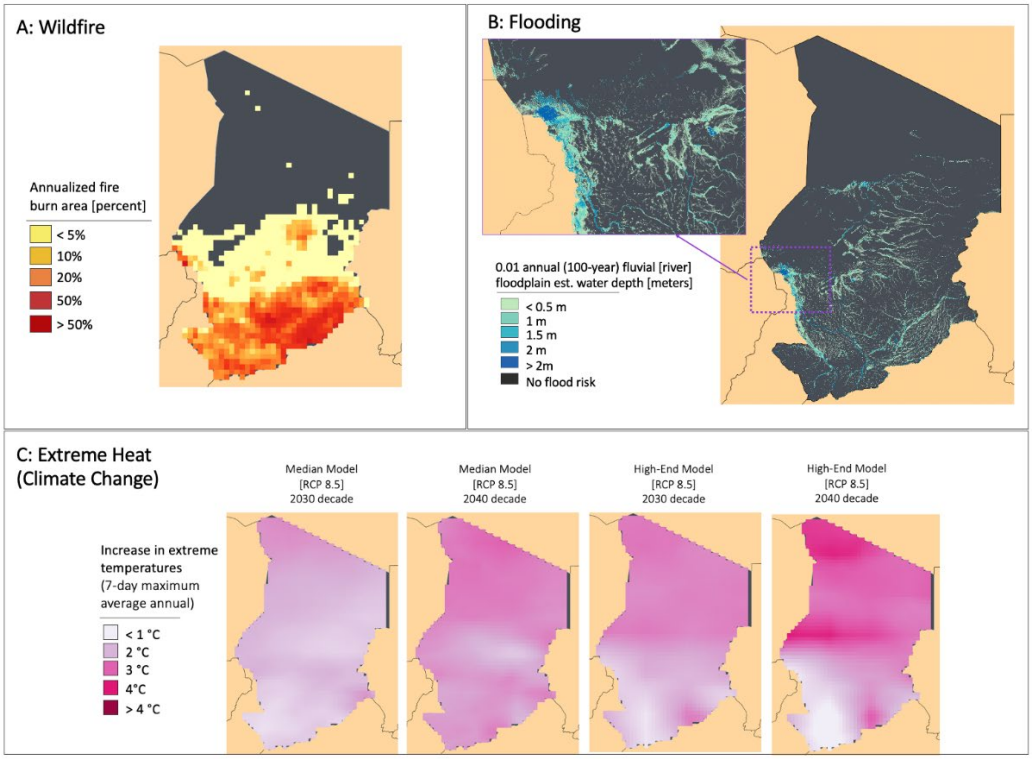
[49] Ibid.
[50] World Bank. 2017. Findex database.

ANNEX 4: Climate and Hazard Considerations

Climate Change and Natural Hazard Risks and Adaptation Opportunities

1. Resilient infrastructure development in the Republic of Chad includes consideration of existing natural hazards[51] and ongoing climate change. Three key risks in this project include wildfire, flooding, and extreme heat, which are expected to increase due to climate change.

Figure 4.1. Key Hazard Risks in Chad and Their Geographic Distribution



Source: (A) Author calculations using data from [46]; (B) FATHOM fluvial flooding data (2021) [48]; (C) Internal calculations using data from NASA NEX-GDDP CMIP5 data [50].

2. **Wildfire is recognized as a 'high' risk in Chad** under current climate conditions, and climate change is expected to exacerbate this risk.[52] However, this risk is concentrated in the southern part of the country, particularly along the southeastern corner where the average annual area of land that is burned is 20–50 percent or more (Figure 4.1). These data are calculated based on an annualized average from a historical 25-year period.[53] Over a 30-year period, however, even a 5 percent annual risk translates into a 78 percent chance that at least one fire event will occur. This rate indicates that adaptation options are

[51] World Bank. 2021. ThinkHazard Database, Chad. *https://www.thinkhazard.org*.
[52] Liu, Y., J. A. Stanturf, and S. L. Goodrick. 2009. "Trends in Global Wildfire Potential in a Changing Climate." *Forest Ecology and Management* 259 (4): 685–697. *https://doi.org/10.1016/j.foreco.2009.09.002*.
[53] Giglio, L., J. Randerson, and G. van der Werf. 2013. "Analysis of Daily, Monthly, and Annual Burned Area Using the Fourth-Generation Global Fire Emissions Database (GFED4)." *Journal of Geophysical Research: Bio geosciences* 118 (1): 317–328.

beneficial over the lifecycle in all regions where fire exceeds a 5 percent annual likelihood. For example, where existing low-voltage and medium-voltage lines will be considered, a fire-retardant application to all wood poles reduces wildfire damages. For normal conductor lines in these regions, using steel poles is cost-effective to reduce damages. Further, for the highest risk and/or most critical regions, consideration of aerial bundled cables reduces the need for vegetation management and damages resulting from fires, as well as the likelihood of causing a fire in high-risk regions.

3. **Flooding is considered as 'high' risk for Chad** although the risk varies geographically and seasonally. Available information for the depth of water under an expected 0.01 annual flood probability (100-year flood)[54] is shown in Figure 4.1. This means that there is a 1 percent chance in any given year of a flood occurring at the depths shown in Figure 4.1. In a 30-year project time frame, this amounts to a 26 percent likelihood of occurring at least once. It should be noted that the data presented in Figure 4.1 are based on historical occurrences, which are limited by the available historical record. Climate change models show that along the Sahel and Central Africa regions, the current 0.01 annual probability flood event could increase in frequency to a 0.015–0.2 annual probability event or greater (the historical 100-year event may become as frequent as a 50–75-year event), although the models vary.[55]

4. **The risk for 'extreme heat' in the current climate conditions is rated 'high' in Chad.** Extreme heat has impacts on energy demand (cooling for buildings), transmission and distribution efficiency, transformer life, and potential increases in other hazards already a concern in the region, including wildfire risk. During the coming decades, climate change is projected to further exacerbate extreme temperatures throughout the country. Figure 4.1 shows the increased annual 7-day maximum average temperature for each decade, relative to the historical values. Values are presented in degrees Celsius[56] for the 2030 and 2040 decades for a median (50th percentile) and higher-end (95th percentile) climate model. In most locations, the increase in maximum temperatures over a 7-day average across each decade is approximately 1.5–2°C in the median model for the 2030 decade, while the higher-end model shows increases of 2–4°C. By 2040, many areas of the country see increases of close to 4°C. Extreme heat reduces the efficiency of PV panels 0.3–0.5 percent per degree Celsius increase above the standard operating temperature of 25°C. [57] For transmission and distribution infrastructure operating at full capacity, increases in ambient temperature reduce the efficiency of transmission.

Project Resilience Considerations

5. Successful implementation of this project will greatly increase the resilience of the country through access to more reliable and higher-quality services, better financial and technical knowledge, and reduced reliance on biomass. The first three components of the project will build a foundation for

[54] FATHOM Flooding Data [Fluvial]. The World Bank Group 2021.
[55] Hirabayashi, Y., R. Mahendran, S. Koirala, L. Konoshima, D. Yamazaki, S. Watanabe, H. Kim, and S. Kanae. 2013. "Global Flood Risk under Climate Change." *Nature Climate Change* 3: 816–821.
[56] Decadal values represent the average of the annual seven-day maximum average temperature for each year within the corresponding decade. The 2030 decade represents the average value for 2030–39, for example. Values are the increase, in degrees Celsius, above the 30-year historical baseline (calculated as the average of annual seven-day maximum temperatures from 1970 to 1999). Calculations completed by the authors, based on data from NASA Center for Climate Simulation, NASA NEX-GDDP (2019).
[57] Skoplaki, E., and J. A. Palyvos. 2009. "On the Temperature Dependence of Photovoltaic Module Electrical Performance: A Review of Efficiency/Power Correlation." *Solar Energy* 83 (5): 614–624.

electricity growth with an initial focus on the highest-need populations including female-headed households, rural areas, and refugees.

Resilience 'of' Project Considerations

6. Components 1 and 2 focus on siting, construction, and operation of appropriate technologies for mini- and micro-grids as well as SSSs for high-need regions and facilities. Considerations of siting to reduce exposure (especially for flooding) is likely the most cost-effective consideration, while protective infrastructure (berms and buildings) and ongoing maintenance (vegetation management) can reduce exposure.

7. Another aspect that will increase project resilience is the specific inclusion of ongoing maintenance, capacity building, and support within the local utilities and consideration of best location, financial mechanisms, and other incentives designed to improve the long-term operations of the systems. This is noted in all components, with Component 4 specifically focused on TA.

Resilience 'through' Project Considerations

8. Many of the primary benefits of this project are the increased resilience of communities, households, and institutions that will be electrified. This includes secondary cities, where economic growth and industrial opportunities can be enhanced by electricity access. Additionally, a focus on basic access and cleaner cooking opportunities in rural and refugee regions reduces the reliance on biomass. Alleviating energy deprivation can provide significant benefits associated with lighting, protection, gender equality, food security, water, sanitation and health, education, livelihoods, connectivity, and environmental protection. This has implications for the health and safety of households, especially women. It may also reduce deforestation and pollution, as most households rely on wood, charcoal, and other biomass for cooking and household energy needs. Considerations of gender equity and safety in the hiring and construction phases of this project may increase the overall resilience of the community through empowerment and inclusion in the workforce.

ANNEX 5: Project Economic and Financial Analysis Details

1. **The project is expected to bring positive economic benefits to the Chadian population through the provision of new and improved energy solutions.** An economic analysis was carried out to assess the development impact in terms of expected benefits and costs. The economic analysis is consistent with the new World Bank guidelines on economic analysis and relies on a standard cost-benefit methodology, which compares the present value of incurred costs, including PCM, to the stream of attributable benefits under two scenarios, that is, the 'with project' and 'without project' scenarios. The economic analysis derives the NPV of each of the proposed project components for which benefits can be clearly identified, as well as an NPV of the proposed project as a whole, using a social discount rate of 6 percent to present all costs and benefits at a common point in time. In line with general practice, the ERR for each of the components and an overall project ERR are also presented.

2. **The economic analysis is confined to the project activities that generate quantifiable benefits for which an economic value can be clearly identified and measured.** In this respect, the analysis focuses on the following components: (a) Component 1 that will support the continued grid electrification of N'Djamena and 12 secondary cities with existing grids, as well as electrification of additional cities and towns through a combination of isolated power systems and mini-grids ; (b) Component 2 that will provide access to electricity for productive uses, public entities, and households ; and (c) Subcomponent 3.2 that will clean cooking solutions to households in refugee camps and host communities.[58]

3. **The project will provide TA and project management and support the development of solar PV power plants with storage around the capital city of N'Djamena and their integration to the main grid,** as well as various feasibility studies for the development of isolated power systems and off-grid solutions under Component 4 (IDA grant: US$14 million; IDA WHR grant: US$3 million). The cost of this component is apportioned across the other subcomponents it aims to support in proportion to the investment costs of each of the subcomponents funded by the project.

4. **The investment, O&M, and any other costs were derived from market assessments, World Bank's recent experience of similar projects in the region, and discussions with both public and private sector stakeholders in Chad.** The costs are considered over the economic lifetime of each technological solution, and for the economic analysis, the costs are adjusted downward to exclude taxes, duties, and other transfer payments (that is, only economic costs are considered). The following paragraphs elaborate on avoided costs and willingness to pay (WTP) for electricity considered in the analysis.

Avoided Costs

5. **Households.** Those without access to electricity have traditionally relied on kerosene and candles to meet their lighting needs. The quality of lighting derived from these alternatives is poor and is associated with harmful local emissions that has especially negative impact on females, children, and

[58] Component 3 comprises three subcomponents: (a) 3.1 aimed at assessment of fuelwood demand and supply chains in Chad, institutional setting, and piloting of various modern/clean cooking options ; (b) 3.2 on providing clean cooking solutions to households in refugee camps and host communities ; and (c) 3.3 aimed at restoration and sustainable natural resource management. Because the benefits of Subcomponents 3.1 and 3.3 are likely to exceed beyond the direct beneficiaries of the project, the economic analysis considers only costs and benefits associated with Subcomponent 3.2.

elderly people who are more exposed to these alternatives by spending more time at home. Recently, these traditional sources of lighting have started to be replaced by lamps and flashlights powered by dry-cell batteries. This change is also taking place in Chad where the results of the most recent survey of households indicate that 84 percent of the non-electrified households in Chad rely on dry-cell battery-powered flashlights. On average, rural households in Chad pay CFAF 2,518 per month on lighting alternatives and about CFAF 1,467 per month to charge their mobile device outside of their house . These costs incurred by households, nevertheless, include taxes and other transfer payments (for example, dry-cell battery flashlights and their components are sold by local shops from which the seller derives a margin) that need to be excluded from the economic analysis. For the analysis, it is assumed that about 35 percent of the current expenditure are taxes and other transfer payments. Furthermore, as the current main alternative is portable (drycell- battery flashlights), it is conservatively assumed that not all the current costs of current alternatives will be avoided, and that 30 percent of the current expenditure will be incurred anyway as some current alternatives will be used complementarily to the SHS by households.

6. **Nonresidential customers.** Nonresidential customers (and some better-off households) rely mostly on diesel self-generators to get electricity and some also rely on SSSs. The cost of self-generation is assumed to be US¢35 per kWh including taxes, duties, and transfer payments.[59] For the economic analysis, these costs are adjusted to net off the taxes, duties, and transfer payments in a similar way as the adjustment described for households above.

7. **WTP.** While the avoided cost methodology is used to proxy benefits of switching to SHSs for households, estimates of WTP are relied upon to proxy benefits derived by households when switching to electricity delivered though a mini-grid or grid solution. While data on WTP for electricity in Chad are not available, according to the results of the most recent expenditure survey data, households currently use on average 2.5 light points across rural areas in Chad for around five hours a day for which they spend about US$4.7 per month per household.[60] Even if an inefficient 40 W light point is assumed, a household in Chad would consume only about 15 kWh per month for which it is currently spending about US¢30 per kWh, which can be considered as a lower bound on WTP for electricity. As WTP per kWh would decrease with greater consumption, and to be on the conservative side, for the analysis, a WTP of US¢25 per kWh is used.

8. **While the analysis does not consider other indirect benefits, it is expected that the project will contribute toward other economic benefits that are more difficult to quantify and monetize.** These indirect benefits include improved air quality from reduced consumption of kerosene; reduced poisoning and accidental fires; and wider benefits that can be linked to access to modern electricity solutions such as improved health, improved connectivity, and improved security. Access to modern energy solutions is also expected to increase income-generating opportunities and improve the socioeconomic situation of households and MSMEs, with an expected positive impact on education and overall lifestyle. This means that the results from the economic analysis can be considered as conservative estimates of the overall economic benefits of the project.

9. **The project is also expected to bring some benefits from reduced GHG emissions and local pollution.** In addition to the quantifiable benefits discussed above, the economic analysis also considers

[59] It is noted that this is a regional estimate as for Chad, such data are not available.
[60] Results of the household expenditure survey are provided in annex 6.

the avoided GHG emissions, in line with the World Bank's Greenhouse Gas Accounting Methodology for Energy Access Investment Operations. Detail of the analysis by technological solution is provided in the following paragraphs, with all monetary values presented in NPV terms (US$ 2021).

Economic Costs and Benefits of Electrification through the N'Djamena Grid (Subcomponent 1.1)

10. The analysis includes the N'Djamena grid densification costs estimated at US$30 million for the 50,000 new residential and nonresidential connections (that is, US$600 per connection).[61] It also includes annual O&M costs and the cost of energy from the grid that is estimated based on the marginal costs of generation, which are calculated by comparing the respective grid generation costs for two states of the world (that is, with and without the incremental load stemming from new connections). The difference between the present value cost between these two states of the world is the incremental generation cost to the 50,000 new connections added by the project. Quantifiable benefits include WTP for electricity for households and avoided cost of self-generation for nonresidential customers.

Table 5.1. Subcomponent 1.1: Densification of the N'Djamena Grid

Key Parameters and Results of the Analysis	Unit	Value	Source
Subcomponent allocation - total	**US$, millions**	**50.0**	**Project design**
Subcomponent allocation - new connections	US$, millions	30.0	Project design
Apportioning of other project-related costs	US$, millions	3.1	Calculated
Number of new connections	Number	50,000	Assumption - Project design
Levelized cost of electricity (customer off-take point)	US¢/kWh	17.0	Calculated
Total costs over project lifetime	**US$, millions**	**236**	**Calculated**
Total benefits over project lifetime	**US$, millions**	**325**	**Calculated**
Net benefit, excluding externalities	**US$, millions**	**89**	**Calculated**
ERR, excluding externalities	**Percent**	**23.3**	**Calculated**

Note: Total costs and benefits as reported in this table and subsequent tables for each subcomponent exclude estimation of the project impact on GHG emissions, which are reported under the sub-section 'All Components - Results Summary' below.

[61] It is expected that US$20 million of the total allocation for this subcomponent will support utility scale solar PV development and new storage capacity. While it is the private sector that is expected to invest in new utility scale solar PV and storage, the project could fund related investments and studies to facilitate the development and integration of new solar PV capacity and potentially also fund additional storage to the N'Djamena grid under the condition that the new solar PV and storage capacity is competitively procured. As the precise investments have not yet been determined and because the benefits associated with a new storage capacity will not only benefit the 50,000 new connections realized under this subcomponent, the analysis is limited to the costs and benefits associated with the grid densification and the 50,000 new connections.

Economic Costs and Benefits of Electrification of Secondary Cities via Isolated Power Systems and Electrification of Towns via Mini-Grids (Subcomponents 1.2 and 1.3)

11. For electrification through isolated power systems and mini-grids, economic costs include the investment costs associated with the rehabilitation, densification, and expansion of existing isolated power systems; construction of new mini-grids; and ongoing maintenance and other operations costs throughout the economic lifetime of the assets. These costs are disaggregated by cost component and according to the time when they are incurred, also considering any subsequent investments needed such as battery and system convertor replacement costs. Similar to providing access through the N'Djamena grid, economic benefits include WTP for electricity for household customers and avoided costs of diesel self-generation for nonresidential customers.

Table 5.2. Subcomponent 1.2: Electrification of Secondary Cities via Isolated Power Systems

Key Parameters and Results of the Analysis	Unit	Value	Source
Subcomponent allocation - total	**US$, millions**	**55.0**	**Project design**
Apportioning of other project-related costs	US$, millions	3.4	Calculated
Number of systems rehabilitated and expanded	Number	12	Assumption - Project design
Number of new connections	Number	50,000	Project design
Economic lifetime of assets	Years	25	Assumption
LCOE	US¢/kWh	24	Calculated
Total costs over project lifetime	**US$, millions**	**102**	**Calculated**
Total benefits over project lifetime	**US$, millions**	**129**	**Calculated**
Net benefit, excluding externalities	**US$, millions**	**28**	**Calculated**
ERR, excluding externalities	**Percent**	**10.6**	**Calculated**

Table 5.3. Subcomponent 1.3: Electrification of Towns via Mini-Grids

Key Parameters and Results of the Analysis	Unit	Value	Source
Subcomponent allocation - total	**US$, millions**	**60**	**Project design**
Apportioning of other project-related costs	US$, millions	3.7	Calculated
Number of new connections	Number	55,000	Assumption - Project design
Economic lifetime of assets	Years	25	Assumption
LCOE	US¢/kWh	27	Calculated
Total costs over project lifetime	**US$, millions**	**95**	**Calculated**
Total benefits over project lifetime	**US$, millions**	**107**	**Calculated**
Net benefit, excluding externalities	**US$, millions**	**11.4**	**Calculated**
ERR, excluding externalities	**Percent**	**7.9**	**Calculated**

Note: The number of systems supported by the project will be determined during project implementation. It is expected that on average, around 200–300 customers will be connected to a single mini-grid with system sizes not exceeding 500 kW.

Off-Grid Electricity Access by Deploying SSSs for Productive Uses and Public Institutions and SHSs for Households (Component 2)

12. For electrification of PUE and public institutions (schools and medical centers), economic costs include the investment cost for SSSs installed by the project, battery replacement costs and invertor replacement costs (assumed to be replaced every 10 and 8 years, respectively), and the recurring O&M

cost over the economic lifetime of the system. On the benefit side, the avoided economic cost of diesel self-generation for those newly connected customers was assessed.

13. For electrification of households through SHSs, economic costs include the investment cost for SHSs and the recurring O&M cost per customer per year over the economic lifetime of the system. SHSs have two types of benefits: (a) they substitute the expense associated with current alternatives; and (b) they bring an additional welfare benefit by making more energy (and of better quality) available. Because data on consumption of those currently relying on alternative sources are not available, the analysis conservatively quantifies only the benefit derived from avoiding the costs associated with current alternatives used for lighting and the avoided costs of charging mobile devices outside of the household according to the latest household expenditure survey data as presented in annex 6. Therefore, this approach shall be viewed as a conservative estimate of potential benefits derived from switching from current alternatives to SHSs for households.

Table 5.4. Subcomponent 2.1: Deploying SSSs for Productive Uses in Rural Areas

Key Parameters and Results of the Analysis	Unit	Value	Source
Subcomponent allocation - total	**US$, millions**	**14**	**Project design**
Apportioning of other project-related costs	US$, millions	0.90	Calculated
Number of PUEs supported	Number	3,500	Assumption - project design
Economic lifetime of assets	Years	20	Assumption
Total costs over project lifetime	**US$, millions**	**20.90**	**Calculated**
Total benefits over project lifetime	**US$, millions**	**21.00**	**Calculated**
Net benefit, excluding externalities	**US$, millions**	**0.07**	**Calculated**
ERR, excluding externalities	**Percent**	**6.10**	**Calculated**

Table 5.5. Subcomponent 2.1 (continued): Providing SHSs to about 1,000,000 Households

Key Parameters and Results of the Analysis	Unit	Value	Source
Subcomponent allocation - total	**US$, millions**	**51**	**Project design**
Apportioning of other project-related costs	US$, millions	3.1	Calculated
Total SHSs installed	Number	1,000,000	Assumption - project design
Economic lifetime of an SHS	Years	5	Assumption
Total costs over project lifetime	**US$, millions**	**72**	**Calculated**
Total benefits over project lifetime	**US$, millions**	**195**	**Calculated**
Net benefit, excluding externalities	**US$, millions**	**123**	**Calculated**
ERR, excluding externalities	**Percent**	**210**	**Calculated**

Note: The retail price for SHS (post-tax) for Tier 1 SHS is assumed to be US$70 per system (US$67 per system pre-tax). The subsidy per system funded by the project is assumed to be US$50 per SHS with the balance of financial cost paid by the household.

Table 5.6. Subcomponent 2.2: Electrification of Medical Facilities and Schools in Rural Areas

Key Parameters and Results of the Analysis	Unit	Value	Source
Subcomponent allocation - total	**US$, millions**	**28**	**Project design**
Apportioning of other project-related costs	US$, millions	1.7	Calculated
Number of medical centers electrified	Number	850	Assumption - project design
Number of schools electrified	Number	700	Assumption - project design
Economic lifetime of assets	Years	20	Assumption
Total costs over project lifetime	**US$, millions**	**37.8**	**Calculated**

Key Parameters and Results of the Analysis	Unit	Value	Source
Total benefits over project lifetime	**US$, millions**	**40.1**	**Calculated**
Net benefit, excluding externalities	**US$, millions**	**2.3**	**Calculated**
ERR, excluding externalities	**Percent**	**7.3**	**Calculated**

Clean Cooking Solutions for Refugee Camps and Host Communities (Subcomponent 3.2)

14. **Economic costs and benefits associated with modern cooking solutions.** The economic costs include the investment costs of double-burner improved wood stoves provided by the project to households. Households currently relying on three stone fires or inefficient traditional stoves (corresponding with Tier 0) will be provided with fuel-efficient stoves (corresponding with Tiers 2 and 3, respectively). The benefits calculated are reductions in the overall fuel consumption owing to switching to more fuel-efficient stoves, that is, households save on fuel when using improved wood stoves. There are other non-monetized benefits from households switching to improved and clean stoves including the reduced emissions, reduced forest degradation, and reduced time spent collecting fuel which make women and children vulnerable to GBV.

Table 5.7. Subcomponent 3.2: Clean Cooking Solutions for Refugee Camps and Host Communities

Key Parameters and Results of the Analysis	Unit	Value	Source
Subcomponent allocation - total	**US$, millions**	**7**	**Project design**
Apportioning of other project-related costs	US$, millions	0.40	Calculated
Economic lifetime of the stoves	Years	3–4	Assumption
Total improved cook-stoves supported	Number	75,000	Assumption
Total costs over project lifetime	**US$, millions**	**7.40**	**Calculated**
Total benefits over project lifetime	**US$, millions**	**8.30**	**Calculated**
Net benefit, excluding externalities	**US$, millions**	**0.44**	**Calculated**
ERR, excluding externalities	**Percent**	**8.30**	**Calculated**

All Components - Results Summary

15. **The economic analysis shows that the project is economically viable even without consideration for environmental externalities caused by reduction in GHG emissions due to switching to improved energy solutions.** The baseline NPV of the proposed project is estimated at US$233 million, corresponding to an ERR of 21 percent. Once benefits from net reduction of GHG emissions are considered, the project NPV increases to between US$363 and US$492 million, depending on the assumptions around the social cost of carbon. The ERR including the shadow price of carbon corresponds to an ERR of 34 to 51 percent, depending on the valuation of GHG externalities. The summary results for the economic analysis are provided in table 5.8.

Table 5.8. Summary of the Results of the Economic Analysis by Component and Overall Results for the Project

Subcomponent	NPV (US$, millions 2021)			ERR (%)			Net Impact on GHG Emissions ($MtCO_2e$)
	Without GHG Benefits	With GHG Benefits (Low)	With GHG Benefits (High)	Without GHG Benefits	With GHG Benefits (Low)	With GHG Benefits (High)	
Subcomponent 1.1	68.2	87.1	106.0	22.9	27.3	31.9	–0.80
Subcomponent 1.2	27.6	42.5	57.3	10.6	12.8	15.0	–0.60

Subcomponent	NPV (US$, millions 2021)			ERR (%)			Net Impact on GHG Emissions ($MtCO_2e$)
	Without GHG Benefits	With GHG Benefits (Low)	With GHG Benefits (High)	Without GHG Benefits	With GHG Benefits (Low)	With GHG Benefits (High)	
Subcomponent 1.3	11.4	28.6	45.8	7.9	10.6	13.1	–0.70
Subcomponent 2.1	123.1	191.9	260.0	147.1	612.2	n.m.	–2.00
Subcomponent 2.2	2.3	12.0	21.7	7.3	12.4	17.1	–0.30
Subcomponent 3.2	0.4	0.9	1.3	8.3	10.7	13.0	–0.01
Project (aggregate result)	**233.0**	**362.9**	**492.2**	**21.4**	**34.1**	**51.3**	**–4.45**

Note: 'n.m.' indicates that the resulting internal rate of return is not meaningful (this is because of annual cash flow modelling where net benefits are positive in all years).

Financial Analysis

16. **In addition to the economic analysis, a financial analysis of the project was undertaken from the point of view of the national utility, SNE.** The financial analysis compares cash flows to the utility 'with' and 'without' the proposed project to arrive at FNPV. As with the economic analysis, the financial analysis is confined to the project activities that generate quantifiable benefits for which a financial value can be clearly identified and measured. Because it is only Subcomponents 1.1 and 1.2 that will have a direct impact on the financial situation of SNE, the project financial analysis is limited to these components. To present all costs and benefits at a common point in time, in the financial analysis, the regulated weighted average cost of capital of SNE would have been relied on ideally. Nevertheless, as at the time of drafting of this analysis, a regulatory methodology that would determine this value has not yet been finalized, and all costs and benefits have been discounted using a 10 percent discount rate (real, pre-tax).

17. **The project is expected to bring positive cash flows to the utility provided there is a marginal increase in real tariffs paid by end customers.** At the time of undertaking this analysis, tariffs paid by end consumers are considerably below the costs of supply. This means that while the initial CAPEX for the new connections connected by the project is going to be provided in the form of a grant, unless tariffs are at least marginally revised upward, the project will result in negative cash flows to the national utility because the incremental costs of supply would exceed the incremental tariff revenue from the newly connected customers.[62] Based on preliminary analysis, it is expected that real tariffs would need to increase at least by 1 percent each year to make the cash flows to the utility positive.

18. **Finally, the impact of the project is also assessed from the perspective of beneficiaries.** Based on the preliminary analysis and assuming a real discount rate of 10 percent, the project brings a positive net benefit to all beneficiaries who will benefit from improved energy solutions. This is because the costs to them (that is, their contribution to the CAPEX, O&M costs, and/or tariffs paid) are below the derived benefit (that is, WTP for electricity and/or avoided costs of current alternatives).

[62] The team notes that the state currently provides subsidy in the form of subsidy in nature (fuel). If the amount of fuel provided to SNE is increased to also cover the demand of those newly connected, the cash flow to the utility would be positive.

ANNEX 6: Outcomes of a Survey on Ability and Willingness of Rural Households to Pay for Electricity Services

1. To inform the design of the project subcomponent aiming to electrify households through SHSs, a survey on ability and willingness of Chad rural households to pay for electricity services was conducted in the first half of 2021. Due to time and budget limitations, as well as security constraints, the survey was implemented in the rural areas of three Chadian provinces that were selected with the objective of obtaining representative data that can be extrapolated to the rest of the rural areas of the country. The poverty incidence, together with homogeneity/differences between provinces, played a key role in the stratification of the sample. Table 6.1. summarizes information on the three selected provinces and sample size, while figure 6.1. shows a Chad map with the names of provinces.

Table 6.1. Sample Size by Province

Province	Poverty Incidence (%)	Sample Size
Guéra	60.0	248
Kanem	27.7	241
Logone Occidental	43.5	239
Total		728

Figure 6.1. Map of Chad

Source: Cartography Unit, the World Bank.

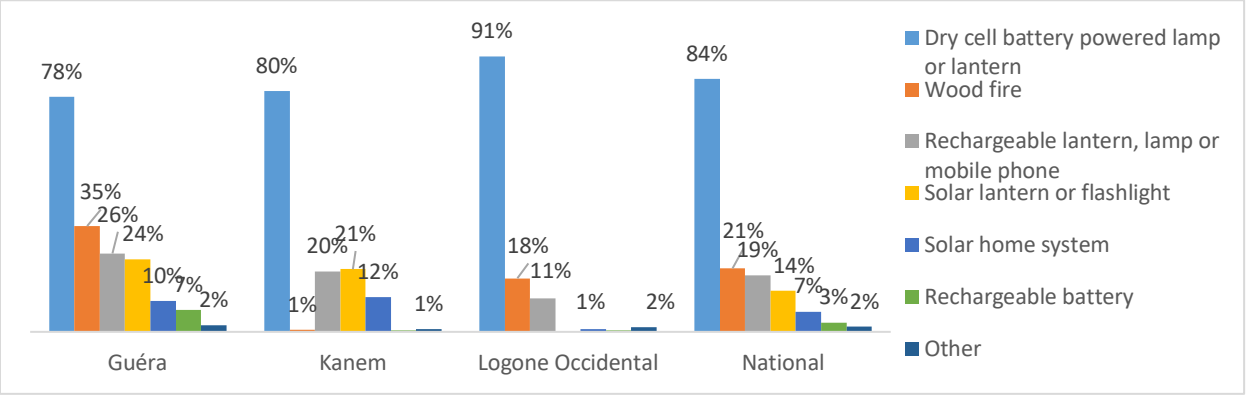
2. Select results of the survey by province and the average for the three provinces are summarized in Table 6.2.

Table 6.2. Select Results of the Survey

	Surveyed Provinces			Average
	Guéra	Kanem	Logone Occidental	
Household size, number of people	5.4	4.6	6.8	5.8
Female-headed households, percentage	9.4	26.6	10.4	13.3
Male-headed households, percentage	90.6	73.4	89.6	86.7
Use of mobile money, percentage	12.0	11.0	4.0	8.0
Households with a bank account, percentage	5.9	0.0	5.1	4.6
Households with an account at an informal organization (group/collective savings), percentage	10.0	1.5	44.4	24.5
Use of lighting per day, hours	4.9	4.7	5.8	5.2
Monthly expenditure on lighting, FCFA	2,095	2,739	2,807	2,518
Number of mobile phones by households, number	0.9	1.4	1.0	1.1
Monthly expenditure on mobile phone charging, FCFA	1,628	1,484	1,306	1,467
Ownership of radio, percentage	31.0	27.0	46.0	37.0
Monthly expenditure on batteries for radio, FCFA	916	1,455	1,189	1,136
Willingness to buy Tier 1 SHS for FCFA 10,000, percentage	73.0	75.2	62.4	69.1
Households paying for cooking fuel, percentage	11.0	28.0	75.0	41.0

3. Rural households in Chad do not have access to grid-based electricity. The most common alternative source of lighting is dry-cell battery-powered flashlights, which are in use in about 84 percent of households across the three provinces. About 20 percent of households use woodfire. Solar lanterns or lamps are only used by 14 percent of rural households, as detailed in Figure 6.2.

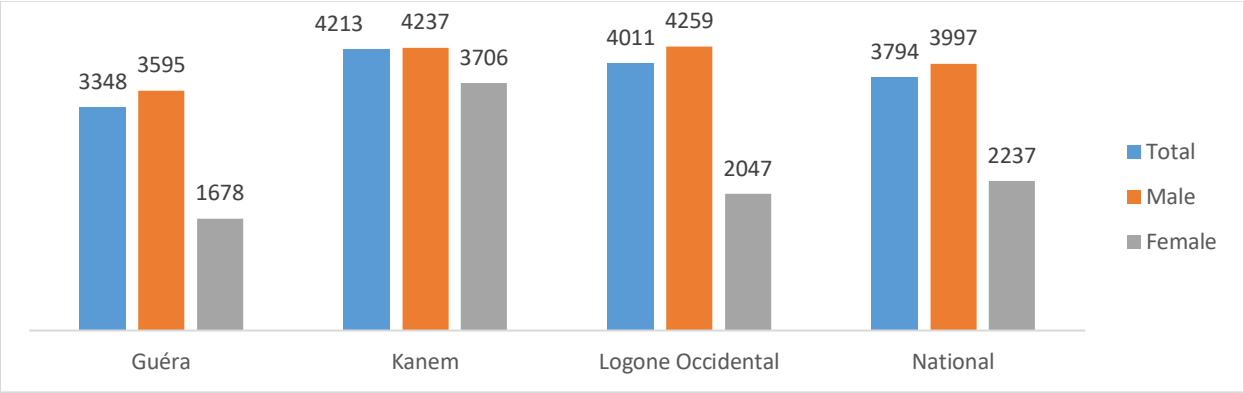
Figure 6.2. Sources of Lighting



Source: World Bank staff calculation.

4. In the absence of access to electricity, rural households spend an average of CFAF 3,794 (about US$6.6 equivalent) per month for basic services—lighting, phone charging, and batteries for radio. It is worth noting that the expenditure of female-headed households on these basic services is substantially lower compared to male-headed households, as shown in Figure 6.3.

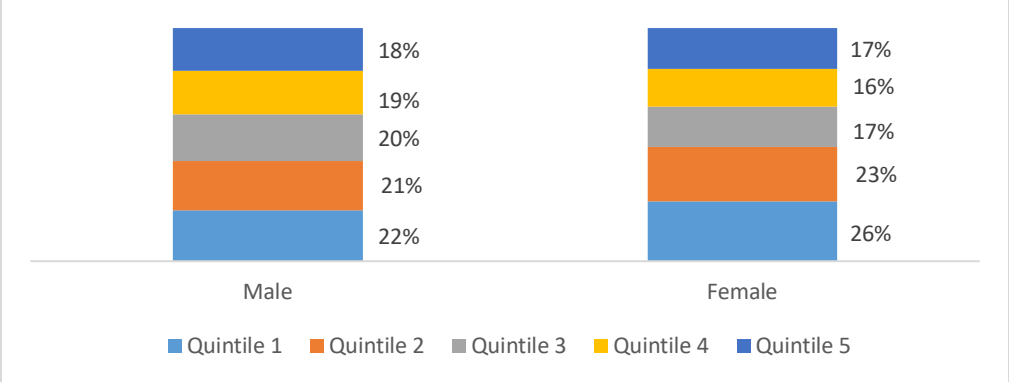
Figure 6.3. Monthly Expenditure of Households for Lighting, Phone Charging, and Batteries for Radio (CFAF)



Source: World Bank staff calculation

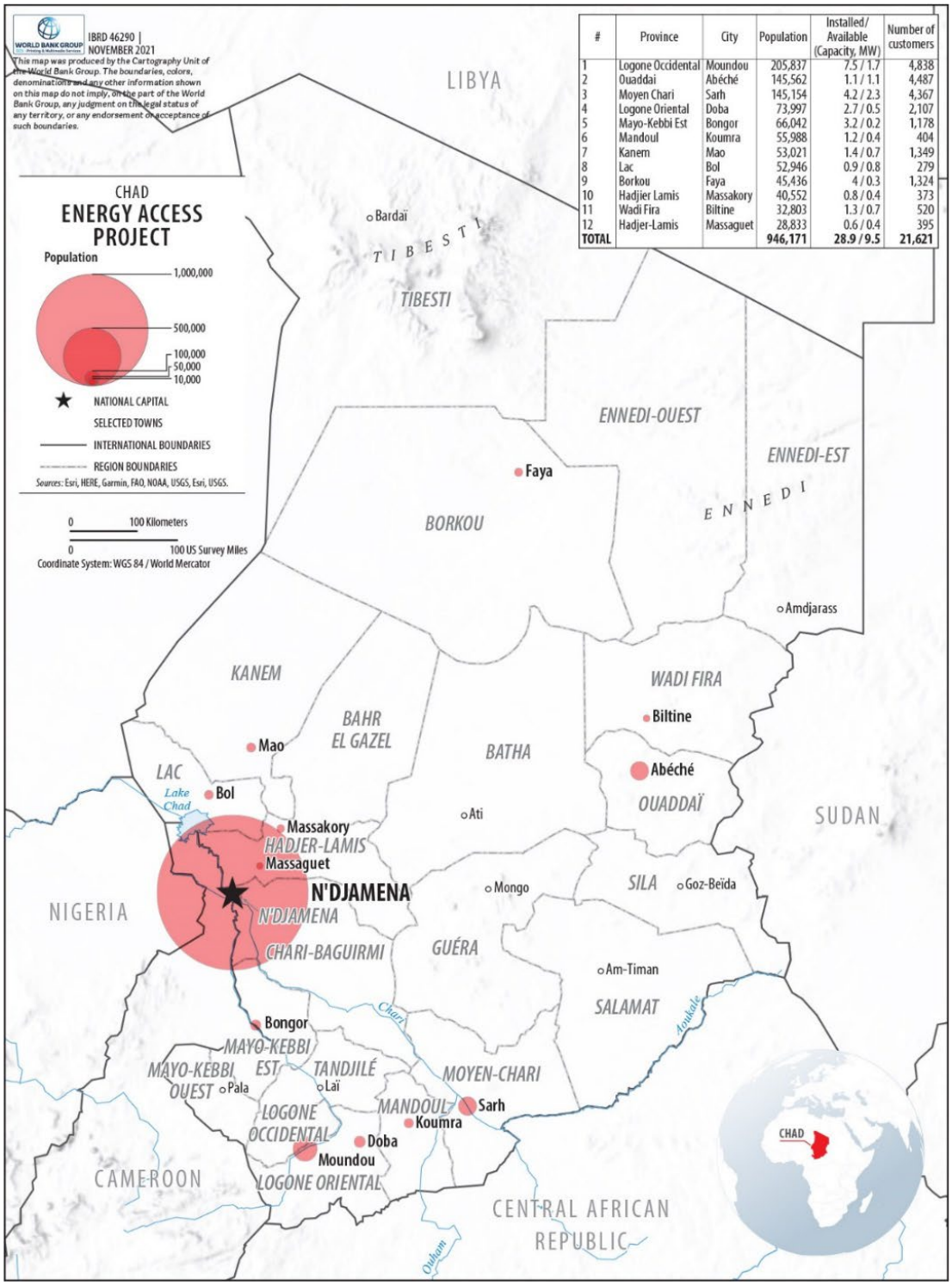
5. The survey outcomes highlighted that poverty incidence is higher for female-headed households than for the male-headed ones: 49 percent of female-headed households are in the bottom 40 percent compared with 43 percent of male-headed households, as shown in Figure 6.4.

Figure 6.4. Distribution of Male- and Female-Headed Households Expenditure Quintiles (on Average for Three Provinces)



Source: World Bank staff calculation.

ANNEX 7: Electrified Cities that are Operated by SNE



Source: Cartography Unit, the World Bank.