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SAHEL HUMAN DEVELOPMENT REPORT 2023

Sustainable Energy for Economic and Climate Security in the Sahel

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SAHEL HUMAN DEVELOPMENT
REPORT 2023

Sustainable Energy for Economic and Climate Security in the Sahel

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Foreword

The Sahel abundance of sustainable energy resources can transform the socioeconomic fortunes of its 340 million inhabitants by spurring green industrialization, providing access to electricity for all, and protecting fragile ecosystems that are under threat from climate change and human activity. This potential will only be realized if these resources are managed prudently. Paradoxically, the Sahel, a region least responsible for causing climate change, faces disproportionate vulnerability due to its geographic exposure, economic fragility, and resource management challenges. Spanning 10 countries, the Sahel epitomizes the climate change conundrum facing African countries. Only half of its population has access to electricity, and the region remains highly susceptible to the diverse impacts of climate change.

Nevertheless, the Sahel stands at a pivotal juncture. It can chart a different course, contingent upon pursuing a development path that effectively capitalizes on sustainable opportunities for future generations. This Human Development Report raises pivotal questions about optimal planet friendly development pathways and the more efficient use of cleaner energy resources and the region's abundance of renewal energy options. Is the Sahel constrained to choosing between utilizing or relinquishing its resources? Addressing this dilemma, the report advocates leveraging synergies between development and energy, and proposes a balanced green growth pathway based on results from futures modeling. This approach reconciles short-term development needs with aspirations for a sustainable future, advocating investment in renewable energy while utilizing existing energy resources during a transitional phase.

Attaining this desirable future demands an unwavering commitment to green transitions, effective policies, and affordable financing. As global financial players shift their focus to clean energy projects, favoring renewables' market trends, this signals a transition that aligns with Sahel countries' renewable energy targets under the Paris Agreement. However, the energy transition necessitates renewed commitments from developed nations and innovative climate finance accessible to the Global South, balancing energy expansion with investments in human development.

Amidst these challenges, security and stability loom large, threatening development gains. Extremist groups further exacerbate fragility, hindering development prospects. Yet, the Sahel remains a region of great promise. Despite their differences, these 10 countries are part of a broader regional dynamic rich in renewable energy potential. This positions the Sahel to accelerate progress toward the Sustainable Development Goals.

However, ongoing geopolitical shifts and evolving multilateralism, especially in energy, pose critical questions for the Sahel's future. This report underscores the urgency of addressing these issues to steer the Sahel toward a more sustainable and prosperous trajectory. The report unveils a series of actionable pathways, effectively bridging the gap between development objectives and the urgent need for climate change adaptation.

Ahunna Eziakonwa, Assistant Administrator
Assistant Secretary-General and Director,
Regional Bureau for Africa, UNDP

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This report is a testament to the collective dedication, collaboration, and expertise of all involved, without whom this significant endeavor would not have been possible.

List of Acronyms

ACLED	Armed Conflict Location & Event Data Project
ADA	Australian Development Agency
AFC	Africa Finance Corporation
AfCFTA	African Continental Free Trade Area
AfDB	African Development Bank
AFESD	Arab Fund for Economic & Social Development
AfreximBank	African Export-Import Bank
AMDA	Africa Minigrid Developers Association
AMP	Africa Minigrids Program
APRI	Africa Policy Research Institute
AQIM	Al-Qaeda in the Islamic Maghreb
AU	African Union
BBOE	Billion Barrels of Oil Equivalent
BGG	Balanced Green Growth
BIO	Belgian Investment Company for Developing Countries
BOAD	Banque Ouest-Africaine de Développement
BOE	Barrels of Oil Equivalent
CO2	Carbon dioxide
COP	Conference of Parties
CP	Current Path
CSE	Centre for Ecological Monitoring
DFC	US International Development Finance Corporation
DFI	Development Finance Institutions
DyTAES	Dynamique pour une Transition Agroécologique au Sénégal
ECA	Export Credit Agencies
ECOWAS	Economic Community of West African States
ECREEE	ECOWAS Centre for Renewable Energy and Energy Efficiency
EIB	European Investment Bank
ERERA	ECOWAS Regional Electricity Regulatory Authority
ESMAP	Energy Sector Management Assistance Programme
EU	European Union
FAO	Food and Agriculture Organization
FDI	Foreign Direct Investment
FMO	Financierings-Maatschappij voor Ontwikkelingslanden N.V.
GCF	Global Climate Fund
GDI	Gender Development Index
GDP	Gross Domestic Product
GEF	Global Environment Fund
GHG	Greenhouse Gases
GII	Gender Inequality Index
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GNI	Gross National Income
GOGLA	Global Off-Grid Lighting Association
GW	Gigawatt
HDI	Human Development Index
HDR	Human Development Report
HDRO	Human Development Report Office
IBRD	International Bank for Reconstruction and Development
ICT	Information and Communication Technology
IDA	Initiative for the Development of Africa
IDB	Inter-American Development Bank
IDPs	Internally Displaced Persons
IEA	International Energy Agency
IFs	International Futures
IFC	International Finance Corporation
IFU	Investment Fund for Developing Countries
IHDI	Inequality-Adjusted Human Development Index
IHME	Institute for Health Metrics and Evaluation
IIASA	International Institute for Applied Systems Analysis
IMF	International Monetary Fund
INSCR	Integrated Network for Societal Conflict Research
IOM	International Organization for Migration
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producers
IRENA	International Renewable Energy Agency
IsDB	Islamic Development Bank
ISGS	Islamic State in the Greater Sahara
KfW	Kreditanstalt für Wiederaufbau
kWh	Kilowatt hour
LDC	Least Developed Countries
LGA	Liptako-Gourma Authority
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
LPSE	Lettre de Politique Sectorielle de l'Energie
MCC	Millennium Challenge Corporation
MER	Observed market exchange
MINUSMA	United Nations Multidimensional Integrated Stabilization Mission
MPI	Multidimensional Poverty Index
MW	Megawatt
MWac	Megawatt alternative current
NAP	National Adaptation Plan
NAPA	National Action Programme on Adaptation
NDC	National Determined Contribution

NEET	Not in Employment, Education, or Training
NELACEP	Niger Electricity Access Expansion Project
NERC	Nigeria Electricity Regulatory Commission
NES	National Electrification Strategy
NESAP	Niger Solar Electricity Access Project
NGO	Non-Governmental Organization
NSIA	Nigeria Sovereign Investment Authority
OECD	Organization for Economic Co-operation and Development
OGCI	Oil and Gas Climate Initiative
OMVG	Organisation pour la Mise en Valeur du fleuve Gambie
OPEC	Organization of the Petroleum Exporting Countries
PANER	Plan d'Action National d'Energies Renouvelables
PHDI	Planetary Pressures-Adjusted HDI
PIP	Performance Improvement Plans
PJ	Petajoule
PPA	Power Purchase Agreement
PPP	Purchasing Power Parity
PRAPS	Projet Régional d'Appui au Pastoralisme au Sahel
PV	Photovoltaic
RP	Renewable Push
ROGEAP	Regional Off-Grid Electricity Access Project
ROGEP	Regional Off-Grid Electrification Project
SDG	Sustainable Development Goal
SIDA	Swedish International Cooperation Agency
SNE	Societe Nationale d'Electricite du Tchad
SPV	Special Purpose Vehicle
SSA	sub-Saharan Africa
UAE	United Arab Emirates
UK	United Kingdom
UN	United Nations
UNCDF	United Nations Capital Development Fund
UNECA	United Nations Economic Commission for Africa
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
UNISS	United Nations Integrated Strategy for the Sahel
UNOPS	United Nations Office for Project Services
UNV	United Nations Volunteers
US	United States
USAID	United States Agency for International Development
USTDA	United States Trade and Development Agency
WAEP	West Africa Energy Program
WAPP	West African Power Pool
WDI	World Development Indicators
WFP	World Food Programme
WHO	World Health Organization

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OVERVIEW OF THE SAHEL HUMAN DEVELOPMENT REPORT 2023

Sustainable Energy for Economic and Climate Security in the Sahel

OVERVIEW OF THE SAHEL HUMAN DEVELOPMENT REPORT 2023

Sustainable Energy for Economic and Climate Security in the Sahel

Sustainable energy could regenerate Africa's Sahelian zone by using the region's abundant clean energy potential to transform lives, diversify economies, give hope, and protect the planet. A combination of energy poverty for over half of the population of the Sahel and an overreliance on expensive and high-polluting hydrocarbons has retarded socioeconomic progress and contributed to environmental degradation. In addition, recent global economic shocks and geostrategic shifts have highlighted the need to move the Sahel away from energy dependency to energy agency that delivers accessible, reliable, and affordable energy for all.

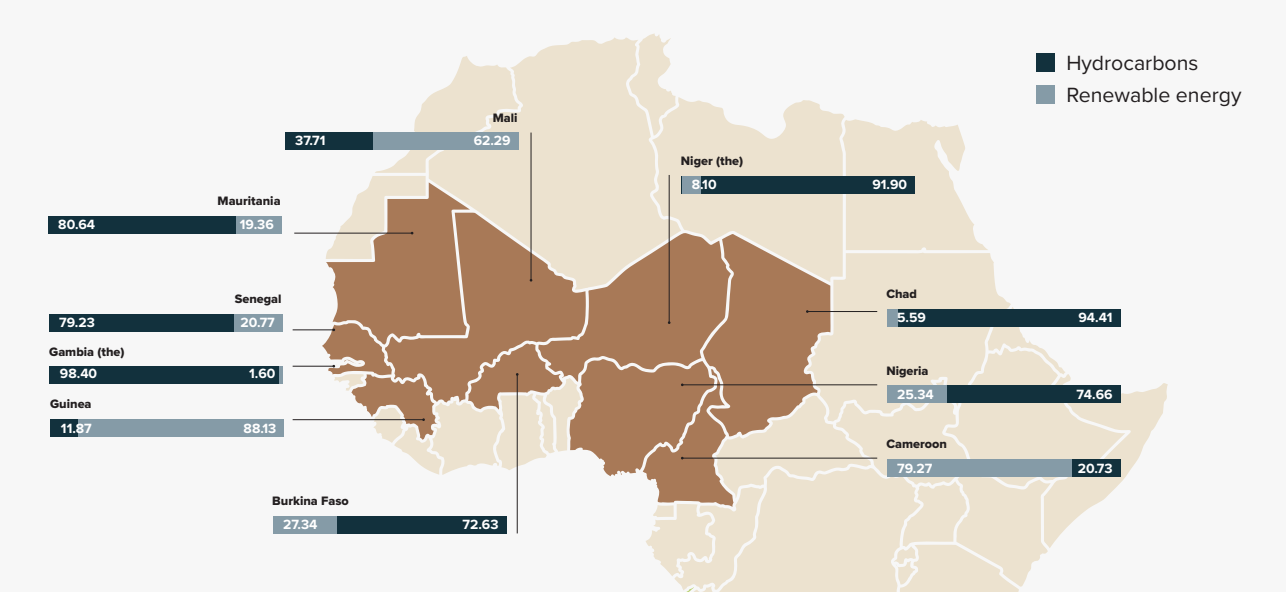
Analyzing viable pathways to this goal is the focus of this Human Development Report, which covers Burkina Faso, Cameroon, Chad, The Gambia, Guinea, Mali, Mauritania, Niger, Nigeria, and Senegal – the 10 countries identified by the United Nations (UN) for the establishment of the United Nations Integrated Strategy for the Sahel (UNISS) in 2013. The HDR uses empirical techniques and political economy analyses to consider optimal energy strategies that would be most appropriate for this sub-region. Energy mixes that promote a just energy transition for the Sahel, while delivering tangible socioeconomic gains and diminishing planetary pressures, are prioritized. Renewable energies have been analyzed to have positive impact on the Human Development Index in developing economies. Without accessing and ensuring clean, reliable and efficient energy, it will not be possible to achieve social and economic development in developing countries.[1]

The Sahel is a diverse ecosystem, with individual countries at different stages of development and energy use. Thus, even though the HDR identifies an optimal pathway, the recommendations are tailored to suit each country. The HDR also explores regional synergies that allow for scaled-up investments, economies of scale and broader energy markets.

A Timely Report for a Region Seeking a Viable Energy Transition Trajectory

Over the last decade, energy demand in the Sahel surged by over 4% annually,[2] driven by population

Figure 1 **Sahelian country energy mix**



Source: EMBER, 2021

1 Azam, A., Rafiq, M., Shafique, M., Yuan, J., & Salem, S. (2021).

2 International Energy Agency (2022). Clean Energy Transitions in the Sahel. International Energy Agency. Paris.

growth and expanding economic activity. All Sahelian countries express intent in transitioning from high-polluting energy sources, outlined in their Nationally Determined Contribution (NDC) documents. Green energy is pivotal to meeting the estimated 950 petajoules surge in demand.[3] However, the pathways will vary among hydrocarbon-exporting states versus non-exporters and between agro-based and service-oriented economies. The energy shift presents an opportunity for economic growth, improved social outcomes, resilient societies, and environmental protection.

Approximately 7,385 MW of new thermal power plant capacity emerged alongside renewable energy initiatives. Transitioning from liquid fuel to gas-fired plants, funded significantly by multilateral and bilateral development institutions providing concessional funds, capital contributions, or guarantees, marked a key shift in the region's energy landscape.

Oil-based power plants dominate, constituting 75% of total generation.[4] Shifting from coal to natural gas could slash greenhouse gas (GHG) emissions by 50% for electricity and 33% for heat supply.[5] Replacing oil and diesel with natural gas could yield emissions reductions of 25% to 30%. Adding a steam cycle to gas-fired plants could amplify thermal efficiency to nearly 60%, halving GHG emissions per kWh compared to traditional coal-fired plants.[6]

A just energy transition, centered on renewables and energy efficiency, is crucial for a climate-resilient future while prioritizing human welfare outcomes. This report delves into the interconnectedness of energy and development, underscoring energy's role in fundamental human needs and economic growth.

Energy drives economic activities, lighting, transportation, and digital technologies, impacting poverty eradication, health, gender equality, food security, and climate adaptation. It has been key to enabling human development.[7] Access to electricity strongly correlates with multidimensional poverty, particularly in sub-Saharan Africa (SSA) (Chapter 1). The Multidimensional Poverty Index (MPI) indicates that 77.5% of the impoverished population in sub-Saharan Africa lacks access to electricity.

Amid challenges facing the Sahel in achieving the SDGs and the African Union's Agenda 2063, such as violence and instability, this report aims to highlight opportunities aligning a sustainable energy transition with the Sahel's development goals. It proposes actionable recommendations to capitalize on this transition (Chapter 1).

Acknowledging resource constraints and trade-offs, the report navigates the tension between fossil fuel exploitation and green energy investment. The Balanced Green Growth (BGG) pathway charts a realistic course, recognizing Africa's developmental needs while addressing environmental concerns.

This report, grounded in empirical models built from country-level nuances, offers a comprehensive view of the Sahel's present and future, acknowledging diverse developmental trajectories.

Unlocking the Energy Potential in the Sahel

The Sahel is also one of the regions with the highest renewable energy potential in the world, including one of the world's highest solar production capacities – 13.9 billion kWh/y compared to the total global consumption of 20 billion kWh/y – and is abundant in the natural resources that are critical for powering clean energy technologies[8] (Chapter 1). These opportunities distinguish the Sahel as a region that can accelerate progress toward the achievement of the SDGs while paving the way for a more prosperous and resilient future.

3 International Energy Agency (2022). Clean Energy Transitions in the Sahel. International Energy Agency. Paris.

4 International Energy Agency (2022). Clean Energy Transitions in the Sahel. International Energy Agency. Paris.

5 International Energy Agency (2019). The Role of Gas in Today's Energy Transitions. International Energy Agency. Paris.

6 Steen. M (n.d). Greenhouse Gas Emissions from Fossil Fuel Fired Power Generation Systems. European Commission Joint Research Centre.

7 Ray, S., Ghosh, B., Bardhan, S., & Bhattacharyya, B. (2016). Studies on the impact of energy quality on human development index. Renewable Energy, 92, 117-126. https://www.sciencedirect.com/science/article/abs/pii/S0960148116300611?via%3Dihub

8 UNDP (2023). A Regeneration. Implementing the United Nations Integrated Strategy for the Sahel. UNDP.

About half of the 340 million people living in the Sahelian region does not have access to electricity.[9] This is one of the lowest rates of consumption of modern electricity on the planet. The current state is the result of a combination of low levels of generation, volatile or high petroleum prices, and inadequate financing for relevant electricity grids, leading to very poor connectivity.

Power generation in the Sahel is about 35 watts per capita, roughly a third of the sub-Saharan Africa average and close to 4% of the global average. There are, however, high regional disparities. For instance, in Senegal, the level of access is as high as 70%, while in Chad it stands at just 8%.[10] Electricity access in urban areas is increasing faster than in rural areas. In fact, electricity is completely absent in many rural areas in the Sahel, forcing people to use firewood for cooking stoves which leads to health (and deforestation) issues (Chapter 4).

Power generation across the Sahel is costly. Affordability problems have been exacerbated over the past few years due to global economic and geopolitical shocks, which have caused the prices of all types of energy sources, as well as of energy-related equipment such as solar home systems, to rise. In the absence of policy changes, energy poverty is set to ravage the region for the foreseeable future. The reliability of electricity in the Sahel is also among the lowest in the world, creating a critical roadblock for development (Chapter 4).

Almost half of Sahel countries experienced a growth of more than 4% in primary energy demand over the last two decades. By 2030, 40% of the population in the Sahel are expected to live in urban areas.[11] If current policies and development patterns continue, around 80 million people will be left without access to electricity and 120 million will not have access to energy that powers clean cooking techniques.[12]

However, amidst these variations, the Sahel boasts a unique collective dynamic that surpasses individual distinctions. Shared challenges, opportunities, and domestic as well as international contexts in energy connect the Sahel countries, making it imperative to explore pathways for an energy transition aligned with both energy and development objectives. These shared contexts encompass abundant human capital and renewable energy potential, vulnerability to climate change, existing energy and development needs, shifting geopolitics, and the potential for impactful regional collaborations. As the Sahel navigates aligning immediate and long-term goals amid these dynamics, this report aids in considering both commonalities and differences within the region (Chapter 1).

Balanced Green Growth Is a Pathway to Success

This HDR uses the International Futures (IFs) model to evaluate three possible scenario options for just energy transitions in the Sahel. Details of the options are presented in Annex A. The options are: (a) the Current Path (CP), which assumes no change to current and planned energy options; (b) the Renewable Push (RP), which assumes an aggressive transition to renewables; and (c) Balanced Green Growth, which assumes a more gradual transition with gas as a transition fuel (Chapter 2).

The Current Path scenario makes a broad set of assumptions about how development works and reflects the broad assumptions that stretch across issue areas within the IFs model. The Current Path scenario, reflecting prevailing trends, forecasts the region's development trajectory, emphasizing the complexities of ongoing socioeconomic dynamics. While leaning heavily on traditional fossil fuels, the projection highlights sluggish progress in renewable energy adoption. This approach faces the dual challenge of fostering development while addressing climate change impacts, posing risks to sustainable growth due to limited access to clean energy sources. Fossil fuels (55.9%) dominate energy production presently, with oil and gas comprising the majority, while

9 Melloh, C. (2021). Solar Power to Boost Electricity Access in the Sahel. Blog. The Borgen Project.
10 International Energy Agency (2022). Clean Energy Transitions in the Sahel. International Energy Agency. Paris.
11 International Energy Agency (2022). Clean Energy Transitions in the Sahel. International Energy Agency. Paris.
12 International Energy Agency (2022). Clean Energy Transitions in the Sahel. International Energy Agency. Paris.

renewable sources like hydro, solar, and wind remain marginal. The forecast anticipates a shift by the mid-2030s, with reduced oil reliance (30%) and increased gas production (70%), paving the way for solar and wind to gain traction, ultimately constituting a substantial portion (30%) of energy production by 2063 (Chapter 2).

The Renewable Push scenario outlines an ambitious strategy for the Sahel region, focused on accelerating the transition to renewable energy sources. This scenario prioritizes hydro, solar, and wind power, leveraging the region's abundant renewable resources. To achieve this, collaboration among governments, international bodies, and private entities becomes paramount, requiring supportive policies, regulations, and financial incentives to spur large-scale renewable energy projects. The RP envisions significant international cooperation and financial aid to secure the region's energy needs due to the high investment needs for renewable infrastructure projects (Chapter 2).

This scenario witnesses a remarkable surge in solar and wind production, exceeding CP levels by more than double by 2030 and nearly quintupling by the mid-2040s. Hydro production also escalates to 1.5 times that of the CP. Notably, fossil fuel output diminishes substantially, with gas production declining by about 40% by the early 2040s, and oil production decreasing by over 75% by 2050 compared to CP levels. Renewable energy is anticipated to constitute over 20% of total energy production by 2050 and exceed 80% by 2063 in this scenario (Chapter 2).

Table 1 summarizes the results from the model and shows that the Balanced Green Growth scenario would keep the Sahel on track to move away from high-polluting fossil fuels, while eliminating extreme poverty and enhancing the region's Human Development Index (HDI), in the long term. The significant development gains justify the trade-off in preferring the Balanced Green Growth path over the Renewable Push strategy.

The BGG path is based on an energy mix that includes a 30% increase in renewable production and investment, a 30% increase in natural gas production and investment, and a 20% increase in production and investment of other fossil fuel-based sources (primarily oil, coal, and nuclear), by 2030. It also assumes a 100% electrification rate across the Sahel by 2050. In addition, the scenario entails various assumptions related to agricultural yields, governance and spending, gender equality and women's empowerment, caloric variations, conflict/war, water and sanitation access, and a range of education, health, and income inequality. A breakdown of the assumptions can be found in Annex 4.

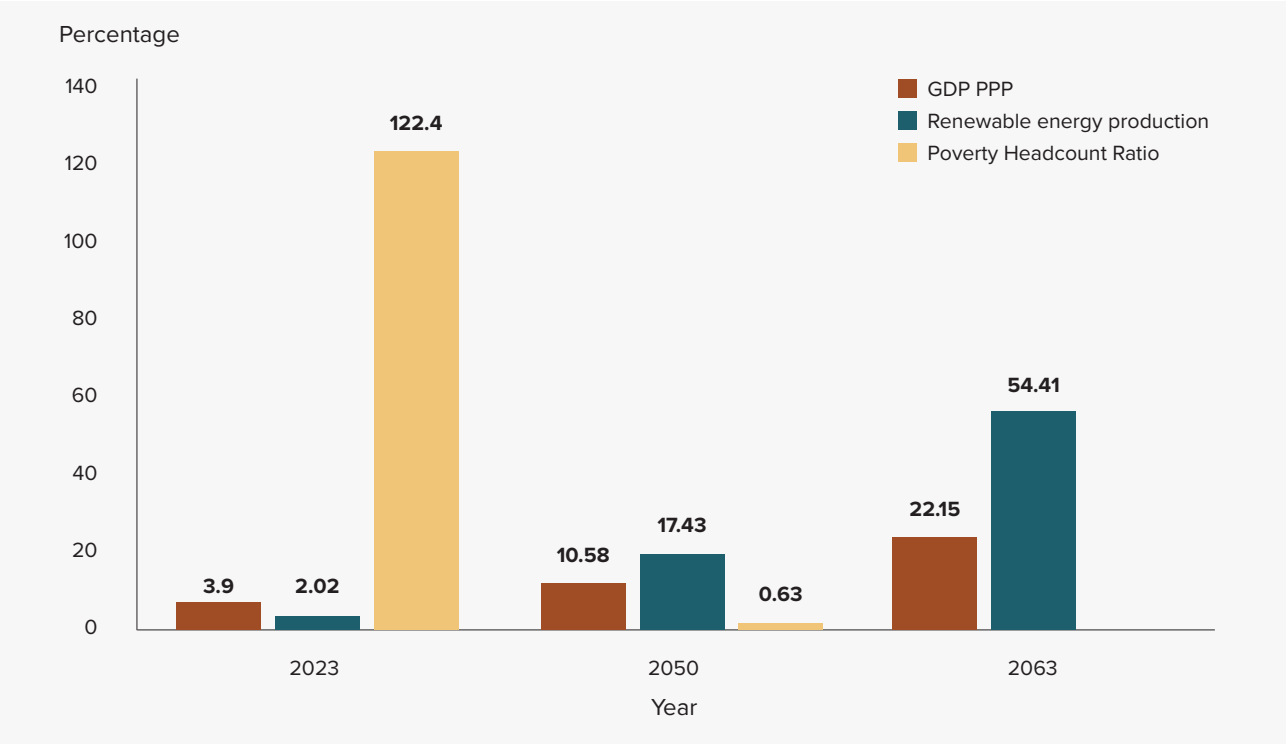
BGG's investment approach is to leverage fossil fuels, notably natural gas, in the medium term (for the next 10-15 years at least) while concurrently investing in renewable energy for the long term. By 2030, renewables in the Sahel would make up 3.1% of the total energy production but by 2063, this increases to 54%. At a country-specific level, BGG increases renewable energy production significantly in the long run, especially for countries such as Burkina Faso and

Table 1 **Summary of results**

		Current Path 2063		Renewable Push 2063		Balanced Green Growth 2063	
	2030	Value	% change	Value	% change	Value	% change
Oil Production (BBOE)	0.8	1.0	28.2	0.1	-88.5	0.5	-30.8
Natural Gas Production (BBOE)	0.5	0.8	59.6	0.5	-9.6	1.0	90.4
Renewable Production (BBOE)	0.0	1.1	3600.0	2.7	8800.0	1.8	5866.7
GDP per capita (thousand US$)	3.9	12.2	215.2	13.0	234.6	22.2	463.3
Human Development Index	0.6	0.9	41.7	0.9	42.3	0.9	49.0
Extreme Poverty (million people)	142.9	28.8	-79.9	24.5	-82.9	0.0	-100.0
Renewable Energy (% of total)	2.0	37.6	1780.0	82.7	4035.0	54.0	2600.0

Source: International Futures (IFs) v8.01.

Figure 2 Balanced Green Growth projections



Source: International Futures (IFs) v8.01.

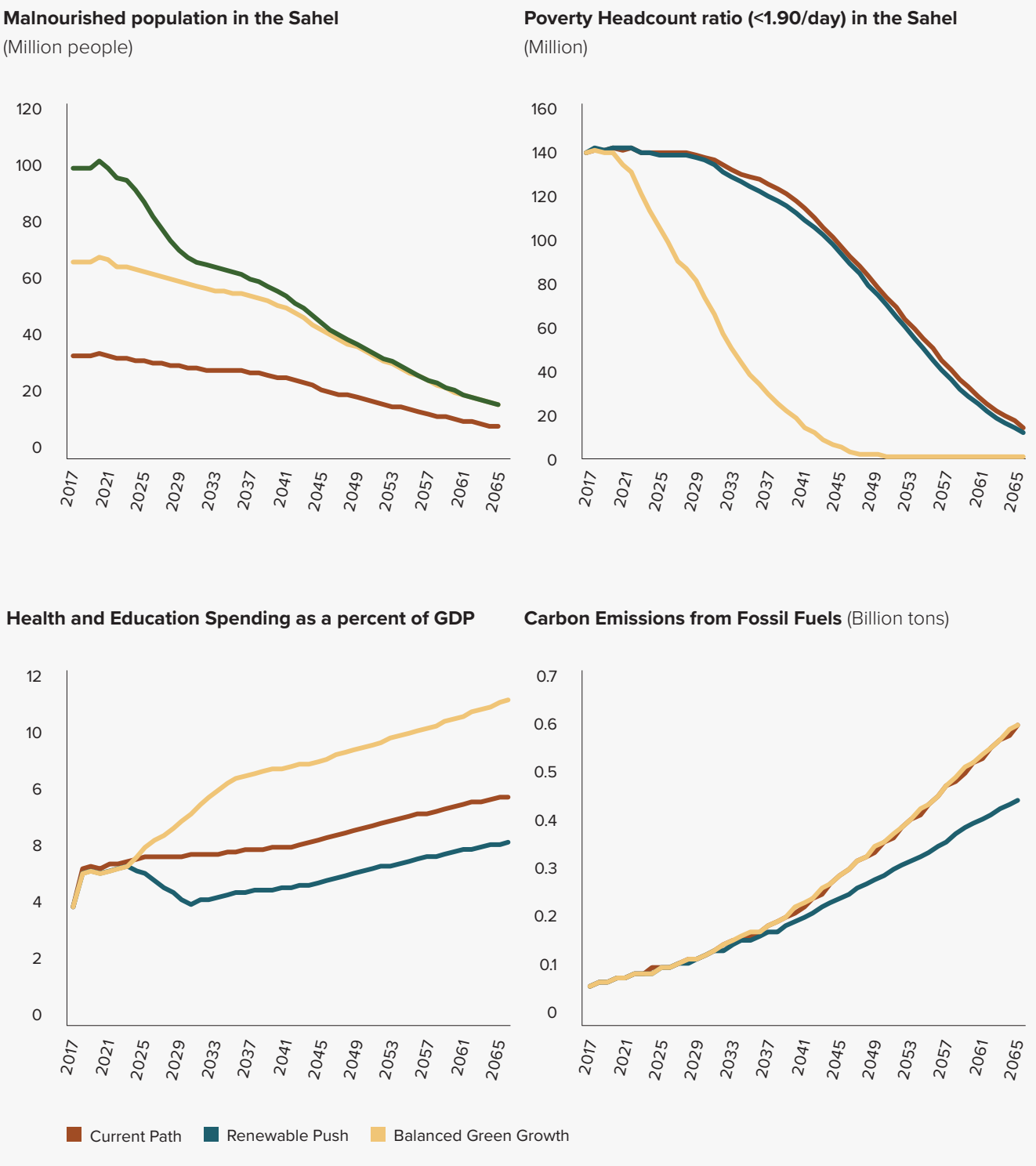
Mauritania which will reach over 95% renewable energy by 2063 (Chapter 2).

According to the projections, BGG increases economic growth for the region and for each individual country as measured by both gross domestic product (GDP) and GDP per capita. GDP per capita in the region measured by purchasing power parity (PPP) increases from $3.9 thousand in 2024 to $22.2 thousand by 2063 – a significant increase with important implications for government expenditure and development gains. Annual GDP grows exponentially under the BGG path, nearly doubling the gains made by the Current Path. The region increases its GDP by over $17,500 billion by 2063 with significant increases for each individual country (Chapter 2).

This scenario also reduces energy import dependency over time. At the same time, because investment is balanced and traditional sources of energy are leveraged in the short term, energy exports increase for BGG until around 2045 which can provide important economic benefits, such as an improved balance of payments, enhanced terms of trade, and a lower need for foreign reserves. Over time, energy exports start to decrease. These initial gains are concentrated in Nigeria (28.9 billion by 2063), Chad (13.5 billion by 2063), and Cameroon (0.8 billion in 2063) who are the largest producers of oil which can be scaled in the short term to increase export values and drive economic growth (Chapter 2). Some of the development gains from the BGG path are illustrated in Figure 3 below.

Our findings reveal that inaction carries a high cost. The CP scenario projects a future where the region fails to achieve universal electrification by 2063. Despite some progress in development goals, the pace is inadequate. Although poverty rates decrease gradually, the rapidly growing population and other factors contribute to its persistence into the mid-2040s. This scenario demonstrates how limited access to clean energy and lack of action in key development areas can hinder the region's pursuit of sustainable development. BGG is the only approach that consistently responds to the need for the Sahel region to improve its human development along an energy transition development pathway.

Figure 3 **Socioeconomic and environmental gains from the BGG path**



Source: International Futures (IFs) v8.01.

Accelerating Human Development Progress in the Sahel

Data from the turn of the twenty-first century indicates an upswing in the Sahel's economic performance and human development, surpassing sub-Saharan Africa's pace. However, progress tapered off in the 2010s. Despite advancements in certain human development aspects like life expectancy and education, the Sahel countries still rank lower in the Human Development Index, trailing in education, health, and income compared to the broader sub-Saharan African region (Chapter 3). The BGG projections depict a remarkable transformation for the Sahel region's overall development.

Socially and demographically, despite strides made, population projections signal a need for substantial improvements in education and employment to unlock the potential of the region's youth. While there have been gains in education and health indicators, challenges persist. Malnutrition rates and stunting among children under five remain among the world's highest. Maternal mortality and a significant portion of unemployed and uneducated youth also pose concerns, setting the Sahel apart from other African regions (Chapter 3).

According to the BGG path, by 2030, the regional HDI leaps from 0.61 to 0.7, and by 2063, it soars to an impressive 0.93 – similar to contemporary countries like Finland and the UAE. This remarkable progress, vital for short- and long-term livelihood enhancements, primarily stems from advancements in education, health, and the economy under the BGG plan. An outstanding feat is poverty reduction accelerated by BGG, with the number of people living on less than $1.90 a day forecasted to nearly vanish by 2050 from the current count of approximately 125 million individuals (about 38% of the population). By 2030, a potential reduction of 50-60 million people (to 20%) living in poverty is projected, marking significant strides. Collective efforts across Sahel countries under unified energy policies are pivotal in this poverty alleviation journey (Chapter 3).

The BGG forecasts increased health and education spending to over 10.4% of regional GDP by 2063, up from the current average of 5%. Leveraging short-term gains from fossil fuels enables substantial investment in education and health, yielding pivotal outcomes (Chapter 3).

Government expenditure aimed at education significantly enhances the mean educational attainment among 15-24-year-olds, projecting an increase by 2063. This balanced investment approach not only augments education but also works toward reducing urban-rural and gender disparities (Chapter 3).

Economically and digitally, the Sahel witnessed moderate growth over two decades, yet macroeconomic instability and a lack of diversification hindered progress. GDP growth slowed in the 2010s, except for Niger and Cameroon. Business environment improvements were offset by political instability, poor infrastructure, and global shocks, leaving the region among the least favorable for business despite its rich natural resources (Chapter 3).

Environmental and energy indicators underscore the vulnerability of the Sahel to climate change impacts, with all but two countries facing high disaster risks. This vulnerability, if unaddressed, directly affects human development, evident in the adjusted HDI due to planetary pressures. Sustainable energy use under BGG significantly improves health outcomes by reducing deaths attributed to health burdens. Notably, the plan sharply curtails the use of traditional cookstoves, eliminating their use by 2063, alleviating indoor air pollution concerns (Chapter 3).

Governance and institutional metrics like Rule of Law, Voice and Accountability, Corruption Control, and Political Stability highlight ongoing concerns. Although minor improvements in accountability have been noted, the Sahel faces challenges in political stability and governance, significantly impacting its development trajectory.

The BGG scenario extends beyond energy and development; it fosters improved political economies. By 2063, various governance indicators significantly enhance, including democracy, civil and political freedoms, economic freedom, and transparency, substantially reducing corruption and the threat of civil conflicts across the region. This improved governance becomes a catalyst for increased economic activity, poverty reduction, and advancements in health and education, highlighting the transformative potential of the BGG approach in unifying energy and development goals for the Sahel region (Chapter 3).

Balancing Climate Imperatives with Human Development: The Energy Challenge in a Sahel Full of Opportunities

Climate change poses increasing threats to the Sahel as rising temperatures, sea levels, and shifting rainfall patterns adversely impact livelihoods, food security, health, and economic growth, potentially fueling conflicts. Compounded by inadequate electricity access, particularly in rural areas, the region faces hurdles in progressing human development. Addressing these challenges demands substantial energy investments for inclusive economies, improved livelihoods, and universal access to clean energy, given the rising population and urbanization rates.

Despite being a low-emitting region, the Sahel bears severe consequences of human-induced climate change, hindering environmental and development goals. By 2050, high-temperature extremes in the Sahara and Sahel could increase significantly, affecting biodiversity, agriculture, water, infrastructure, and migration patterns (Chapter 4).

Examining the current energy landscape, nearly half of the Sahel's population lacks access to modern electricity, posing a considerable challenge to connectivity and development. While some countries, like Senegal, boast 70% access, others, like Chad, struggle at just 8%. Affordability and reliability issues persist, hampering business, healthcare, and daily activities (Chapter 4).

The region is experiencing population growth and must elevate energy access to support its expanding economy. Transitioning from traditional biomass and fossil fuels to tap into its vast renewable energy potential is crucial. While governments incorporate renewables into their strategies, their current usage remains minimal (Chapter 4).

BGG takes a more gradual path toward net-zero in the Sahel but is more sensitive to the region's diversity and ensures much-needed space for socioeconomic development. This is true at both the national and regional levels.

Aligning National Targets with Regional Priorities

The preferred pathway is consistent with the African Union's Common Position on Just Energy Transitions in Africa and supports national renewable targets in many countries – as shown in Table 2. This bodes well for national ownership and would make it easier to garner political will. The Just Energy Transition aspects of the BGG path will work better for some countries than others. For example, Senegal and Nigeria have an abundance of natural gas resources and infrastructure in place that can and should be used to create opportunities for local companies and international partners to drive economic growth. In countries without such endowments, much more should be done to support the transition both technically and financially (Chapter 4).

Table 2 National renewable energy targets in the Sahel

Country	Renewable energy target
Mauritania	To increase the share of renewables in the energy mix to 60% by 2030.
Mali	To increase the share of renewable energy in the energy mix to 59% by 2025, 64% by 2030, and 70% by 2036.
Burkina Faso	To increase the share of renewable energy in total electricity production to 50% by 2030.
Niger	To reach at least 30% of the energy balance from renewable energies by 2030.
Chad	To reach a 20% share of renewable energy in national electricity production by 2030.

Private sector players should engage in public-private partnerships to co-create enabling environments that support scaling mini-grids and other renewable energy technologies. For example, the Africa Mini-grid Developers Association (AMDA) could work together with governments and donors to ensure that mini-grids are effectively used as a key component in ending energy poverty through reliable, affordable, and sustainable energy (Chapter 4).

To succeed, Sahel governments should prioritize strong engagement in enacting enabling policies to support the localization of energy technologies. Several policy options to do so and attract private sector participation are urgently required. Off-grid providers should be incentivized and regulated, for instance,

through clean energy targets, tax breaks, net metering, and carbon pricing. For off-grid solar, countries should use technological, digital, and business model innovations that could increase energy access in rural areas (Chapter 4).

Leveraging Regional Synergies to Enhance Green Energy Initiatives

BGG could create new regional green energy solutions, while also expanding and deepening existing regional arrangements. For example, the West African Power Pool (an agency of the Economic Community of West African States that is working toward integrating 14 of its 15 members into a unified regional electricity market) is committed to strengthening regional integration which will lead to lower import costs and cleaner energy generation while significantly expanding the grid beyond major cities.[13] The FREXUS program is another regional initiative that has been successful in achieving its objectives of using a water-energy-food nexus to address a wide range of challenges in fragile contexts. The nexus approach allows the initiative to avoid unintended consequences and impacts on other sectors and to improve the efficiency of natural resources in a climate-conscious way. The project is based in Mali, Niger, and Chad, led by the Lake Chad Basin Commission and Niger Basin Authority and includes capacity building for country stakeholders to address conflict and climate change in an integrated way (Chapter 4).

Financing Green Energy Transitions in the Sahel

Securing financial resources is pivotal for bolstering energy production. Exploring the landscape of financing players and instruments active in energy projects, the report highlights the need for Sahel countries to effectively utilize these resources. Understanding the region's energy history, trends, and financing dynamics becomes crucial in comprehending present energy plans' urgency, scope, and potential implementation challenges.

For the BGG path, across all 10 Sahel countries, the cumulative investment toward energy needed is $186 billion by 2030 – see Table 3 and Table 4. By 2050, this increases to $797 billion and by 2063 the total is $1.9 trillion. Investment levels differ by country, ranging from $1,571 billion in Nigeria to $3.1 billion in Mauritania. The overall cumulative investment toward energy is lower for BGG than the Current Path and Renewable Path up until 2050, meaning these transformative impacts on energy and development could be achieved under similar or lower investment levels than the other pathways. This level of investment is still a heavy burden and will require bold action by key financing players (Chapter 4).

Table 3 Anticipated annual energy investments in the Sahel across scenarios (billion US$)

	Current Path	Renewable Push	Balanced Green Growth
2030	18.89	19.3	17.25
2050	46.80	59.1	50.3
2063	97.92	117.1	124.1

Table 4 Anticipated cumulative energy investments in the Sahel across scenarios (billion US$)

	Current Path	Renewable Push	Balanced Green Growth
2030	195	196.2	186.1
2050	795.6	921.9	797
2063	1,735	2,062	1,898

Source: IFs v8.01.

To facilitate and expedite requisite financing, Sahelian countries must take steps to strengthen their domestic financial systems. National governments can play a key role in addressing financing bottlenecks by promoting and supporting local financial institutions to identify projects and accredit implementing

13 West Africa Power Pool (2023). https://www.ecowapp.org/

entities that meet investors' requirements. They can also enhance the capacity of local finance actors such as commercial banks and institutional investors to improve energy finance. Since local finance channels eliminate currency risks, reduce exposure and vulnerability to external shocks, and effectively, price risks due to their proximity to communities and markets, they have great potential as sources of energy investment.

In addition, Sahelian countries should embrace innovative financial strategies, including greenhouse gas trading systems, green bonds, green swaps, sustainability-linked bonds, efficient carbon marks, debt swaps, and forward-looking domestic resource mobilization instruments. Greenhouse gas trading systems could establish a market for buying and selling emission allowances and provide an opportunity for Sahel countries to generate revenue that can be reinvested in BGG priorities.

Turning Opportunities and Regional Synergies into a Pathway for Success in the Sahel: Recommendations to Leverage Energy for an Accelerated and Sustainable Development

Sustainable energy can unlock the Sahel's immense potential. As UN Secretary General António Guterres has stated,

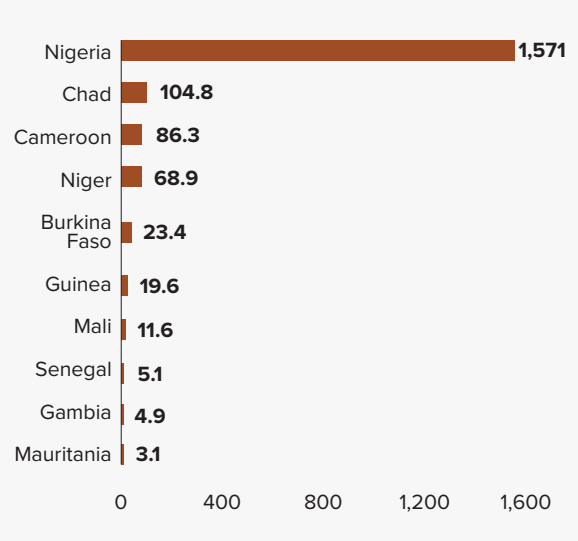
"With their innovation, their climate leadership and commitment to inclusive and sustainable development, African countries can provide solutions not just for Africa, but for the world."

This sentiment was echoed by UNDP Administrator Achim Steiner who pointed out that

"Africa has abundant renewable energy sources with the potential to ensure access to affordable, reliable, sustainable and modern energy for all."

This HDR unpacks the relationship between energy, economic development, and societal stability in the Sahel and identifies eight broad recommendations (Chapter 5).

Figure 4 Cumulative investment in energy under BGG scenario across Sahel countries by 2063



Source: International Futures (IFs) v8.01.

1. The Sahel can lead a green industrialization in Africa. Given its significant renewable energy resource potential, the Sahel can become the first region in Africa to pioneer and champion an industrial revolution based on, and fueled by, renewable energy. Investments in renewable energy would go beyond transforming domestic use (the transition from biomass) to focus on establishing green regional value chains that create jobs, leverage global value chains, and accelerate the attainment of the SDGs. Industries like the manufacture of photovoltaic (PV) cells/batteries, textiles, and agro-processing are potential candidates. Countries in the Sahel should adopt targeted green industrial policies, use the African Continental Free Trade Area (AfCFTA) to widen market access, and work with the private sector to ensure (and expedite) necessary technology transfers and financing – including with the diaspora (Chapter 5).

For example:

- The Nigerian Energy Masterplan outline approaches to bolster domestic solar panel manufacturing and skills for green industries, targeting job creation in a market of 206 million people.
- Senegal is hosting Africa's first utility-scale wind farm, the 158 MW Taiba N'Diaye facility, and is positioning itself for associated industrial growth.

2. Only a balanced and coordinated approach utilizing some natural gas and fossil fuels in the short term while scaling up renewables long term will succeed in transitioning the region's energy system. A balanced and coordinated strategy also provides a realistic transition timeline that is sensitive to each country's resources, avoids energy shortfalls as renewable capacity scales up, and keeps the lights on for Sahel communities. It should take into account potential unintended effects of renewable energy transition, including increased material footprints, land-use change and its consequences, potential Human Rights effects, and conflict tensions. Sahelian governments must enact clear legal and regulatory frameworks that attract investments to facilitate a just green transition. Development partners and investors can provide funding and technical expertise to help update grids, build gas infrastructure where viable, pilot new technologies, and craft localized transition roadmaps rooted in data and community needs (Chapter 5).

For example:

- Nigeria boasts extensive infrastructure and more than 200 trillion cubic feet of proven gas reserves, currently fueling 43% of its power generation. Rather than abandoning operational gas plants, Nigeria can attract investment to capture flared gas, utilizing existing pipelines to expand electricity access and support industries.

3. Consistent long-term engagements between governments, development partners, and communities will deliver tangible results on the ground and build trust in the process. This is critical because trust-building between citizens, officials, and development partners could help establish a more permissive political economy that will support and promote green transitions. Sahelian governments should institutionalize inclusive energy and development planning processes that empower communities in shaping priorities. Civil society and private sector partners can provide capacity building and participatory monitoring support while financiers must commit to multi-year funding tranches tied to locally defined energy access and usage metrics (Chapter 5).

For example:

- The EU-funded FREXUS project in Niger facilitates engagement between the government, Lake Chad Basin Commission, civil society, and local communities to co-develop context-specific solutions addressing the water-energy-food nexus in the Diffa region facing conflict and environmental pressures.
- Burkina Faso's Bottom-Up Energy Planning methodology ensures citizen feedback for the formulation of an energy policy targeting 26% electrification by 2030, in collaboration with development partners.

4. Technology should play a central role both in delivering energy access solutions and informing data-driven policy to maximize socioeconomic impacts. Technology is at the core of expanding energy access and affordability in the Sahel, underpinning off-grid solar solutions, mini-grid connections, battery storage innovations and efficiency improvements. Granular geospatial and user data layered with machine learning can support dynamic, evidence-based policy targeting for subsidies, grid expansions, and renewable micro-financing so investments maximize impact. Sahelian governments should invest in nationwide energy user and market datasets while crafting interoperability standards. Private sector and development partners should develop customer-centric pay-as-you-go solutions, provide analytics to model least-cost electrification scenarios, and finance pilot innovations aligned to socioeconomic development metrics (Chapter 5).

For example:

- Orange Mali introduced three Solar Electricity Villages, supplying decentralized solar power to sustain critical telecom infrastructure. Additionally, they have extended pay-as-you-go home solar systems to more households in these villages, utilizing mobile payment solutions.
- Niger's government aims to leverage geographic information system (GIS) data strategically to target electrification investments and subsidies, maximizing socioeconomic benefits.

5. Patient capital must underpin the Sahel's renewable energy revolution. The Sahel requires patient, long-term capital to fund its renewable energy revolution because transforming distributed energy ecosystems requires sustained investments before commercial viability. Without concessionary and risk-tolerant financing that adopts a long-term lens, bankable projects will remain scarce, deal flows limited, and energy poverty entrenched across the region. Sahelian governments should explore mechanisms to attract and retain long-term capital that will improve investor returns over the medium term. Furthermore, just as development banks and impact funds provide credit enhancements and subordinate debt to catalyze private capital inflows, corporate partners can also embrace social responsibility mandates supporting early-stage ventures (Chapter 5).

For example:

- Nigeria has initiated various financial incentives to encourage renewable energy adoption. These include freezing import duties on renewable energy technologies, tax credits, capital incentives, and favorable loans to foster continuous growth in renewable energy projects.
- In Mali, the government's Segou Solar PV project champions initial private sector investments in a large-scale solar photovoltaic facility. This endeavor not only lowers overall power generation costs but also encourages increased private sector involvement in funding renewable energy ventures amid evolving regulatory frameworks.

6. Scaling up the Sahel's energy ambition means prioritizing cross-border initiatives to boost affordability and reliability. Scaling up the Sahel's energy ambition requires prioritizing cross-border interconnectivity and regional power pools because no country has sufficient resources to independently achieve universal access. Regional approaches protect against climate vulnerabilities as countries facing droughts or fuel shortages can import clean electrons from neighbors with surpluses. Such initiatives can build on existing regional arrangements like the Economic Community of West African States (ECOWAS) and the West African Power Pool (WAPP).[14] Sahelian governments should harmonize power sector regulations, lower duty barriers for equipment imports, and jointly plan least-cost generation additions with WAPP support. Development partners can provide technical assistance to negotiate and broker agreements while the private sector finances interconnections through transparent public-private deals (Chapter 5).

For example:

- Guinea's Kaleta dam kickstarted a broader strategy, revamping its electricity sector and establishing new power lines to connect with neighboring countries. The addition of the 450MW Souapiti dam has substantially increased the country's power capacity. Despite ongoing distribution and transmission challenges, resolving these issues could enable Guinea to export electricity to neighboring nations, aligning with the government's goals.

7. Leaving no one behind requires incentives, not just subsidies. Achieving universal access in the Sahel requires incentives that spur commercial investments, not just temporary subsidies that could distort markets. With the right mix of smart incentives tied to milestones like new connections or kilowatt hours of renewable energy delivered, companies can profitably expand pay-as-you-go solar and mini-grids to rural villages while subsidies focus on those in most need. This approach will help close the gender energy gap and bridge the rural-urban divide in energy access and affordability. Sahelian governments should set up investment facilities that de-risk lending to decentralized players while streamlining licensing. Development partners can provide working capital loans via local financial institutions to support inventory and receivables, and impact-focused investors must structure innovative instruments like enterprise challenge funds (Chapter 5).

14 An agency of ECOWAS that is working toward integrating 14/15 of its members into a unified regional electricity market.

For example:

- Mali is prioritizing gender inclusion in renewable energy programs by integrating gender expertise throughout project activities, aiming to reduce disparities in resource access, decision-making, and autonomy.
- Niger's government aims to establish financial support programs that strike a balance between ensuring commercial sustainability for service providers and protecting customers from high tariffs. Solar home systems play a pivotal role in Niger's National Electrification Strategy, especially in rural areas.

8. Garnering sustained political commitment requires an alignment between national policy objectives and programmatic initiatives being implemented. Garnering ongoing high-level political commitment requires closing gaps between ambitious national policies and actual initiatives implemented on-ground. Without visible demonstrations that policy priorities like expanding off-grid solar or funding hydro plants translate into households getting connections, trust in government commitment erodes. Sahelian governments need to task relevant ministries, departments, and agencies with tracking policy priorities against spending allocations and community-level energy access data while providing public dashboards. Civil society should conduct citizen surveys and budget expenditure analyses feeding into oversight, and development partners can fund independent evaluators assessing rural connectivity against national electrification targets (Chapter 5).

For example:

- Mauritania's commitments in its updated NDC focus on assessing renewable energy accessibility and promoting clean energy production through legislation revisions. The revised NDC aims for an 11% reduction in greenhouse gas emissions by 2030, emphasizing clean energy projects like green hydrogen, solar, and wind energy, with an estimated cost of $34.25 billion.

Political Economy Considerations for Successful Implementation and Transformative Outcomes in the Sahel

This report delves into the challenges and requirements for implementing its recommendations across Sahel countries. It employs a model that examines policy ambiguity and conflict within each nation, crucial factors shaping implementation hurdles. For example, Nigeria faces low policy conflict and ambiguity, primarily requiring adequate resources for successful execution. In contrast, Mali deals with high policy conflict and low ambiguity, necessitating resolution through inclusive political participation (Chapter 6).

By identifying potential implementation barriers, both development actors and Sahel countries can better allocate investments to actualize the report's recommendations. The analysis in this report encompasses security, governance, geopolitical, and social aspects pertinent to an energy transition, tailoring specific implementable suggestions at regional and national levels, while considering the existing financing landscape (Chapter 6).

The report offers a roadmap outlining initial steps for actors to kickstart the process. It proposes immediate resource infusion into areas with clear goals and political alignment, such as renewable energy production, gender empowerment, education, water access, leveraging regional and international cooperation initiatives. In areas marked by high conflict and ambiguity like fragility and governance, bolstering state capacity and advancing democratic processes are pivotal, potentially diminishing factors contributing to fragility (Chapter 6).

By factoring in the political economy and tradeoffs inherent in energy transitions, this HDR charts a tangible pathway for policy prioritization. This approach holds significant promise to achieve developmental goals, enhance livelihoods, and steer the Sahel toward sustainable prosperity. Seizing the current opportunity window becomes imperative to effectively implement recommendations and harness energy as a catalyst for development.

CHAPTER

1

Introduction

Seizing the Unique Momentum to Leverage Energy for Accelerated and Sustainable Development in the Sahel

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Introduction – Seizing the Unique Momentum to Leverage Energy for Accelerated and Sustainable Development in the Sahel

Today, the world faces an undeniable climate crisis. Worldwide, the impact of extreme weather events detrimentally affects human lives, ecosystems, and non-human species. Previously seen as distant issues, phenomena like droughts, sea level rise, floods, and wildfires now hold center stage, impossible to disregard.

At the same time, due to a variety of factors ranging from geographical placement, economic vulnerability, and the fragility of social and governmental systems and resources, lower-income regions are less able to withstand the shocks of climate change, and therefore are poised to suffer disproportionately from its effects. Many have pointed out the cruel irony in this: those countries that have benefited the least from modern industrial development and the greenhouse-gas emitting technologies that go along with it are bearing the brunt of climate change.

Regions that have never known the stability of a reliable and far-reaching electric grid or easy access to gas-powered vehicles and roads to drive them on are now paying for the reliance of higher-income regions on them. As such regions work to advance their human development priorities in order to raise the quality of life of their populations and the stability of their social systems, they are faced with an unjust dilemma: follow the well-trodden path taken by the global north to economic development and focus on exploiting oil and gas resources – in many cases, the easiest and most straight-forward approach – or attempt to "leapfrog" those technologies and to pivot to renewable energies, simultaneously advancing human development while investing in an environmental sustainable energy system, and thus, future?

The Sahel, a semi-arid region covering 10 countries in northern Africa, is a poignant case in point of the paradox that climate change presents to developing nations. With just half its population currently able to access electricity, and thus having benefited relatively little from modern energy systems, it is nevertheless uniquely vulnerable to climate change. At the same time, it faces a series of challenges to meet its human development priorities, including the SDGs and the African Union's Agenda 2063.

This report suggests that rather than making an impossible choice between advancing human development and developing environmentally sustainable energy sources, the Sahel can simultaneously make progress in both, by taking advantage of the unique synergies between development and energy, and by focusing efforts toward one in ways that bolster the other. We give this approach a name and delineate its concrete features (see Chapter 2): the Balanced Green Growth pathway, an empirically-based model derived from the latest and most up-to-date data and forecasting paradigms. We then outline specific recommendations that the nations and region of the Sahel can look to in order to turn this forecast into reality – not in an abstract, ideal world, but in the very real and evolving context of the region, taking into account all the complexities and dynamics of the geographical, political, economic, and social realities of this region; the challenges they present and the opportunities they contain.

Why Energy and Development?

This HDR is based on the inseparable relationship between energy and development. At the most basic level, humans require energy to be able to eat, study, work, socialize, and survive. Energy is therefore a public good that must be guaranteed for all citizens.

Energy is the driving force of economic growth: It is critical for lighting, cooling, cooking, transportation, and industrial activities as well as powering the digital technologies that are increasingly important to the global economy. Scholars agree that increasing access to modern energy systems, which includes reliable access to electricity and clean cooking facilities, has far-reaching effects that can help communities eradicate poverty, improve health, support business activity, achieve gender equality, address food insecurity, and adapt to climate change effects. Access to electricity has been found to be an important proxy and strong predictor for multidimensional poverty (for example, 77.5% of the population in sub-Saharan Africa that are electricity deprived are also poor,

as measured by the MPI).[15] Yet despite being a public good, there are still millions of people in the Sahel who live without access to energy whether it be electricity or energy to power clean cooking. Often referred to as the biggest barrier to African economic development, the energy deficit stands in the way of the Sahel region improving its economic growth and human development indicators.[16,17] For the Sahel to reach its development potential, access to energy must be dramatically increased and its sustainability, affordability, and equitability ensured.

Timing and Rationale for the Report

This report comes at a time when the Sahel is facing significant challenges in achieving the SDGs and the goals set out in the African Union's Agenda 2063. Violence and instability are threatening development gains as coups are still prominent in the region, as seen by the recent coup in Niger. Electricity access remains inadequate, and the region is at risk of falling further behind in terms of economic and human development.

This report also comes at a time when global financial players are shifting their financing focus to clean energy projects while limiting acceptance of new oil and gas projects. At the same time, new clean energy technologies are scaling up, international markets and costs are shifting in favor of renewables, and the potential for regional integration is increasing. All of these factors signal that an energy transition toward renewables could be a way forward to expand energy access and reduce environmental impact – trends that Sahel countries have responded to by setting their own renewable energy targets.[18] Yet an energy transition takes time and resources, which, considering the abundance of human development investments needed, are scarce. The demand for energy and the demand for investment in development priorities such as health and education present a difficult tradeoff. The Sahel needs a way forward that meets energy expansion and environmental goals without sacrificing investment in development. This HDR will extensively review the subregion's sustainable development progress, emphasizing an energy transition as an enabling factor for achieving the SDGs.

Why the Sahel?

This HDR covers the 10 countries of the Sahel: Burkina Faso, Cameroon, Chad, The Gambia, Guinea, Mali, Mauritania, Niger, Nigeria, and Senegal.[19] In 2013, in response to the Malian security crisis, the United Nations recognized the spillover effects and overall connection between these 10 countries and called for a United Nations Integrated Strategy for the Sahel to be implemented. These spillover effects make the Sahel an important region to focus on in order to reduce barriers to development like instability and violence and seize opportunities, both of which can spread across the region and ultimately the continent.

The Sahel has been a focal point of complex intersecting challenges across various domains including security, development, climate, and governance. State fragility in countries such as Burkina Faso, Mali, Mauritania, and Niger has led to ongoing violence, instability, humanitarian crises, and mass migration. Chad, Niger, Mali, Burkina Faso, Guinea, and Niger have all experienced coups since 2020. Niger was once seen as the region's greatest hope for stability, earning it significant interventions including funding and personnel from the United States and France in order to make it the cornerstone of regional antiterrorism efforts.[20] Now in the midst of a coup, instability and violence in Niger could pose a significant

15 https://www.rockefellerfoundation.org/wp-content/uploads/2021/06/Interlinkages-Between-Multidimensional-Poverty-and-Electricity-Oxford-Poverty-and-Human-Development-Initiative.pdf

16 https://www.atlanticcouncil.org/blogs/energysource/for-africa-economic-growth-and-sustainability-intersect/

17 https://www.iea.org/events/africa-energy-outlook-2022

18 IEA (2021) lists renewable energy targets for six countries in the Sahel. In addition, in accordance with the Paris Agreement, several other countries including Nigeria, Cameroon, Guinea also have their pre-determined NDCs and emission targets.

19 The UN Security Council resolution 2056 led to the development of the UNISS which formulated strategic goals around three broad areas of support: governance, resilience, and security.

20 https://www.cfr.org/in-brief/niger-coup-could-threaten-entire-sahel

threat to other Sahel countries who face similar challenges as those that led to conflict in Niger.

The Sahel faces persistent security threats from violent extremist groups such as Boko Haram, Al-Qaeda in the Islamic Maghreb (AQIM), and the Islamic State in the Greater Sahara (ISGS). In 2022, UN Secretary General Antonio Guterres warned that "If nothing is done, the effects of terrorism, violent extremism and organized crime will be felt far beyond the region and the African continent."[21] Countries like Niger and Burkina Faso have grappled with persistent security threats and fragile governance structures. In contrast, Senegal has managed to maintain relative political stability and have shown better economic resilience.

The 10 countries of the Sahel have their own unique characteristics, opportunities and challenges, differing in things like ethnic and cultural diversity, energy availability, economic diversity, transitional versus democratically-elected governments, regional influence, population size, and natural resources. For example, Nigeria has a large regional influence, a large population size, and abundant oil and gas resources. In contrast, countries such as Chad and Mali have lower rates of electricity, smaller populations, and transitional governments. These unique dynamics, explored further in Chapter 6, are taken into consideration throughout this HDR in order to provide realistic and relevant pathways and recommendations for leveraging energy.

Yet the Sahel as a region is more than just the sum of its parts. Despite their differences, the 10 countries in the Sahel region are part of a broader regional dynamic. Understanding this dynamic is key for development actors to best leverage synergies across countries to maximize impact which is explored in this HDR. The Sahel's regional dynamic is fueled by the region's shared challenges and opportunities when it comes to improving human development indicators and expanding affordable and sustainable energy as well as the shared geopolitical context that is making the Sahel a hotspot for action. Some of these shared characteristics in the Sahel include the following:

The Sahel is one of the most vulnerable regions to climate change in the world.[22]

The Sahel is highly vulnerable to climate change, experiencing erratic rainfall patterns and increasing temperatures. These environmental shifts contribute to desertification, land degradation, and water scarcity, impacting agricultural productivity and livelihoods in a region where the agri-food industry accounts for a third of the GDP and 75% of employment.[23] The impact of climate change is affecting the poorest and most vulnerable, particularly in Niger, where floods have severely impacted both refugees and the local population. In addition, climate change plays an amplifying role in propagating conflict, leading people with high dependence on natural resources to fight over these increasingly scarce resources. Significant investment will be needed from domestic and international actors in order to change course and accelerate climate change adaptation and mitigation in line with the SDGs by 2030 and the African Union's Agenda 2063.

The Sahel is facing both a severe energy crisis and a development crisis.

The Sahel countries are facing a severe energy crisis with 51% of the population living without access to electricity and 79% of the population living without access to clean cooking technologies and fuel, which has far-reaching consequences on all aspects of human development.[24] The 10 Sahel countries have a wide range of electricity rates and development progress so far, yet all 10 still need significant effort to get them to the levels of the SDGs and Agenda 2063. At

21 https://media.un.org/en/asset/k12/k129za571y#:~:text=%E2%80%9CIf%20nothing%20is%20done%2C%20the,international%20breakthrough%20is%20urgently%20needed

22 All 10 Sahel countries fall into the top 16% of the most vulnerable countries to climate change as measured by the Notre Dame GAIN Index (https://gain.nd.edu/our-work/country-index/rankings/).

23 https://www.ifc.org/en/stories/2022/lowering-barriers-for-agribusiness-in-the-sahel

24 https://www.undp.org/energy/our-flagship-initiatives/energy4sahel

the same time, achievement of human development goals is hindered by persistent poverty, weak governance, low economic output, high underemployment, and extreme vulnerability to climate change consequences. The need to expand access to affordable and sustainable energy in a way that works in tandem with human development goals makes the Sahel a key region for considering different energy pathways.

The Sahel has enormous human capital and renewable energy potential.

While most developed (and growing numbers of middle-income) economies are facing a slowdown in population growth, 63.6% of the Sahel's population is under the age of 25, which, with investments in health and education, could yield significant demographic dividends.[25] The Sahel is also one of the regions with the highest renewable energy potential in the world, including one of the world's highest solar production capacities – 13.9 billion kWh/y compared to total global consumption of 20 billion kWh/y – and is abundant in the natural resources that are critical for powering clean energy technologies.[26] These opportunities distinguish the Sahel as a region that can accelerate progress toward achievement of the SDGs while paving the way for a more prosperous and resilient future.

The Sahel is at the heart of the ongoing geopolitical shifts and the redefinition of global powers, especially as they relate to energy.

More broadly, the geopolitical landscape is marred by competition and polarization among major players such as the United States, China, Russia, and the European Union (EU), which is reshaping development cooperation strategies. The Sahel has now become a region of strategic interest and competition for engagement by these players as they seek to solidify partnerships related to extractives, resources, security, and development. While the strategies and motives of these partners might differ, the fast and evolving realignment of geopolitics on a broader level show that the Sahel is and will be a region of interest and importance going forward.

There are also a multitude of geopolitical implications involved in an energy transition specifically and its effects on development in the Sahel, including the shifting geopolitics of international cooperation, the effects of global shocks such as the war in Ukraine, and the increased geopolitical interest in the minerals needed for renewable energy. New geopolitical landscapes are emerging, with major economic players now prioritizing investment in clean energy both for themselves and for their development assistance in other countries. This creates new strategic rivalries and competition in mineral-rich countries, including those in the Sahel, and affects relations between the United States, Russia, China, and other players like Turkey.[27] These changing dynamics could also cause countries that rely on exporting fossil fuels to lose long-held influence, shifting that influence to those with renewable energy potential and the minerals required.[28,29] The war in Ukraine has also impacted geopolitical dynamics as European countries in particular look for new partners to end their reliance on Russia for oil and gas through greater investment in renewable energy.[30],[31] Such concern for energy security is "forcing countries to recalculate the geopolitical equation in favor of renewables" as seen in an increased attention on wind and solar from countries like Germany.[32]

These realities represent both opportunities and challenges for the Sahel countries, which are resource-rich but underdeveloped and often rely on

25 https://www.un.org/africarenewal/sahel
26 https://www.undp.org/sites/g/files/zskgke326/files/2023-09/a_regeneration_-_english_fnl_-_reduced_size.pdf
27 https://www.mei.edu/publications/conflicting-agendas-and-strategic-rivalry-sahel
28 https://www.ft.com/content/a37d0ddf-8fb1-4b47-9fba-7ebde29fc510
29 https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2998305
30 https://library.cqpress.com/cqresearcher/document.php?id=cqresrre2022111800
31 https://afripoli.org/exploring-key-implications-of-the-russia-ukraine-war-on-africas-energy-policy
32 https://library.cqpress.com/cqresearcher/document.php?id=cqresrre2022111800

international support. Accurately grasping, managing, and responding to these new geopolitical vulnerabilities will be critical for energy expansion and development in the Sahel.

The Sahel has high potential for regional synergies that can maximize impact of regional interventions.

As we see with initiatives such as the Desert to Power Initiative and the ECOWAS Green Hydrogen Project initiatives, there are already successful regional interventions that are improving livelihoods in the region and for individual countries. These initiatives have already received funding from a variety of sources, including global financial institutions and international partners, indicating that there is an appetite to finance renewable energy projects in the Sahel. Given the strong synergies between countries, investing in cross-country and regional initiatives have comparative advantages for maximizing positive spillover effects and reaching the most people. These initiatives can be duplicated or expanded to maximize impact and align energy and development goals.

These shared opportunities and challenges across the region make it clear that the Sahel has a unique regional dynamic, especially when it comes to advancing energy and development. The Sahel must take this regional dynamic into consideration when thinking about its energy future. Managing the tradeoff between leveraging nonrenewable energy sources in the short term of around 10-15 years to enable long term development and a transition to renewables will be a central question for this report – one that will require a deep dive into what a potential future could look like in the Sahel – a sustainable and prosperous future – and how to achieve it. Through specific, actionable, and politically feasible recommendations, this HDR provides important levers for the Sahel countries and the development community to pull during this critical point for the region. These recommendations are based on the realities of the region and the individual countries, making a unique contribution that should be used to shape policy decisions now.

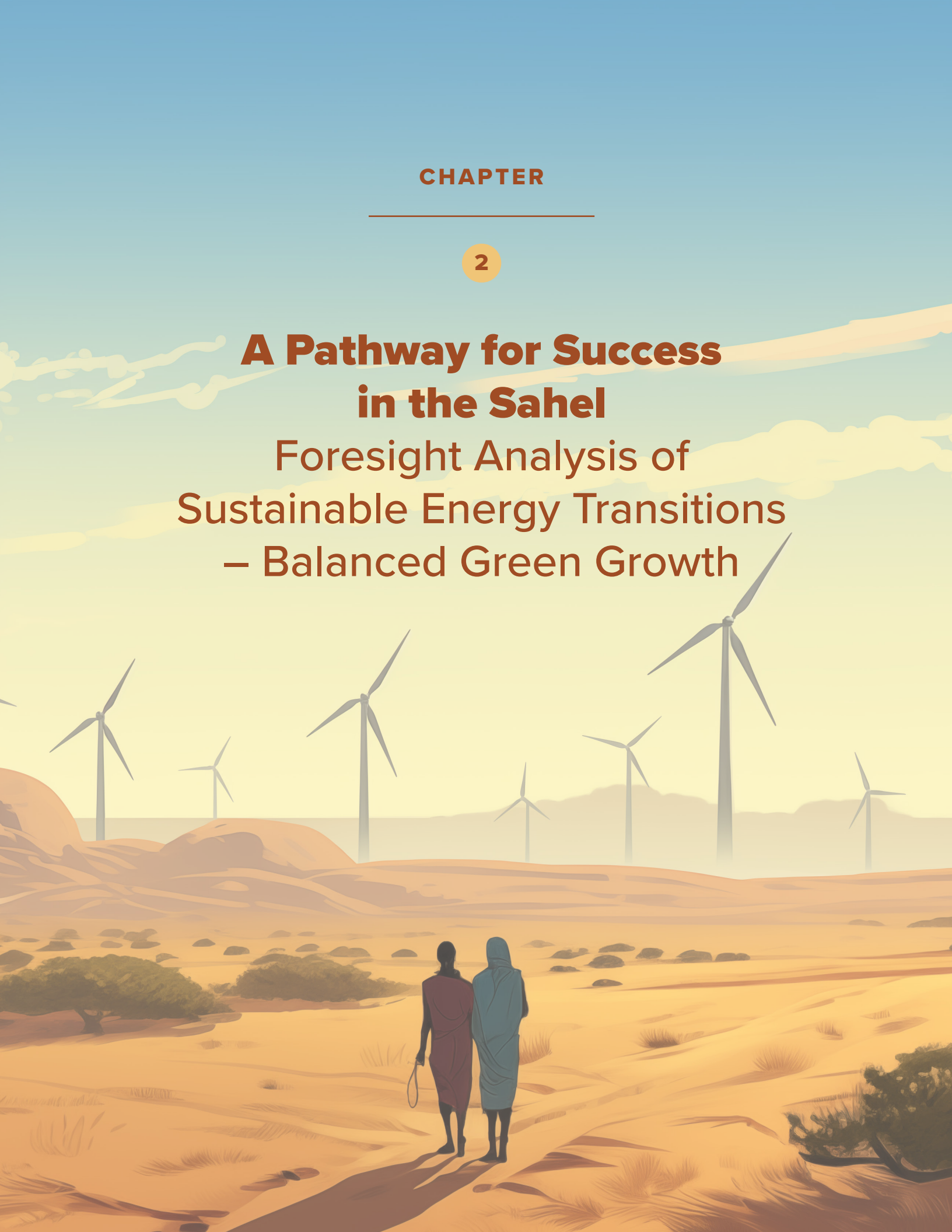
The report is organized in six chapters and showcases a pathway forward that is fully grounded in the current state of human development and energy in the Sahel, accounting for complex local, regional, and international realities. Chapter 2 dives straight into the forecasting model that is central to this report and projects development outcomes based on three different energy pathways, highlighting the one recommended here, the Balanced Green Growth pathway. Chapter 3 then steps back to review the current progress and state of human development in the Sahel, based on various indices and indicators. Chapter 4 reviews the current state of energy access and sources in the Sahel and the specific regional and national contexts surrounding energy investment. The empirical data presented in Chapters 3 and 4 sets the stage for the specific regional and national policy recommendations outlined in Chapter 5, which are based on turning the optimal pathway forward into reality in light of the current, on-the-ground context. Finally, Chapter 6 offers a view of the road ahead for policymakers, presenting key considerations for policy implementation as well as offering overall conclusions based on the findings of the report. Taken as a whole, this HDR argues that now is the time to prioritize, invest, and mobilize efforts toward these recommendations aimed at energy production that minimizes spending tradeoffs and maximizes impact on Sahelian economies and livelihoods.

CHAPTER

2

A Pathway for Success in the Sahel

Foresight Analysis of Sustainable Energy Transitions – Balanced Green Growth



CHAPTER 2

A Pathway for Success in the Sahel – Foresight Analysis of Sustainable Energy Transitions – Balanced Green Growth

Advancing energy development and access to safe and reliable sources of energy is critical to building a prosperous future in the Sahel. This Sahel HDR attempts to supply a solution to the dual imperative of meeting energy and development goals in the Sahel. Despite making progress, the Sahel still desperately needs to expand access to affordable energy and electricity as well as to accelerate its human development in order to meet the SDGs and the goals of the Agenda 2063. These are huge and complex imperatives that will require significant effort and resources.

This chapter presents a promising way forward that can lead the Sahel to achieve both energy and development goals by using energy as an enabler. In order to do so, the Sahel region faces difficult choices to find and implement a viable energy pathway that considers the region's resource reality, leverages the global geopolitics, and attracts sufficient support. In order to overcome the large energy deficit, the Sahel will need to ramp up energy production which will require strategic decisions for how to achieve this.

There now exists a window of opportunity for the Sahel to meet these dual imperatives. There is no better time to get a policy on the agenda than when there is alignment between the problem, politics, and policies.[33] This chapter helps give insights into the types of policy priorities that could be pursued in terms of the energy transition, offering Sahel countries a pathway forward that achieves both energy and development goals.

This HDR adopts a multidimensional view of development, where the aim of development is enhancing the capabilities of individuals and groups to enable the pursuit of desired lives. It embraces a holistic perspective on development as an integrated system. A fundamental element and enabler of holistic development is access to affordable, reliable, and sustainable energy, as so many facets of human development rely on energy access, whether to power modern cookstoves or to deliver education and healthcare.

The question of how energy is to be sourced is of great importance. Currently, the Sahel's energy is primarily sourced from oil and gas, thanks to the region's high reserves of these fuels (particularly natural gas), but the region also has high potential for renewable energy production. However, harnessing this potential is costly.

The theory of change underpinning this analysis is that governments possess the capacity to enact policy reforms both through their operational procedures and through their allocation of resources to facilitate socioeconomic development. The analysis relies on modeling the diverse investments necessary to enhance these capabilities, with each investment yielding distinct outcomes in specific facets of development.

Furthermore, the report is based on the assumption that climate change is an issue of justice. Those least responsible for climate change should not suffer developmental setbacks due to the actions of those who bear greater responsibility. The Sahel region, facing various internal and external challenges and shocks, lags behind in terms of development. Moreover, the region is anticipated to be disproportionately affected by climate change, while having made an insignificant contribution to causing it. Consequently, we contend that the region should not have to prioritize more costly renewable solutions over available fossil fuel resources, notably natural gas, to meet energy demand or other development gains that rely on access to energy.

The International Futures model serves as a methodological tool to explore various energy transition scenarios and assess their impacts on development within the Sahel region. It facilitates the simulation and examination of multifaceted impacts encompassing economic production, financial dynamics, and human well-being. The Sahel HDR utilizes IFs to compare three distinct energy transition scenarios, aligning with the SDGs related to universal energy access.

IFs, a comprehensive global modeling system (Hughes & Hillebrand, 2006), analyzes long-term futures across critical areas such as agriculture, economics, education, energy, health, and sociopolitical systems across 188 countries, utilizing a vast database spanning from 1960 to recent values. Operating at a

33 The window of opportunity is based on Kingdon's Three Streams model of policymaking process.

policy strategy level, IFs focuses on broad developmental strategies, providing insights for macro-level interventions and, as a structure-based and dynamic modeling system, integrates various modeling approaches and emphasizes accounting structures, including cohort component structures for aging populations and social accounting matrices for financial flows among agent classes (Moyer, 2023; Moyer & Bohl, 2019; Hughes et al., 2012).

Comparing three scenarios, IFs aids in revealing the complexities and interactions between energy, economics, governance, and conflict:

a) A Current Path scenario, which assumes no change to current and planned energy options;

b) A Renewable Push scenario, which assumes an aggressive transition to renewables; and

c) A Balanced Green Growth scenario, which assumes a more gradual transition with gas as a transition fuel with balanced investments in various development needs.

This analysis helps uncover tradeoffs and synergies among energy and development investments, allowing for data-driven recommendations for the balanced approach. Annex 4 offers a detailed description of assumptions for each pathway, providing insights into the tradeoffs and synergies between energy and development investments in each scenario. Contrasting results emerge from the Current Path and Renewable Push scenarios.

Challenges and Progress in the Sahel: Assessing the Current Path Scenario

The Current Path scenario makes a broad set of assumptions about how development works and reflects the broad assumptions that stretch across issue areas within the IFs model. This scenario is under constant refinement by the Pardee Team with the goal of most accurately reflecting broad development trends and patterns that have characterized the international system since the end of the Cold War. The dominant system – as noted in Annex 4 – have to do with demographic growth and transformation, economic production and consumption across sectors, and core strengths in various models reflecting human and social development.

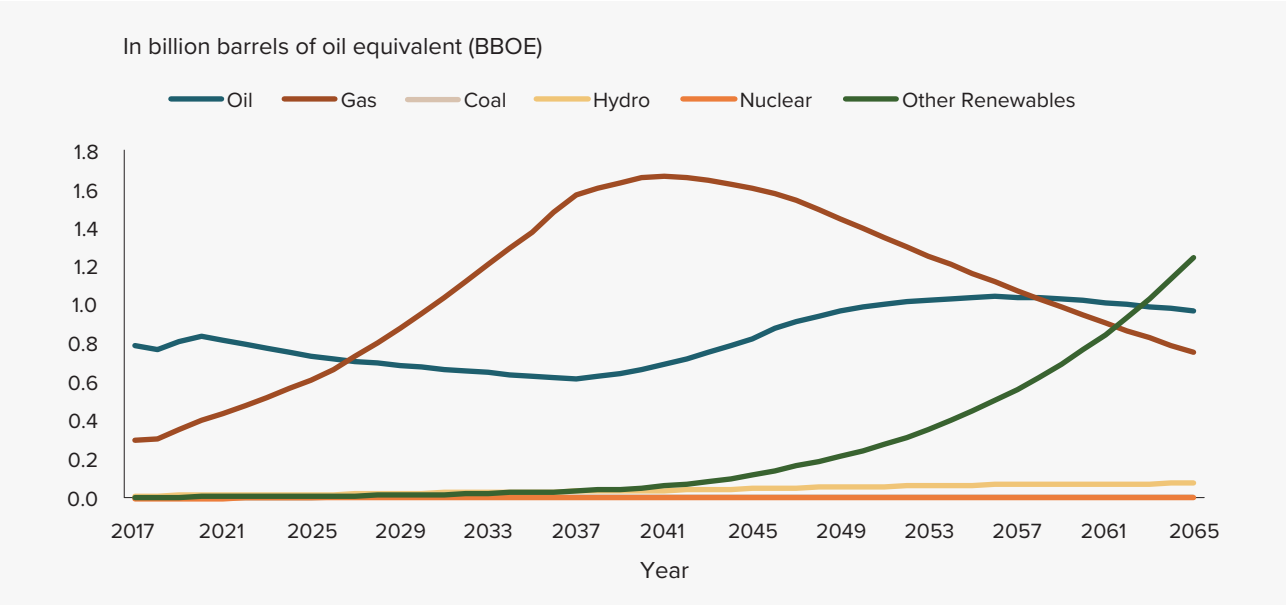
The one additional assumption included in the CP scenario is the increase in hydro-based energy by 10% in Guinea, Senegal, and the Gambia to reflect some projects that are set to go into effect in 2025.

The Sahel region grapples with multifaceted challenges in achieving sustainable development. The Current Path scenario, reflecting prevailing trends, forecasts the region's development trajectory, emphasizing the complexities of ongoing socioeconomic dynamics. While leaning heavily on traditional fossil fuels, the projection highlights sluggish progress in renewable energy adoption. This approach faces the dual challenge of fostering development while addressing climate change impacts, posing risks to sustainable growth due to limited access to clean energy sources. Fossil fuels (55.9%) dominate energy production presently, with oil and gas comprising the majority, while renewable sources like hydro, solar, and wind remain marginal. The forecast anticipates a shift by the mid-2030s, with reduced oil reliance (30%) and increased gas production (70%), paving the way for solar and wind to gain traction, ultimately constituting a substantial portion (30%) of energy production by 2063 (Figure 5).

The evolving energy dynamics in the Sahel significantly impact regional governance and political economies, reinforcing Nigeria's energy dominance while hindering renewable energy progress within the region. Challenges in electricity access, particularly in rural areas, persist despite projected growth. Additionally, the surge in carbon emissions poses environmental concerns, reflecting the region's increased global contribution to fossil fuel emissions over the coming decades.

The Sahel region foresees significant growth in electricity generation capacity from 18.45 GW in 2021 to an estimated 120.7 GW by 2060. Despite

Figure 5 **Energy production by source type projections up to 2065 under CP scenario**



Source: International Futures (IFs) v8.01.

this, per capita electricity production remains lower than the World Bank's low-income countries, projecting an increase from 0.055 to 0.161 KW per capita by 2063. While electricity access in the Sahel surpasses low-income countries at 53.8% in 2024, rural areas face challenges, with disparities among countries and limited progress toward universal electrification by 2063.

Energy production mixes in the Sahel have downstream effects on carbon emissions, anticipated to rise from 0.4% to 1.8% of global emissions from fossil fuels by 2063. These trends coincide with economic patterns, projecting GDP growth from $0.8 trillion in 2024 to $7.9 trillion by 2063, although heavily dependent on fossil fuels.

The region's population, currently at 364.7 million,[34] is anticipated to grow to 846.9 million by 2063, contributing to demographic shifts and a growing youth population. Despite population growth, improvements in human development indicators like education (low secondary net enrollment, 75%) and life expectancy (78 years) are slow, driven by government investments projected to increase substantially by 2063. Projected improvements in education and health spending may positively impact human development (see Figure 6); yet reaching the SDGs could take until around 2060.

In the Current Path scenario, the Sahel faces a slow but steady reduction in poverty, dropping from 140 million in 2044 to 29 million by 2063. Undernutrition also diminishes from 32 million in 2024 to 9 million by 2063, yet the region still lags significantly behind in key developmental indicators despite long-term improvements.

Several challenges impede future development, including low education, health, and infrastructure levels, weak governance, high intrastate conflict, and rapid population growth. Countries like Mali, Niger, Burkina Faso, and Chad consistently exhibit weak governance indicators, fostering corruption, inadequate public services, and political instability, fueling extremist activities. Ethnic and cultural divisions further complicate institution-building, hindering rapid progress in the region's development.

The CP presents a scenario of gradual developmental gains alongside poor regional governance,

34 United Nations World Population, 2021.

Figure 6 **HDI projections of the Sahel compared with other income groups under CP scenario**

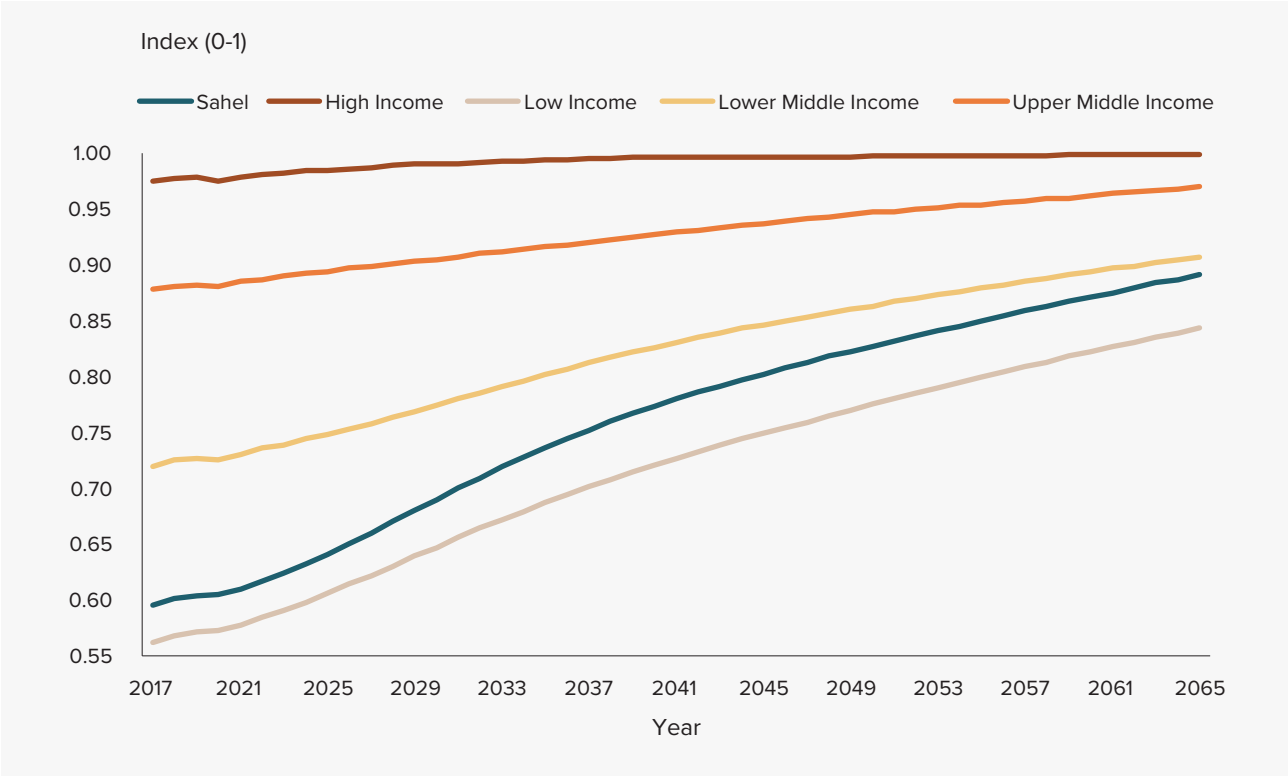
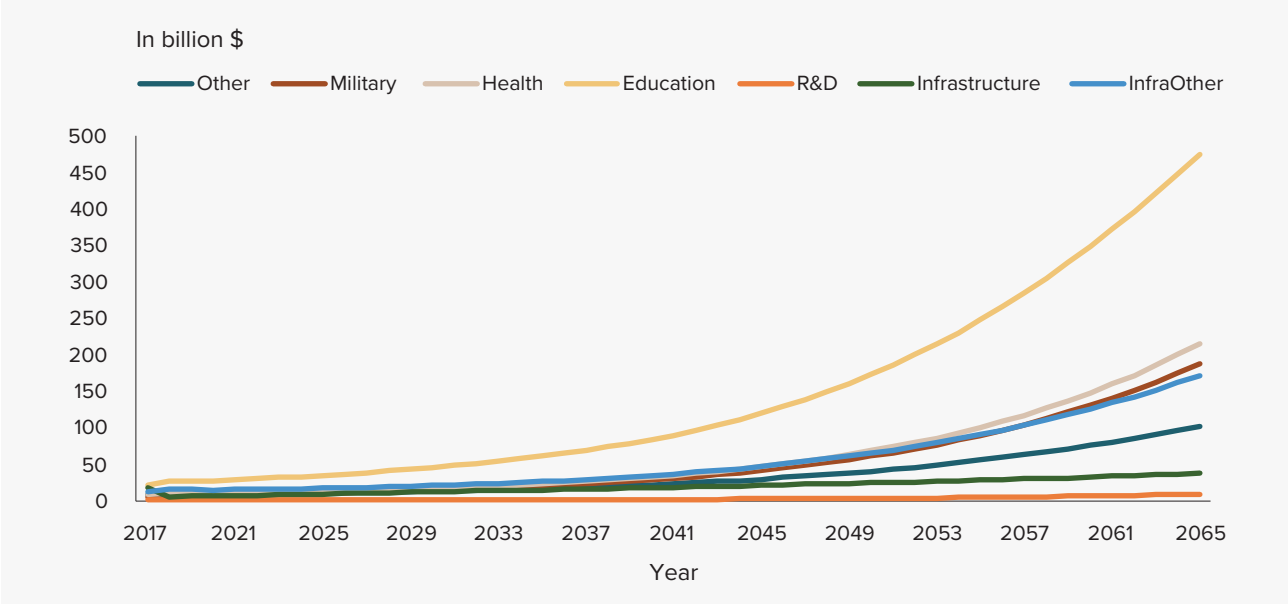


Figure 7 **Government consumption across sectors under the CP scenario**



persistent corruption, conflict issues, and burgeoning urban populations straining developmental investments. With 666.5 million births projected between 2024 and 2063, investments in education, healthcare, and employment must surpass this rapid population growth to address the pressing needs of the Sahel (see Figure 7).

Limited Development Transformation from the Renewable Push Scenario

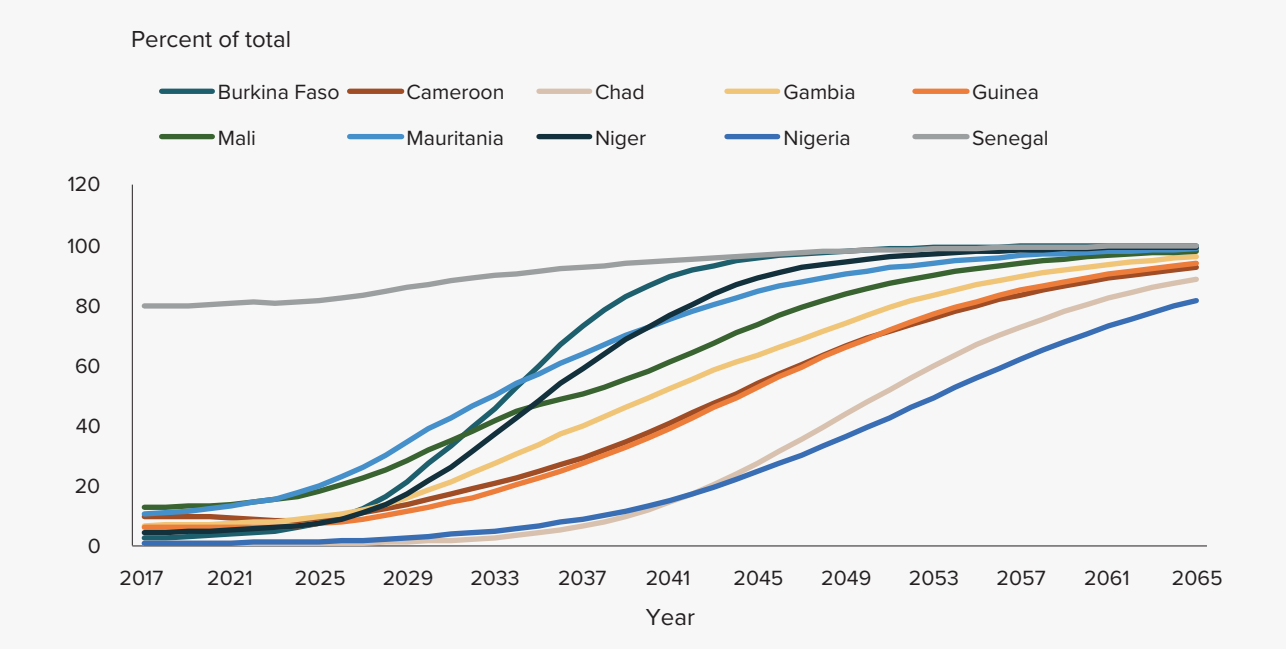
The Renewable Push scenario outlines an ambitious strategy for the Sahel region, focused on accelerating the transition to renewable energy sources. This scenario prioritizes hydro, solar, and wind power, leveraging the region's abundant renewable resources. To achieve this, collaboration among governments, international bodies, and private entities becomes paramount, requiring supportive policies, regulations, and financial incentives to spur large-scale renewable energy projects. The RP envisions significant international cooperation and financial aid to secure the region's energy needs due to the high investment needs for renewable infrastructure projects.

This scenario witnesses a remarkable surge in solar and wind production, exceeding CP levels by more than double by 2030 and nearly quintupling by the mid-2040s. Hydro production also escalates to 1.5 times that of the CP. Notably, fossil fuel output diminishes substantially, with gas production declining by about 40% by the early 2040s and oil production decreasing by over 75% by 2050 compared to CP levels. Renewable energy is anticipated to constitute over 20% of total energy production by 2050 and exceed 80% by 2063 in this scenario.

Country-specific shifts are evident, with Nigeria exemplifying a dramatic six-fold increase in renewable energy under the RP compared to the CP. This transition decreases reliance on fossil fuel production, with substantial reductions in gas and oil production. Illustrating this transformation, Figure 8 below portrays the rapid adoption of renewable energy across the 10 Sahelian countries, with renewables projected to contribute over 90% to total energy production by 2063.

The Renewable Push scenario recognizes the need for nuanced strategies tailored to individual country resources. For instance, Burkina Faso and Cameroon are projected to produce additional renewable energy by 2063: 0.043 BBOE and 0.145 BBOE, respectively.

Figure 8 **Renewable energy production as a share of total energy projections up to 2065 for the Sahel under RP scenario**



Other Sahelian countries show varying projections: Chad (0.207 BBOE), Gambia (0.01 BBOE), Guinea (0.058 BBOE), Mali (0.043 BBOE), Mauritania (0.004 BBOE), Niger (0.131 BBOE), Nigeria (0.912 BBOE), and Senegal (0.008 BBOE).

However, the RP scenario requires significant financial investments, anticipating cumulative government spending increases of $37.8 billion by 2035 and $887.9 billion by 2063. Achieving 100% electricity access by 2030 reduces people without electricity by 187 million, necessitating infrastructure investments of $95.5 billion by 2035 and $213.2 billion by 2063. Addressing traditional cookstove use decreases respiratory deaths by 161,000 by 2035 and 412,000 by 2063.

Despite advancements in electricity access, other development areas, like education and health, remain largely unaltered. Educational outcomes stagnate at a low literacy rate of 62% in 2024. Additionally, child mortality rates persist, barely differing between CP and RP scenarios.

Inequalities in service access persist, undermining resilience and climate adaptability. The scenario's heavy energy subsidization sidelines crucial social and economic issues. The RP's substantial renewable energy focus reduces carbon emissions by 20% compared to the CP through 2063, but this constitutes a mere 0.6% of the global total.

While advocating for renewable energy is vital, it is essential to address governance and institutional challenges. Weak institutions impede clean energy deployment and equitable benefits distribution. Governance reforms should encompass democratic institution strengthening, rule of law, transparency, and accountability, ensuring equitable renewable energy project distribution. Expanding institutional capacity beyond energy to education, healthcare, and job creation is pivotal for sustainable development. A holistic approach must consider the broader socioeconomic and political context, beyond clean energy alone, to foster lasting change in the Sahel.

Energy as an Enabler for Development: A Balanced Green Growth Approach

A just and sustainable energy transition, centered around renewable sources and energy efficiency, stands as an imperative for ensuring a climate-resilient future and fulfilling sustainable development goals. However, this transition must not only be viable but also prioritize human-centric outcomes.

Aligned with the people-centered approach advocated by the UNDP, the Balanced Green Growth pathway emerges as a visionary route for the Sahel region, projecting its potential by 2030 and 2063.

The BGG pathway paints a compelling picture of transformative change, aiming to uplift millions from poverty, guarantee universal electricity access, relieve health burdens, enhance educational opportunities, bolster incomes, and empower women and girls. All these objectives are set within an environmental framework that minimizes spending trade-offs. Realizing this ambitious vision necessitates rapid and substantial action from both the international development community and the Sahelian countries themselves.

The immense development strides promised by this path underscore its preference over the RP strategy.

The analysis presented here advocates a forward-looking approach that strikes a delicate balance between investing in sustainable energy and prioritizing overall development – the Balanced Green Growth pathway. This report underscores that increased fossil fuel production within the Sahel region has limited global implications in terms of actively contributing to global emissions. Contrary to maintaining the status quo, the BGG scenario unlocks a greater potential for future human development, albeit with higher regional carbon emissions. Importantly, these projected emissions still remain well below global and country-specific environmental targets.

What distinguishes the BGG pathway is its capacity to meet environmental objectives while significantly expanding renewable energy production. Crucially, it achieves a diverse array of development outcomes, representing a unique pathway that aligns with both environmental goals and human development objectives. This multi-faceted approach stands as a

compelling testament to the potential of sustainable development and green growth within the Sahel.

What Is the BGG Pathway and What Does It Involve?

The BGG pathway consists of comprehensive assumptions that place holistic and integrated development at the core of regional and national policy agendas for the coming decades. While it prioritizes renewable energy and electrification, it also underscores the far-reaching impact of other investments in human development, such as increased investments in education, healthcare, and conflict mitigation. Thus, it factors in various energy and development assumptions.

> Notably, this scenario is based on an energy mix that includes a 30% increase in renewable production and investment, a 30% increase in natural gas production and investment, and a 20% increase in production and investment of other fossil fuel-based sources (primarily oil, coal, and nuclear), by 2030. It also assumes a 100% electrification rate across the Sahel by 2050. In addition to this particular energy mix and electrification rate, the scenario entails various assumptions related to agricultural yields, governance and spending, gender equality and women's empowerment, caloric variations, conflict/war, water and sanitation access, and a range of education, health, and income inequality assumptions. A breakdown of these exact assumptions can be found in Annex 4, and the policy recommendations associated with them will be discussed in Chapter 5.

Overall, this scenario is based on ambitious, but realistic, assumptions that consist of a balanced investment approach in areas of both energy and development. The BGG pathway therefore recognizes the importance of addressing multiple development aspects simultaneously, emphasizing that achieving sustainable growth in the Sahel regions goes beyond energy considerations alone, and encompasses governance, healthcare, transparency, rule of law, gender empowerment, agricultural yields, food security, water and sanitation, education, and reducing inequality – all of which are crucial elements that require investment and attention for holistic development. The outcomes from this pathway show this to be true.

What Are the Benefits of BGG?

In order to visualize the impact of implementing a balanced investment approach, we compare the BGG pathway to two alternative scenarios: one that maintains the status quo and predicts the most likely development path if the current trends and policies were to continue unchanged. This pathway, the Current Path, uses existing energy trends with the Sahel slowly increasing renewable energy adoption but continuing to rely dominantly on conventional fossil fuels. The second pathway, Renewable Push on the other hand, assumes an unidimensional and ambitious push toward renewable technologies which phases out the use of conventional fuels. Annex 4 provides a detailed account of the methodology, assumptions, energy finances for the Current Path, Renewable Push, and Balanced Green Growth per the International Futures approach.

Unlike BGG, this pathway assumes no development policy changes, therefore reflecting how a future could look if no actions were taken and the region continues to rely on fossil fuel sources with limited increases in renewable sources. What we find is that inaction is incredibly costly – the CP pathway illustrates a future where the region still has not met universal electrification by 2063. While progress on various development goals is shown, it is simply too slow. Poverty rates drop over time, but rapidly growing populations and other factors make it a persistent problem through the mid-2040s. Overall, maintaining the status quo gives insight into how limited access to clean energy sources and inaction when it comes to critical development areas can undermine the region's goals toward sustainable development.

Thus, a different future for the Sahel is needed: one that is based on a balanced and integrated approach for ramping up investments across development areas. Comparing the model's future outcomes under the BGG pathway to the CP pathway helps to understand the impact of such an approach of balanced investments on potential outcomes in the future.

Using the model, we find that the BGG pathway shows significant promise for energy, economic, and human development goals by 2030 and by 2063 (see Table 1 above).

Energy Benefits

In terms of energy, BGG's investment approach is to leverage fossil fuels, notably natural gas, in the short term (for the next 10-15 years at least) while investing in renewable energy in the long term. Overall, energy use per capita rises over time from 2.75 barrels of oil equivalent (BOE) in 2017 to 10.01 BOE in 2063 for the region. This leads to a significant increase in renewable energy production for the region as a whole over time, though the increase is at a slower pace. By 2030, renewables in the Sahel would make up 3.1% of the total energy production but by 2063, this rises to 54% (see Table 9, Annex 1). At a country-specific level, BGG increases renewable energy production significantly in the long run, especially for countries such as Burkina Faso and Mauritania which reach over 95% renewable energy by 2063 (Table 5).

This scenario also reduces energy import dependency over time. At the same time, because investment is balanced and traditional sources of energy are leveraged in the short term, energy exports increase for BGG until around 2045 which can provide important economic benefits. Over time, energy exports start to decrease. These initial gains are concentrated in Nigeria (28.9 billion by 2063), Chad (13.5 billion by 2063), and Cameroon (.8 billion in 2063) who are the largest producers of oil. This can be scaled in the short term to increase export values and drive economic growth.

Electricity access as a percent of the population grows rapidly in this scenario and universal access is assumed by 2050, a more realistic timeline, which drives up electricity generation per capita in absolute terms for the region and for each specific country (see Table 10, Annex 1). Electricity connections increase over time, reaching 60.1 million by 2030, and the population without electricity access gradually decreases to 117.3 million people in 2030 all the way down to zero by 2050 (see Table 11, Figure 27, and Figure 28, Annex 1). Electricity use per capita also shows strong growth. BGG therefore increases electricity generation capacity all the way up to 225.5 GW (a huge increase from the 15.42 GW in 2017) (see Figure 26 and Table 10, Annex 1).

The value of approaching the energy transition and achieving electricity access in this balanced way is reflected in the following wide range of benefits and their combined synergies.

Economic Benefits

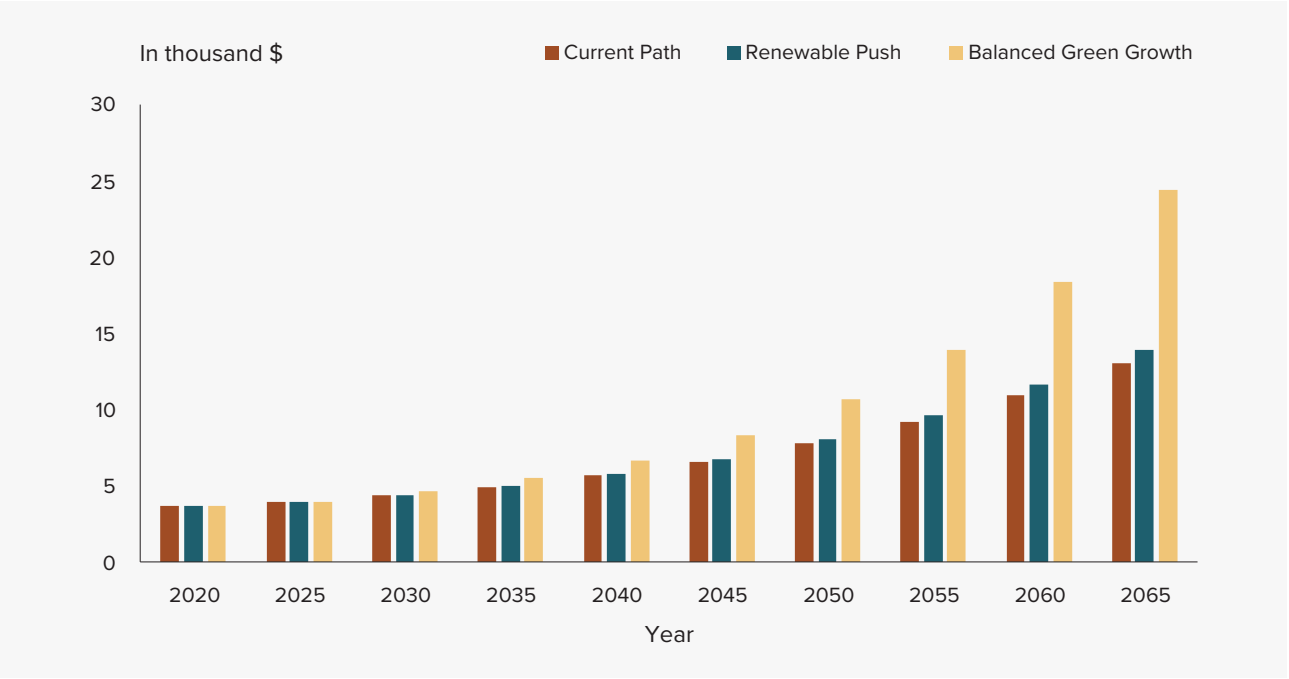
Using existing oil and gas reserves in the short term to expand energy and electricity access quickly drives economic growth through greater productivity.

Table 5 Renewable energy production (percentage of total production)

Year/Scenario	2030		2063	
Country	Current Path (%)	Balanced Green Growth (%)	Current Path (%)	Balanced Green Growth (%)
Burkina Faso	15.2	18.6	98.8	99.2
Cameroon	10.4	12.2	68.2	75.1
Chad	0.8	0.9	2.8	12.1
Gambia	11.6	13.1	70.6	75.9
Guinea	6.7	7.8	64	70.6
Mali	21.7	24.1	67.9	77.2
Mauritania	24.1	27.2	82.5	95.1
Niger	11.6	13.4	84.4	88.7
Nigeria	1.4	1.9	36	54.1
Senegal	76.5	77.1	61.3	87.0

Source: IFs v8.01.

Figure 9 **GDP per capita (PPP) across three scenarios – thousand $**



Source: IFs v8.01.

According to the projections, BGG increases economic growth for the region and for each individual country as measured by both GDP and GDP per capita. GDP per capita in the region measured by PPP increases from $3.9 thousand in 2024 to $21.8 thousand by 2063 (Figure 9) – a significant increase with important implications for government expenditure and development gains. Annual GDP grows exponentially under BGG, nearly doubling the gains made by the Current Path. The region increases its GDP by over $17,500 billion by 2063 with significant increases for each individual country (see Table 13, Annex 1).

The value added by the energy sector is also higher with the BGG pathway compared to the current path. Nigeria especially sees significant value added ($10.4 billion more than under the CP) (see Table 13, Annex 1).

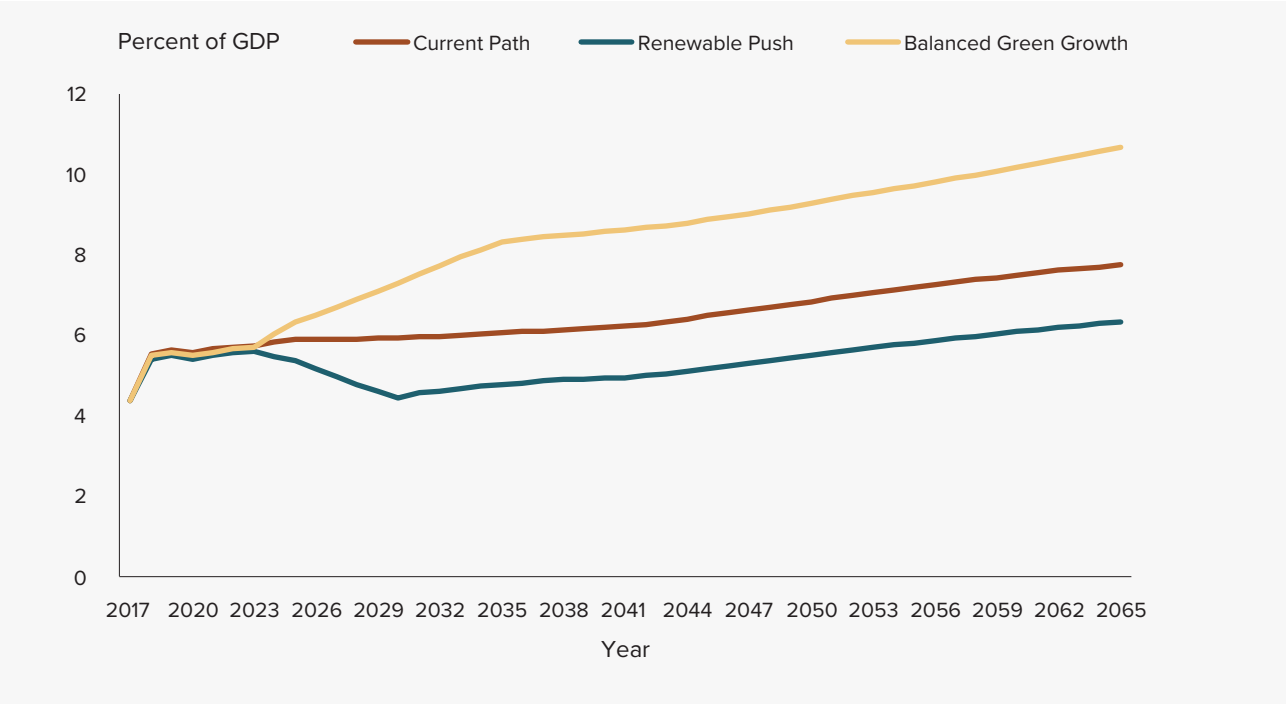
Economic gains are also seen through the increase in foreign direct investment (FDI) under the BGG pathway. In 2021, FDI inflows as a share of GDP in the Sahel region was at around 1.1%, but the BGG pathway illustrates an increase to over 4.2% by 2063 (see Table 14, Annex 1).

Balanced Green Growth: The Optimal Pathway to Both a Successful Energy Transition and Sustainable, Long-Term Development

The outcomes of the CP an RP scenarios were measured against the BGG approach. The analysis indicated that BGG, balancing energy and development investments, is the most effective strategy for achieving both energy and development objectives.

As discussed, if the Sahel were to maintain the status quo, the model shows that the Sahel would be unable to meet development goals and would maintain an energy deficit. The status quo scenario invests little in renewable energy (reaching only 36% of total production by 2063) and performs poorly on development outcomes including poverty reduction and education and health indicators. While the Sahel would be able to make some progress without changing the status quo, it would not be enough to meet the goals set out in the SDGs or Agenda 2063, with dire consequences. BGG outperforms the status quo by lifting 29 million more people out of poverty, 8.13 million more people out of undernutrition, and averting 14 million more deaths by 2063.

Figure 10 **Education and health spending – percent of GDP**



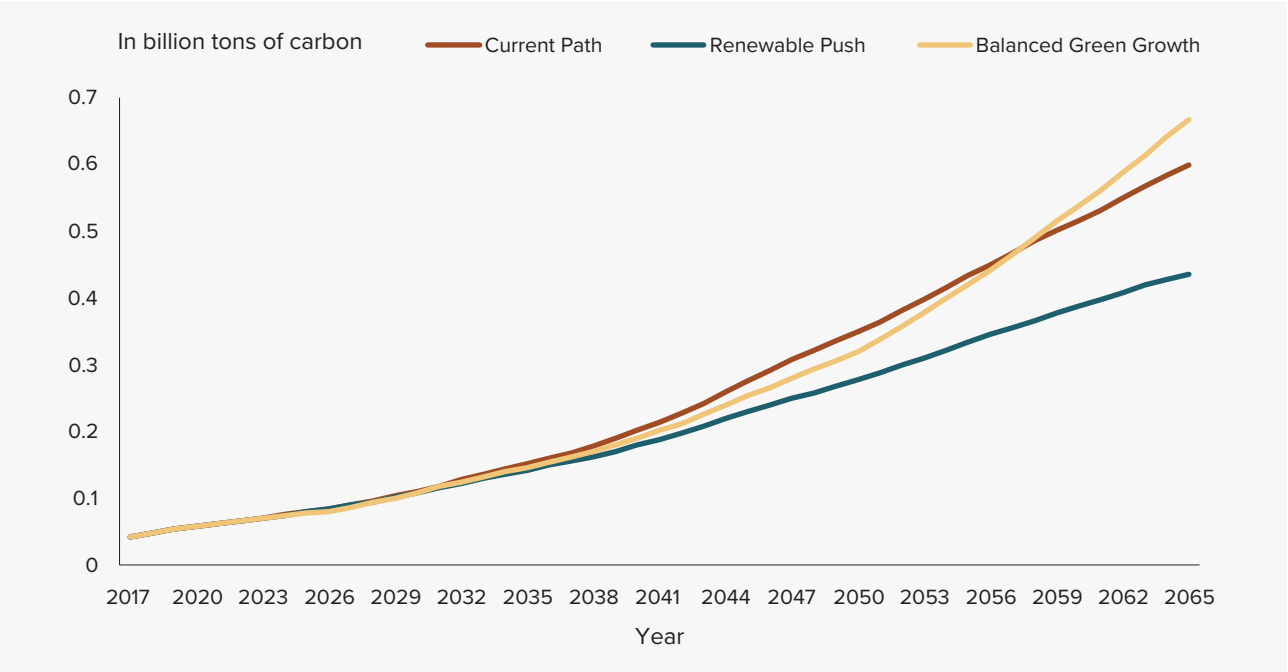
Source: IFs v8.01.

The second scenario, the Renewable Push, allows us to see the distinct tradeoffs that come from rapid investment in renewable energy versus a balanced approach. Comparing the RP's high regional expenditure on energy and electricity-related investments ($1.5 billion by 2030) to its lower expenditure on health and education reveals an interesting tradeoff on the priority of fiscal investments. BGG also requires a high level of expenditure on infrastructure but not so high that it sacrifices other necessary development expenditures. Although the Renewable Push scenario achieves impressive renewable energy production and does so more quickly than BGG, critical investments are diverted in order to fund the renewable energy push, meaning that key development priorities are neglected. This can be clearly seen in reduced government expenditures on education and health. The consequences of diverting these investments result in a significantly higher high poverty headcount by 2030, worse education and health outcomes, and a negative impact on human capital's contribution to productivity.

The Renewable Push scenario also sheds light on tradeoffs regarding energy exports and imports. Compared to the BGG scenario, the Renewable Push significantly increases import dependency for the next 35 years relative to demand. At the same time, the Renewable Push has lower energy exports relative to demand. These dynamics are critical, especially for countries such as Nigeria that currently rely on oil exports. By implementing a rapid push to renewables, such countries would miss out on this important revenue and economic gain. By approaching the energy transition in a balanced way, BGG increases energy export value and reduces dependency on energy imports.

The comparison of scenarios also reveals tradeoffs between reduced carbon emissions and development gains. The Renewable Push scenario has the greatest environmental benefits compared to the other scenarios given it prioritizes investment in renewable energy production without any further development investments. Yet even under the BGG scenario, the Sahel shows far less emissions relative to other country groups including sub-Saharan Africa, South Asia, upper middle-income countries, and high-income countries across years 2030, 2050 and 2063, assuming these regions continue on their current path.

Figure 11 **Carbon emissions from fossil fuels across three scenarios – billion tons of carbon**



Source: IFs v8.01.

This shows that BGG is a way forward that can help achieve greater development gains without sacrificing emissions and keeping them far below those of other regions.

The comparison between these three potential energy futures reveals that now is the time for action: it is clear that maintaining the status quo will have dire and immediate negative implications for development in the Sahel. The BGG scenario offers a way forward that reduces tradeoffs, such as those involved in the Renewable Push, while leveraging synergies and improving holistic development regionally and nationally.

What Risks and Opportunities Does BGG Hold?

It is clear that at the current juncture, there are significant opportunities for the Sahel to seize – and what makes these opportunities so significant are the synergies between them. A balanced transition away from fossil fuels yields synergistic outcomes across all scenarios, particularly in reducing reliance on traditional cookstoves. The increased availability of electricity would substantially decrease the number of people – predominantly women and girls – exposed to high levels of indoor air pollution. This, in turn, would alleviate the future burden of respiratory diseases on healthcare systems and foster a more productive workforce, despite the fact that most of those affected by indoor air pollution engage in unpaid domestic labor. This serves as an exemplar of the synergistic benefits of investing in greater access to renewable electricity throughout the region, particularly in rural households.

There exist ample opportunities for the region to leapfrog development by collaborating with external partners in the development and adoption of renewable energy and smart grid technologies. The costs of solar and wind energy are rapidly declining, and modest investments in micro-grids that operate independently from national grids can unlock substantial development benefits, including those related to traditional cookstoves.

As the projections have shown, the advantages of pursuing a BGG scenario are evident, with balanced investments in human development promising long-term dividends; however, there are always inherent risks and challenges that must be considered.

For the BGG scenario specifically, there are risks related to energy trade. Historically, fossil fuel energy, particularly from stable fuels like oil, has been widely traded. As the world increasingly transitions to renewable energy production, it appears that trade in fossil fuels may decrease, and not be replaced by a similar global trade structure, as seen in the case of oil. This is primarily due to current limitations in electricity storage technology for harnessing solar and wind energy over the long term – a significant bottleneck hindering the development of a global renewable energy sector. Consequently, the BGG pathway could lead to reduced global energy trade, potentially impacting countries that are heavily dependent on oil exports, such as Nigeria. However, these scenarios may foster increased electricity trade among neighboring states. This underscores the necessity of developing regulatory frameworks for electricity trade and identifying and developing infrastructure corridors that can facilitate such trading schemes.

Overall, the region is poised for massive population growth, with an estimated 380 million people in 2024, projected to reach almost 900 million by 2063. Accommodating these additional 520 million people will exert substantial pressure on development financing and government policy strategies. Moreover, the region remains afflicted by internal conflicts and in-fighting, two significant impediments to developmental progress. External threats also loom large, with geopolitical rivalries intensifying in Africa and climate change posing a potentially existential threat, capable of rendering large swathes of the region uninhabitable. As the forecast has shown, the risk of governance corruption decreases under the BGG scenario. However, these challenges represent a risk that it might not be possible to implement the necessary policy choices and interventions that would make BGG possible in the first place. Chapter 6 goes into greater detail regarding how to overcome these implementation challenges.

Implications for Policy Strategy

The comparative and overall results of this model have important implications for policy prioritization and strategy. Developing country governments must navigate a complex landscape of competing policy priorities, spanning demographics, health, gender, technology, security, and regional governance, and others, in contexts of relative resource scarcity. Deciphering how to prioritize development policy strategies within this intricate milieu will invariably remain a challenge, given that human development unfolds within complex social systems. Nevertheless, government priorities in stimulating the development of renewable energy and advancing the core tenets of human development known to impact relevant development indicators are pivotal.

The results from the IFs model operate at the level of "policy strategy", meaning that they are focused on broad questions of development strategy and uncertainty framing, with implications for deciding what should be a policy priority going forward. The model itself is not a tool for perfect predictions or specific policy advice, yet its findings can help us understand, first, what policies should be prioritized, and later (expanded on in Chapter 5), what policies should be enacted to achieve the interactions described by the model.

Advocating for a rapid push toward renewable energy in the Sahel region is undoubtedly crucial for addressing energy access challenges and reducing the region's environmental footprint. However, it is essential to recognize that clean energy investments alone cannot comprehensively improve the Sahel's overall development standing. Underlying governance and institutional mechanisms are equally, if not more, critical in ensuring the success and sustainability of such efforts. Governance and institutional challenges in the Sahel are multifaceted and deeply intertwined with broader development issues. Weak institutions, corruption, and a lack of effective governance structures have hindered not only the efficient deployment of clean energy technologies but also the equitable distribution of benefits to local communities.

To truly support and sustain countries across the Sahel, clean energy investments must be coupled with comprehensive governance reforms. These reforms should include measures to strengthen democratic institutions, enhance the rule of law, improve public administration, and promote transparency and accountability. Such changes are essential to ensure that the benefits of renewable energy projects reach all citizens, particularly those in marginalized

and vulnerable communities. Additionally, institutional capacity-building efforts must extend to areas beyond the energy sector. Investments in education, healthcare, and social services, along with job creation initiatives, are vital to addressing the root causes of poverty and instability in the region. Sustainable development requires a holistic approach that considers not only the energy transition but also the broader socioeconomic and political context.

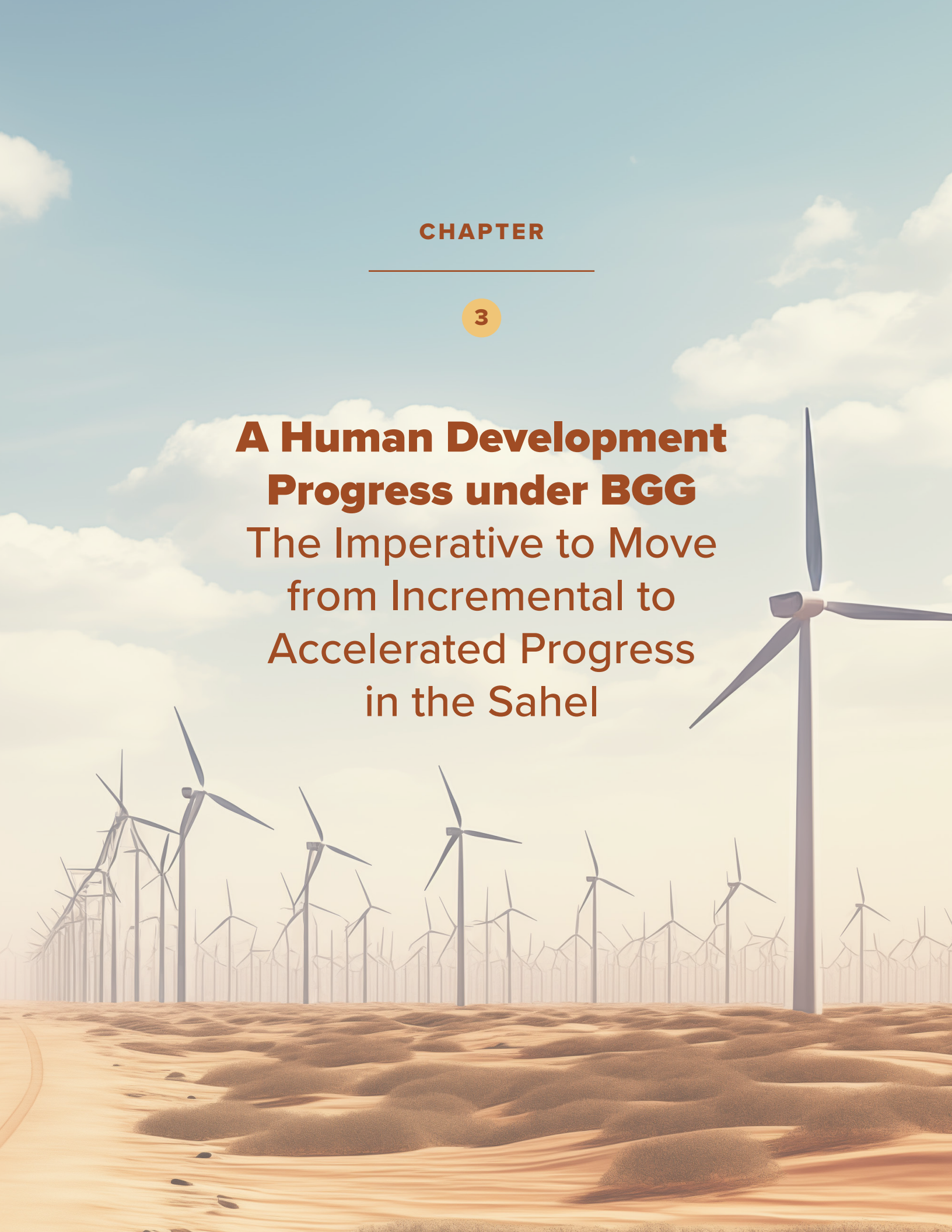
As the Sahelian nations chart a course toward a sustainable energy mix, fostering transparent and accountable governance structures will be paramount. This, in turn, will enable the equitable distribution of clean energy benefits, unlocking new opportunities for economic development, education, healthcare, and social well-being. In essence, it is the fusion of green energy and strengthened interventions across the domain of the sustainable development goals that will light the way for the Sahel's journey toward a brighter, more prosperous, and sustainable future, in which human development is prioritized, and the region thrives in harmony with its environment.

CHAPTER

3

A Human Development Progress under BGG

The Imperative to Move from Incremental to Accelerated Progress in the Sahel



CHAPTER 3

A Human Development Progress under BGG – The Imperative to Move from Incremental to Accelerated Progress in the Sahel

It is critical to understand where the region and individual countries currently stand in terms of human development indicators so that policymakers can make decisions about potential energy pathways that will have maximum impact, capitalizing on synergies between energy and development as exemplified in the BGG pathway.

The BGG pathway shows that if there is political will and coordination, the trajectory could lead to substantial human development benefits, including through greater government expenditure on education and healthcare, not just in the short term, but also in the long term.

Currently, data shows that the Sahel is experiencing regeneration and renewal in human development progress, yet still faces challenges that have caused the region to fall behind. The current situation in the Sahel is marked by deep-rooted environmental, political, economic, and security challenges that affect the subregion's prosperity and peace. Notably, the adverse effects of exogenous climate change shocks have significantly impacted the region, including rising temperatures and sea levels, declining precipitation and water availability, and conflicts due to resource scarcity. Furthermore, health and education policy inefficiency and dysfunctional public resource governance characterize the Sahel's economic and social sectors, contributing to the subregion's poor performance in human development and sustainability indicators. Structural factors such as high population growth, unemployment, vulnerable economies, weak social protection systems, and political instability are all contributing to these inter-linked challenges from food insecurity and poverty to inequality and exclusion. Global shocks such as the COVID-19 pandemic and the Ukraine-Russia war have further exacerbated these challenges with soaring inflation, fractured food and energy supply chains, and intensifying economic, health, and security pressures on already resource-constrained environments.[35]

Progressing Toward Higher Human Development: Advancements in an HDI-Challenged Region

At the start of the twenty-first century, the Sahel subregion's economic performance improved, and human development (measured by HDI) increased at a faster pace than sub-Saharan Africa (22.9% compared to 17.56% respectively). In line with the trend of the broader continent, this progress slowed in the 2010s to an average of a 12% increase. Now, despite progress in several human development indicators such as average life expectancy at birth and years of schooling, the Sahel countries still remain at the bottom of the Human Development Index rating (Figure 12). Compared to sub-Saharan Africa, the Sahel lags in all HDI components: education, health, and income. In 2021, the Sahel's HDI of 0.512 was below the average of sub-Saharan Africa (0.534) as well as other sub-regions (Eastern Africa, 0.517 or South Asia, 0.623) with Cameroon (0.567), Mauritania (0.556), and Nigeria (0.535) at the highest HDI in Sahel and Chad (0.3940), Niger (0.400), Mali (0.428), and Burkina Faso (0.449) at the lowest.

All Sahelian countries except for Cameroon and Nigeria are categorized as Least Developed Countries (LDCs) by the United Nations, and almost all Sahelian countries are highly vulnerable to economic and environmental shocks, have low levels of income and human assets, and are classified by the World Bank as fragile states. Extreme poverty ranges from 6.5% in Mauritania to 50.6% in Niger across

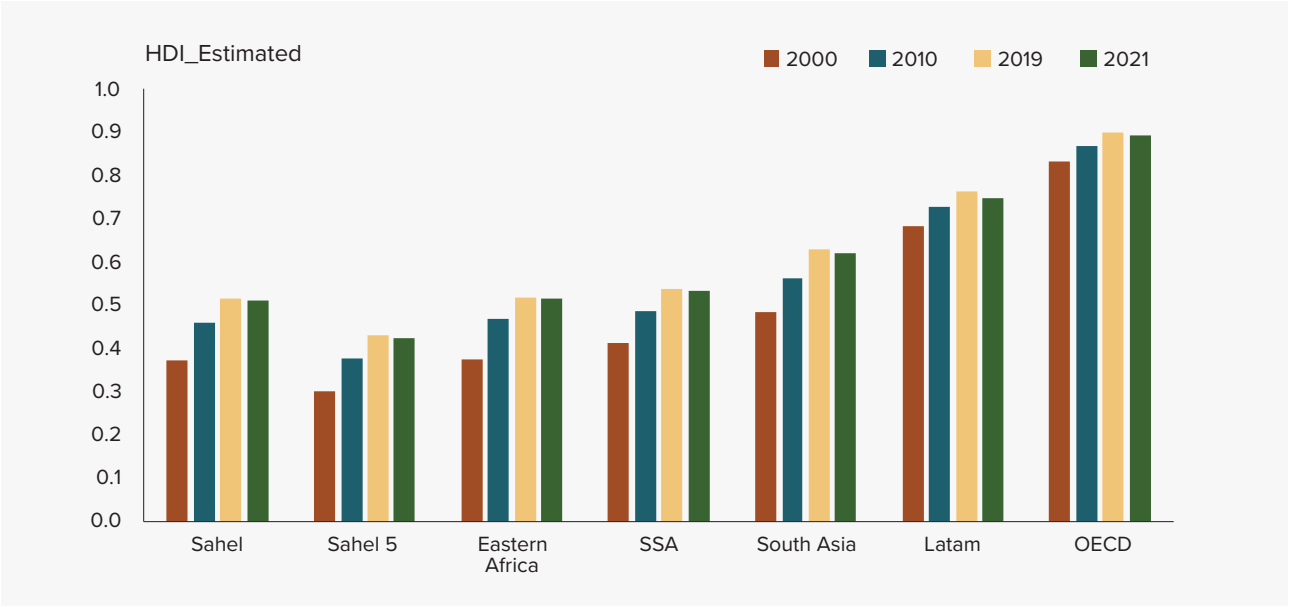
35 The effects of these challenges on the Sahel can be analyzed through updated data on social and demographic, economic, environmental and energy, governance and accountability, and inequality indicators which shine a light on the first main challenge this HDR is engaging with: accelerating human development across the region.

To observe trends in human development in the Sahel subregion, UNDP's family of composite human development indices are considered. The global values for the Human Development Index (HDI), Inequality-Adjusted Human Development Index (IHDI), Gender Development Index (GDI), indicators associated with the Multidimensional Poverty Index (MPI), and Gender Inequality Index (GII) for each country in the subregion are weighted dynamically by population (UNDESA, 2020) to form a subregional Sahel value.

In addition to the composite indices for human development, we also present tables for the Sahel subregion countries with a cross-section of human development and human security indicators which were selected based on their particular relevance to Sahelian issues such as demographics and linkages to youth unemployment, environmental sustainability challenges, and human security.

In the spirit of working to achieve the 2030 Agenda and providing unified, data-driven development action in the Sahel, this chapter provides new subregional values for the Sahel and Sahel G5 for composite development indices and critical indicators.

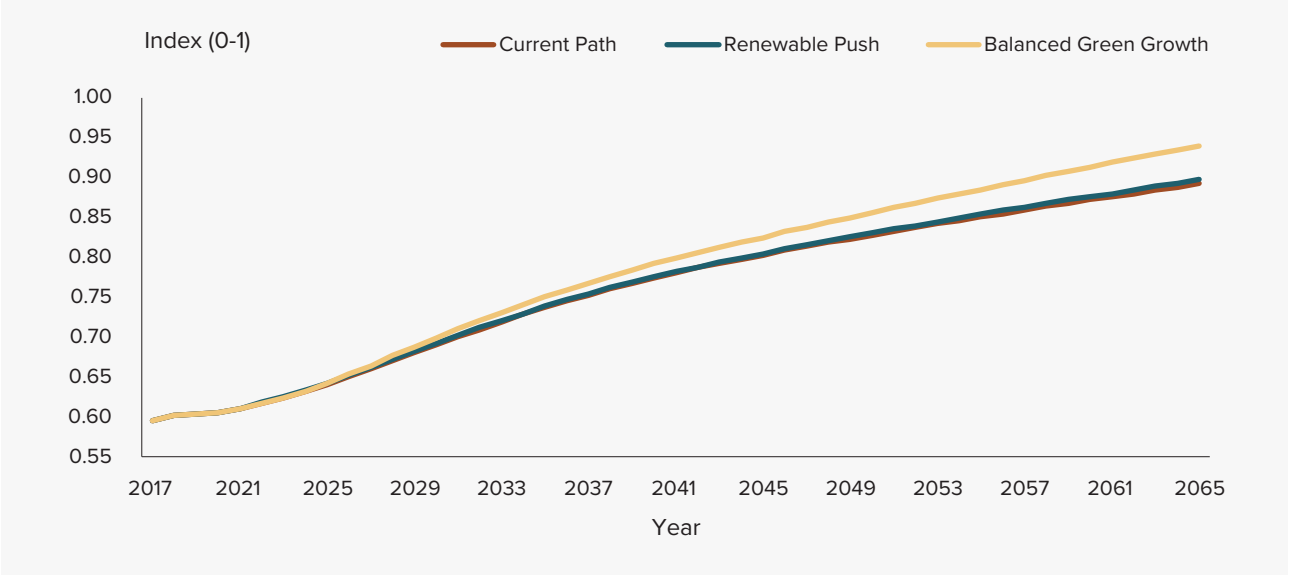
Figure 12 **Sahel HDI remains well behind other regions like Southern Africa, South Asia, and Latin America**



Source: Author's calculations

the Sahel as defined by the World Bank as living on less than $2.15 daily,[36] and nearly one-quarter of the population in the subregion currently faces moderate or severe food insecurity.[37] The Sahel's malnutrition rate is among the highest in the world, with children under five particularly vulnerable.

Figure 13 **HDI projections in the Sahel across the scenarios**



36 https://www.worldbank.org/en/news/opinion/2020/12/16/the-world-bank-can-only-accomplish-its-mission-of-ending-extreme-poverty-in-africa-by-prioritizing-the-sahel-region

37 https://reliefweb.int/sites/reliefweb.int/files/resources/sahel_en_4.pdf

The COVID-19 pandemic significantly impacted the subregion's human development progress, with a reversal in the growth rate between 2019 and 2021 (-0.9%). 34% of human development progress was lost in 2021 due to inequality in the Sahel compared to a global loss average of 20% – 10% for OECD, 26% for Eastern Africa, and 30% for sub-Saharan Africa.

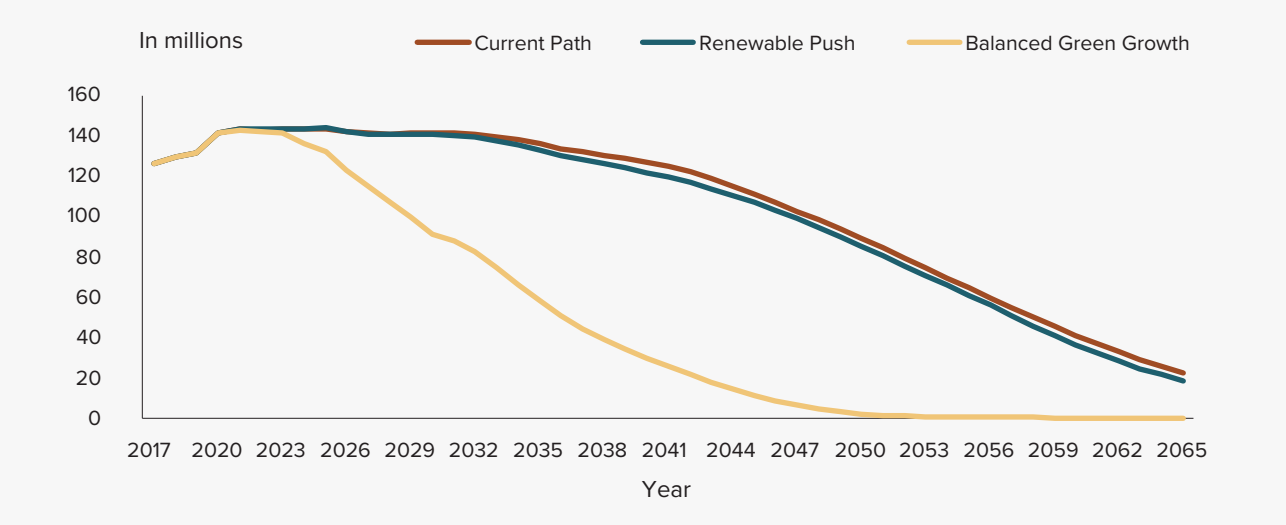
With the BGG projections, the overall regional HDI improves significantly both by 2030 and by 2063 (Figure 13). Currently the overall regional HDI is at 0.61 which, under BGG, improves to 0.7 by 2030 and reaches an impressive 0.93 by 2063 – comparable to modern-day countries such as Finland and the UAE. This is a transformative improvement for a region that needs to significantly improve development progress in order to improve livelihoods in the short and long term.

Perhaps most impressively, through the improvements in education, health, and the economy, BGG accelerates poverty reduction, with the number of people living on less than $1.90 a day in the region reaching nearly zero by 2050 (Figure 14). This is an astounding achievement for the region that is currently facing upwards of 125 million people (~38% of the population) in poverty. Progress may happen quickly, with a potential reduction of 50-60 million (to 20%) people living in poverty by 2030. Individuals see incredible reductions as well by 2030 (see Table 17, Annex 1). All countries in the Sahel make joint, focused efforts toward poverty alleviation through the lever of combined energy policies that enable movement toward sustainable and development goals in the region.

Dynamic Demographics: Sahelian Trends Shaping Human Development and Energy Needs

Current and future demographic and social trends in the Sahel will continue to greatly affect the region's human development progress and drive and transform its energy demands. Current data shows that while most regions of the world are experiencing declining rates of population growth, the population across Sahel countries is growing rapidly from 2.5% to nearly 4%.[38] Sahel countries are also experiencing rapid urban development. Two-thirds of the population growth in Sahelian countries over the past couple of decades have been absorbed in Sahelian cities, due to both natural growth and to population movement from rural areas to cities. The Sahel also has a low median age compared to other regions in the world (slightly over half the median age of OECD countries)

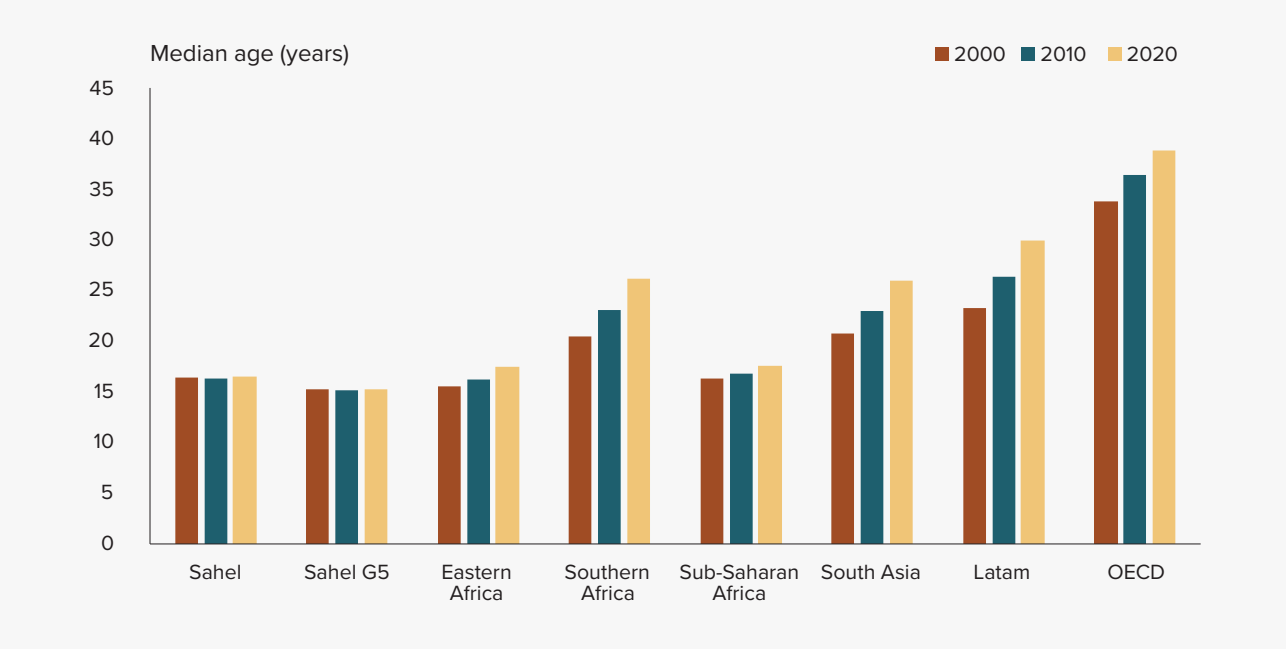
Figure 14 **Poverty headcount <$1.90 per day across three scenarios – millions**



Source: IFs v8.01.

38 United Nations Population database, 2021.

Figure 15 **The Sahel has lowest median age, reflecting its higher share of youth population compared to other regions**



Source: Author's calculations

and other regions in Africa, reflecting its higher share of the youth population (Figure 15).

Health and education indicators have shown progress over the past two decades for the region, yet challenges remain. The Sahel region currently has one of the highest rates of malnutrition in the world (undernutrition kills more than 550,000 Sahelian children per year), has a high rate of children under the age of five who are stunted (32%, author's calculations, HDRO 2021), and has a high maternal mortality ratio (768 per 100,000, author's calculations, HDRO 2021) compared to other African subregions.

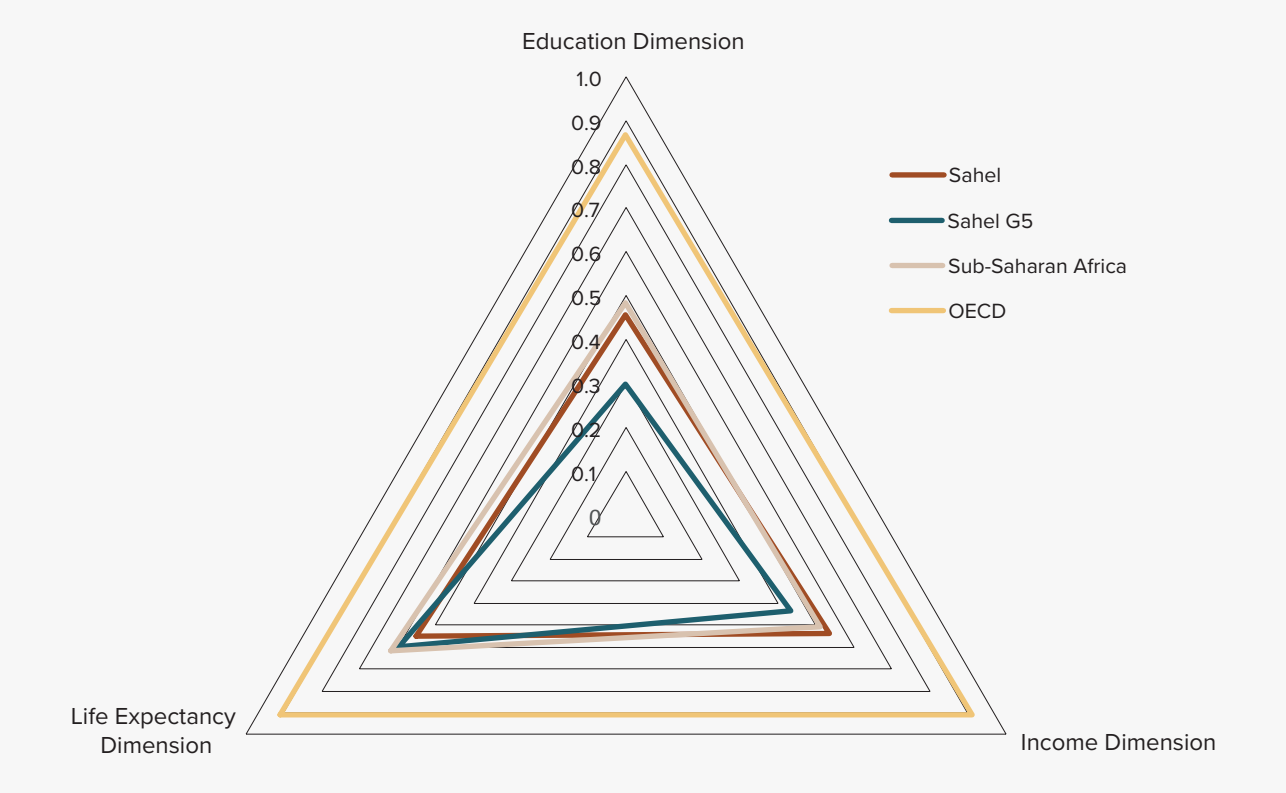
Secondary school enrollment has seen major progress, more than doubling in most Sahelian countries. Progress in tertiary enrollment has also been made in the past decade; however, enrollment rates are under 10% for all Sahelian countries except Cameroon, Guinea, Senegal, and Nigeria. Sahelian countries also have a high share of youth not in employment, education, or training (NEET), particularly Mauritania (44.1%, 2019), Burkina Faso (41.0%), and Nigeria (36.7%, 2019). Harnessing youth potential will require significant improvements in education and employment for young people.

The demographic reality of rapid population growth and a high share of young people (Figure 17) means that there are, and will continue to be, resource and energy constraints on Sahelian countries to meet the health and education needs of the present and future population.

Considering the BGG scenario, by 2063, health and education spending rise to over 10.4% of regional GDP, compared to the current regional average of 5%. This is made possible by the economic gains from leveraging fossil fuels in the short term. The ability to use these economic gains to spend more on education and health priorities both now and in the future delivers critical outcomes.

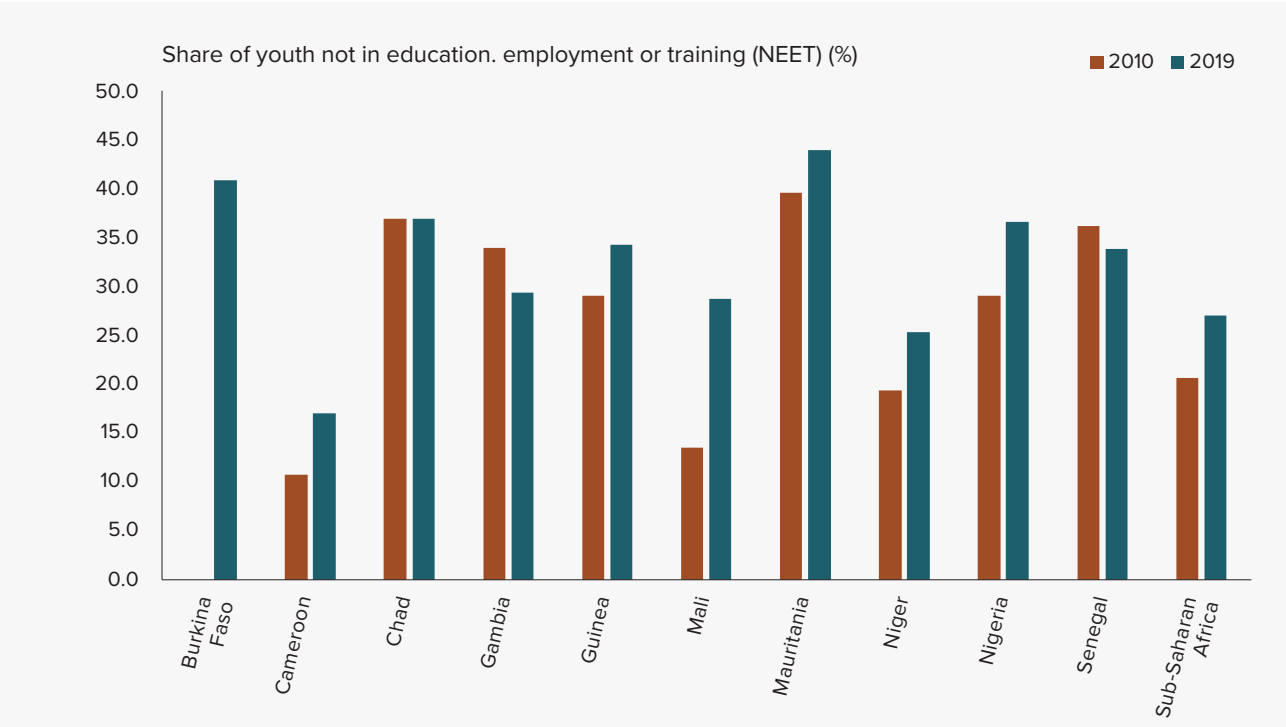
Through greater government expenditure, BGG raises the mean educational attainment among 15-24-year-olds in the region and across all countries by 2030 and by 2063 (see Table 15, Annex 1). By 2063, BGG raises the mean educational attainment to a range of 8.38 years in Mali up to 11.76 years in Cameroon. By raising the government expenditure possible because of this balanced investment approach, education can be improved and expanded which can help reduce urban-rural and gender inequities.

Figure 16 **Sahel countries lag behind SSA and OECD in education in 2019 with implications for demographic dividend**



Source: UNDESA Data; UNDP data; Author's calculations

Figure 17 **Countries in the Sahel have high rates of youth NEET relative to SSA overall**



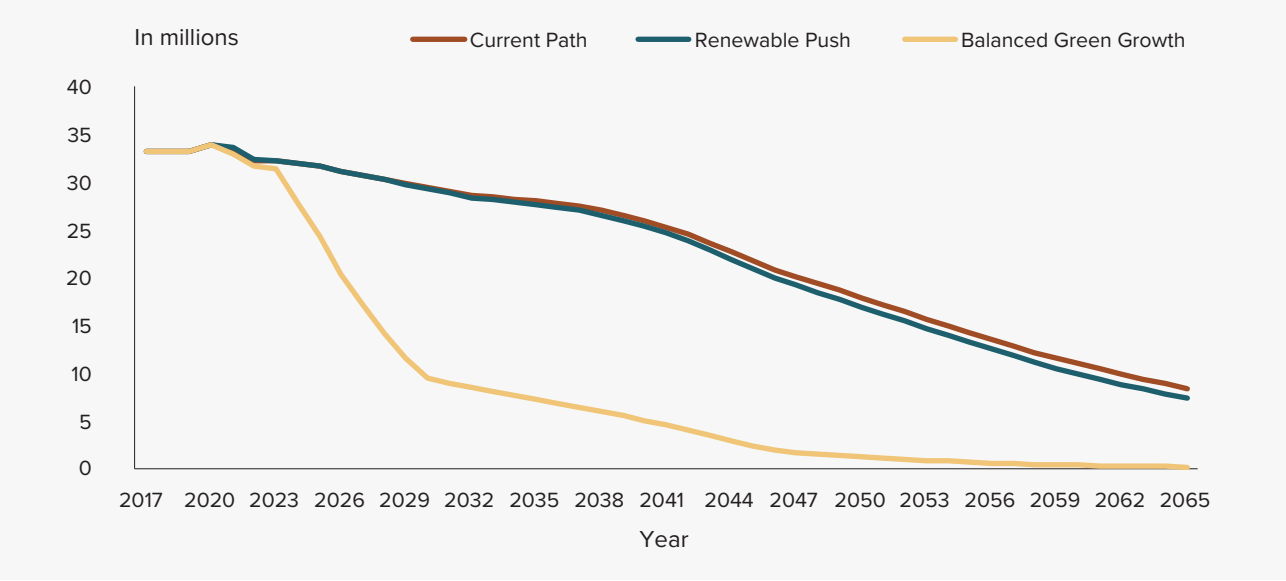
Source: World Bank, Author's calculations

Similarly, by using available energy in the region in a sustainable and healthy way, BGG achieves improvement in health outcomes by significantly reducing the number of deaths due to health burdens (see Figure 29, Annex 1). The number of deaths averted by 2030 and 2063 are significant across all countries compared to the Current Path results. These results show the devastating effects of inaction and the opportunity available to avert health burdens and deaths in the short and long term.

BGG also reaches health outcomes by achieving a sharp reduction in the use of traditional cookstoves which contribute to indoor air pollution. 39.2 million households (69.1% of the total) used traditional cookstoves in the region in 2021, but BGG completely eliminates their use by 2063. Progress is made quickly due to increased energy access using available resources, with overall use of traditional cookstoves dropping to 50% for the region by 2030. Mauritania can reach almost 87% uptake of modern fuel-based cookstoves by 2030 and each country reaches 88-98.8% uptake by 2063. This has significant effects for women who are often the main users and therefore inhaling increased levels of pollution. With these types of gains, gender empowerment can be a reality in the Sahel. In the Sahel region, the energy sector lags in gender diversity, presenting a notable disparity in both electrification and gender equality. Despite some positive shifts in recent decades, the region remains behind. However, there is recognition[39] that expanding renewable energy sources, known as "sustainable electrification," offers a chance to empower women economically by integrating gender perspectives into industry development.

The health benefits further extend into an increase in calories per capita. This is in addition to the sharp reduction in malnourished and undernourished people across the Sahel. By 2030 the BGG pathway achieves a large reduction in malnourished people and drops to below 10 million people around 30 years before the CP would (Figure 18). With the exception of Chad,[40] each country reaches malnourishment levels of less than 2% of their population by 2030. These kinds of improvements related to food and health are critical to jumpstart further development as food security and adequate nourishment act as a foundation for improved livelihoods.

Figure 18 **Malnourished people in the Sahel across scenarios (in millions)**



Source: IFs v8.01.

39 https://jpia.princeton.edu/news/powering-households-and-empowering-women-gendered-effects-electrification-sub-saharan-africa

40 Chad has a high level of malnutrition currently making it more difficult for Chad to reach the same levels as other Sahel countries.

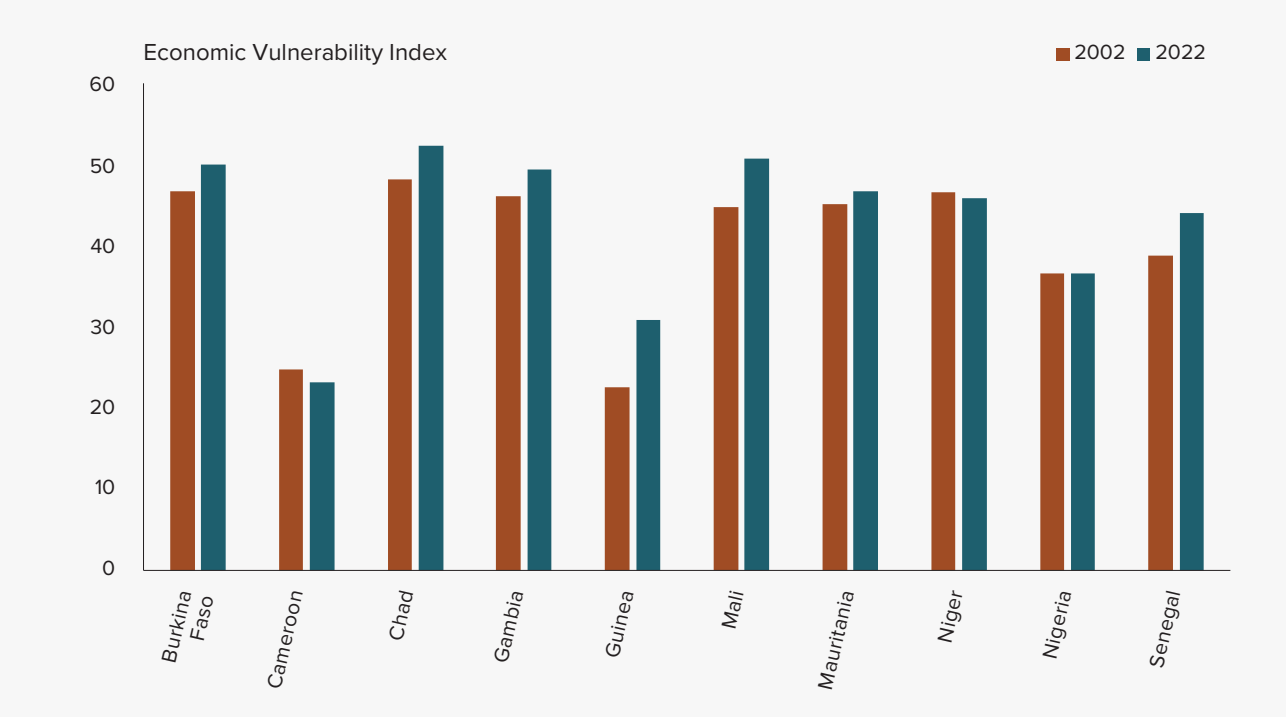
Persistent Challenges: Macroeconomic Volatility and Economic Transformation in the Sahel

Macroeconomic volatility and a lack of economic transformation are ongoing problems among Sahel countries. In recent decades, Sahelian countries have experienced decent economic growth; however, the pace of growth has been somewhat below regional counterparts such as the countries of the East African region. Despite progress, gross national income (GNI) per capita remains low in the Sahel, especially among the G5, and annual GDP growth has slowed in the second decade of the twenty-first century.

Trade as a share of GDP remains low for Sahel (30.2%, author's calculation, World Bank, 2021) relative to SSA (45.3%, author's calculation, World Bank, 2021) and the world (57%, World Bank, 2021), and exports are highly concentrated in certain sectors and partners, contributing to a high level of economic vulnerability as calculated by the Economic Vulnerability Index (Figure 19).[41] Economic vulnerability has increased over the past two decades for all Sahelian countries except Niger and Cameroon.

Though Sahelian economies are endowed with vast natural resources, the region is characterized by a "paradox of plenty": its abundant resources have not translated into economic growth and prosperity for the population. Moreover, due to frequent natural disasters, the COVID-19 pandemic, and commodity price volatility, Sahelian economies stand out in terms of macroeconomic volatility, which is reflected in volatile GDP growth. The economic volatility in the Sahel region is indicative of large macro shocks, and, equally important, of a lack of mechanisms for dampening the effects of these shocks, such as greater economic diversification, financial sector development, or access to international capital markets.

Figure 19 **Economic vulnerability is high in the Sahel and has increased for all Sahel countries except Cameroon and Niger**



Source: Author's calculations

41 The Economic Vulnerability Index is the composite of eight indicators: population size; remoteness; merchandise export concentration; share of agriculture, forestry, and fisheries in GDP; homelessness owing to natural disasters; instability of agricultural production; instability of exports of goods and services; and the share of the population living in low elevation coastal zones.

This means that while socioeconomic progress in the Sahel region has improved over the last two decades, Sahelian countries are at risk of being left behind their neighbors due to their highly fluctuating growth. Moreover, economic growth in the Sahelian countries has been insufficient to make significant progress in creating jobs, increasing incomes or addressing multidimensional poverty.

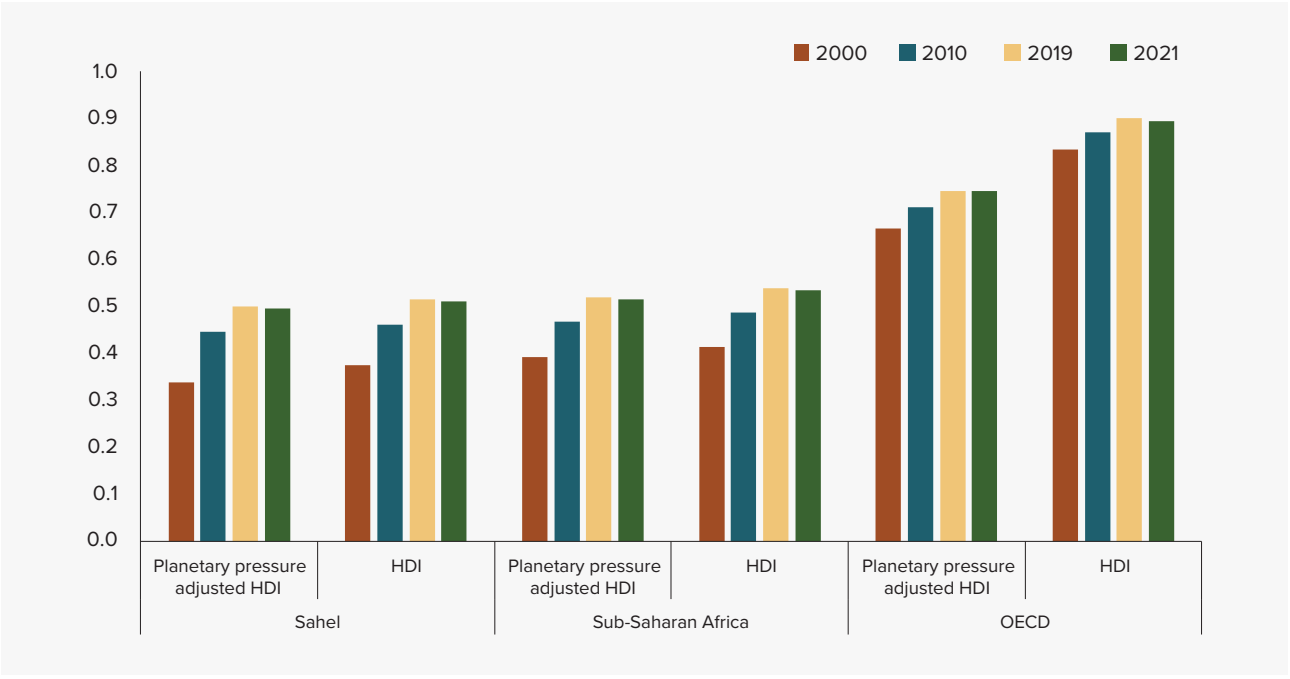
Data from the World Bank shows that, except for Mauritania, the Sahel countries have some of the highest labor force participation rates in Africa, yet very low rates of formal employment. Though unemployment rates in the Sahel are not among the highest in Africa, widespread under-employment afflicts half of all youth in the region. According to the World Bank's Doing Business reports, though Sahel countries have recently improved their business-friendly environments by undertaking regulatory reforms and increasing investment in infrastructure, they are still ranked among the least business friendly, due in large part to their poor infrastructure (power, roads) and histories of political instability.

Unseen Risks: Climate Change Threatening the Sahel Despite Low Emissions

Although emissions in countries of the Sahel are low relative even to other developing regions, climate change poses an enormous threat to the Sahel. According to INFORM Disaster Risk Classifications, all Sahel countries besides Senegal, Guinea, Mauritania, and the Gambia (which are at medium risk of climate change disaster) are designated as High or Very High Disaster Risk.

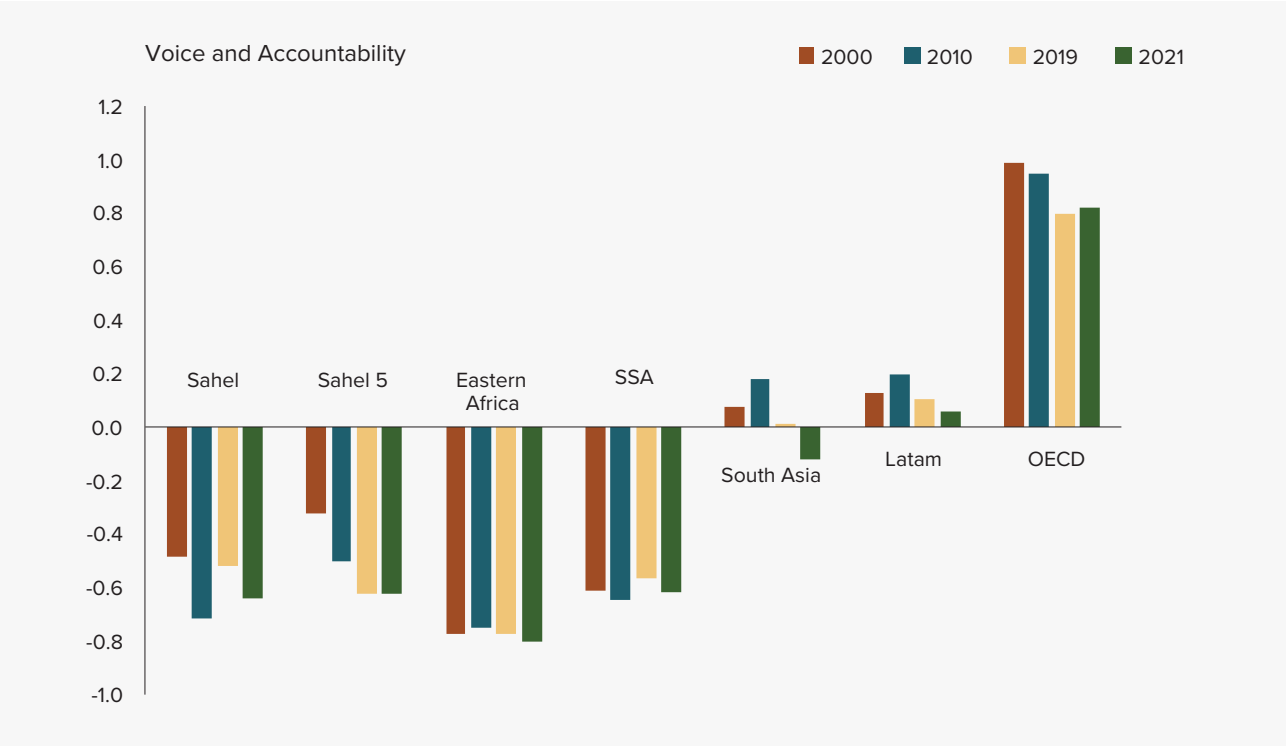
The Planetary Pressures-Adjusted HDI (PHDI) is an experimental index to adjust HDI for planetary pressure arising from carbon dioxide emissions and material footprint. In the Sahel, Senegal and Nigeria lose the most HDI value to planetary pressure with 1.4 and 1.3% losses respectively. However, this is still much lower than Very High Human Development Countries, which lose up to 16.6% of HDI value due to planetary pressure, or developing countries, which lose up to 7.2% (Figure 20).

Figure 20 **Planetary Pressures-Adjusted HDI limit human development progress in all regions**



Source: Author's calculations

Figure 21 **Voice and Accountability are very low in the Sahel, though with minor improvements**



Source: Author's calculations

Climate change's already potent impact will threaten the Sahel's future socioeconomic development and political stability in the decades to come. Climate change is also expected to have increasing influence on security and has been shown to interact negatively with conflict dynamics in the Sahel.[42] Competition for resources has been and remains a dominant driving factor of conflict in the wider region. Climate change also influences conflict and fragility due to its impact on food insecurity which hit a 10-year high in the Sahel in 2023 and is expected to become more severe.

Enhancing data availability on environmental indicators is important, as are climate-responsive and agile development solutions to environmental challenges such as access to fresh water. Chapter 4 will expand on the specific impacts of climate change on the Sahel as well as the current energy landscape.

Challenges in Governance: Assessing the Sahel's Institutional Indices Amid Conflict

Governance and institutional indices such as Rule of Law, Voice and Accountability, Control of Corruption, and Political Stability highlight ongoing concerns for the Sahel, where 6 out of 10 countries are involved in Medium-Intensity Conflict. For example, while Voice and Accountability showed slight improvement over the 2010-2020 period (Figure 21), it remains very low across the Sahel. Political instability also remains a huge challenge, with the Sahel and Sahel 5 performing much worse than sub-Saharan Africa and East Africa and a decrease in stability over the past decade. Overall, these indicators remain low relative to other African and developing regions. Regulatory quality and government effectiveness indicators have missing values for the Sahel region.

42 SIPRI (2021).

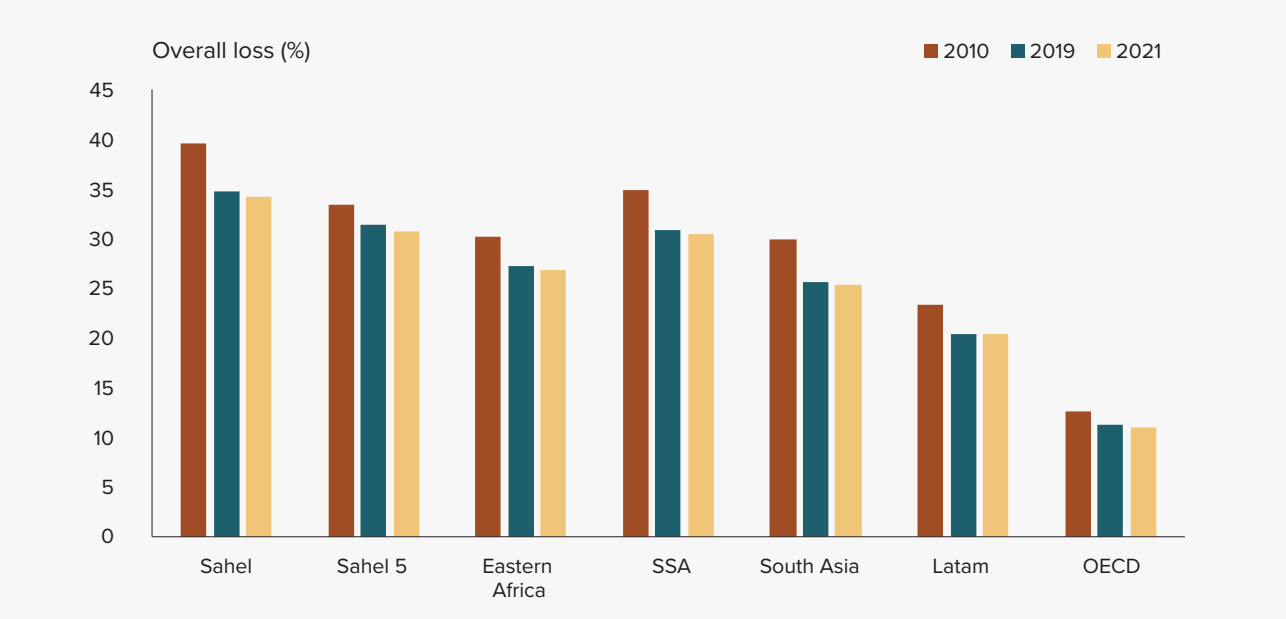
Although governance remains a major challenge in the Sahel, new information and communication technology (ICT) could foster a governance transformation. Thus, e-Governance and e-Justice initiatives and leveraging new technologies to deliver public services are key for governance transformation.

In addition to the explicit benefits of calibrating a clean energy transition in the region with other human-development-centered ambitions, the BGG pathway also emphasizes a positive externality that permeates through improved political economy in the region. Under the BGG scenario, by 2063, several key indicators – notably, the democracy index, civil and political freedoms, economic freedom, and government capacity and effectiveness – substantially improve, fostering an environment across the Sahel that is conducive to centering both people and the planet in policies. It also significantly reduces governance corruption across the region – so much so that governments in the Sahel become more transparent than the African continental average by 2030. The threat of civil wars is reduced and gradually eliminated across the region over time, with countries that have higher probabilities for conflict (Nigeria, Chad, Cameroon, Niger) seeing their conflicts resolved through concerted peacebuilding efforts domestically and regionally and through effective continental governance (see Table 20, Annex 1 which is a projection of state failure using the Instability Index). Improving governance and security within the region is imperative for its developmental progress, as these are both enablers and beneficiaries of increased economic activity, reduced poverty, and improvement in health and education. Such development outcome projections drive home the point that the BGG approach to energy investment could be completely transformative for the region, seizing on the synergies between energy and development.

Inequality Within the Sahel: Unveiling Human Development Disparities

This chapter has explored the aggregate and individual human development indicators for the Sahel region as a whole and for individual countries, but it is also critical to note various levels of inequality within the Sahel that impact human development progress and that therefore must be taken into account to effectively accelerate progress. For example, the

Figure 22 The Sahel records relatively higher level of inequality in human development compared to other regions



Source: Author's calculations

Inequality Adjusted HDI for the Sahel shows that 34% of human development progress was lost in 2021 due to inequality, compared to the global average of 20%. Among global developing regions, sub-Saharan Africa had the highest regional loss (30.5%) in the HDI (Figure 22).

Inequality that must be examined under its geographic and gender dimensions.

Geographic: While the 10 Sahel countries share some geographic similarities, geographic differences exist between them. For geographical and historical reasons related to the colonization and trade via ports, coastal cities are more developed than landlocked regions – hence the persistence of inequalities between rural and urban areas and between north and south in the Sahel sub-region, particularly in countries bordering the Atlantic Ocean. These divides can be seen in poor human development outcomes in rural areas compared with urban centers, and between countries in the Sahel. For example, the Sahel G5-agreement countries – Burkina Faso, Chad, Mali, Mauritania, and Niger – have relatively poorer development outcomes compared to their neighbors. Though limited to a four-country sample, the MPI over the last decade reflects these differences. For example, the Sahel G5 had a very high average MPI for 2010-2019, while the Sahel's overall MPI outranked other regions and subregions analyzed. Despite an improvement in the accessibility of social services, studies show that Sahel countries also tend to have high spatial inequalities in access to education, health, and other services between countries within the sub-region.

Gender: There has been notable progress in gender equality, particularly in areas such as education, health, and seats held in parliament. However, gender inequalities are still prevalent and pronounced in the Sahel: The Gender Inequality Index (GII) for the Sahel and Sahel G5 are higher than other subregions and regions analyzed, indicating that, like income inequality, gender inequality is a serious problem in the Sahel. The decrease in the GII was constant for all the sub-regions except during the COVID-19 pandemic. Out of 170 countries with a rank on the UNDP Gender Inequality Index, Chad ranks 165, Burkina Faso 157, Mali 155, and Niger 153 in 2021. Similarly, a recent African Development Bank (AfDB) and UNECA study indicates that gender inequality in the Sahel sub-region remains the highest in Africa, with an average of 68.1%, compared to the African continental average of 51.6% across the three economic, social, and representation dimensions. Such high and persistent gender inequality is a significant hindrance to sustainable development in the Sahel sub-region.

Figure 23 illustrates that a majority of low-income households in the Sahel rely on traditional biomass like dung, crop waste, and wood for fuel. Women primarily undertake the collection of these traditional fuels, highlighting their significant role. Moreover, studies show that women tend to reinvest 90% of their income into their families, a stark contrast to men who reinvest only 35%.[43]

Modernizing electricity access in Sahelian households holds the potential to revolutionize farming practices, enhance access to information and communication technologies, and integrate into financial systems. Traditionally, women in the Sahel region bear the responsibility for energy-intensive household tasks, making electrification's benefits vary among household members. Among the 51% without electricity access, a staggering 80% lack clean cooking solutions.[44]

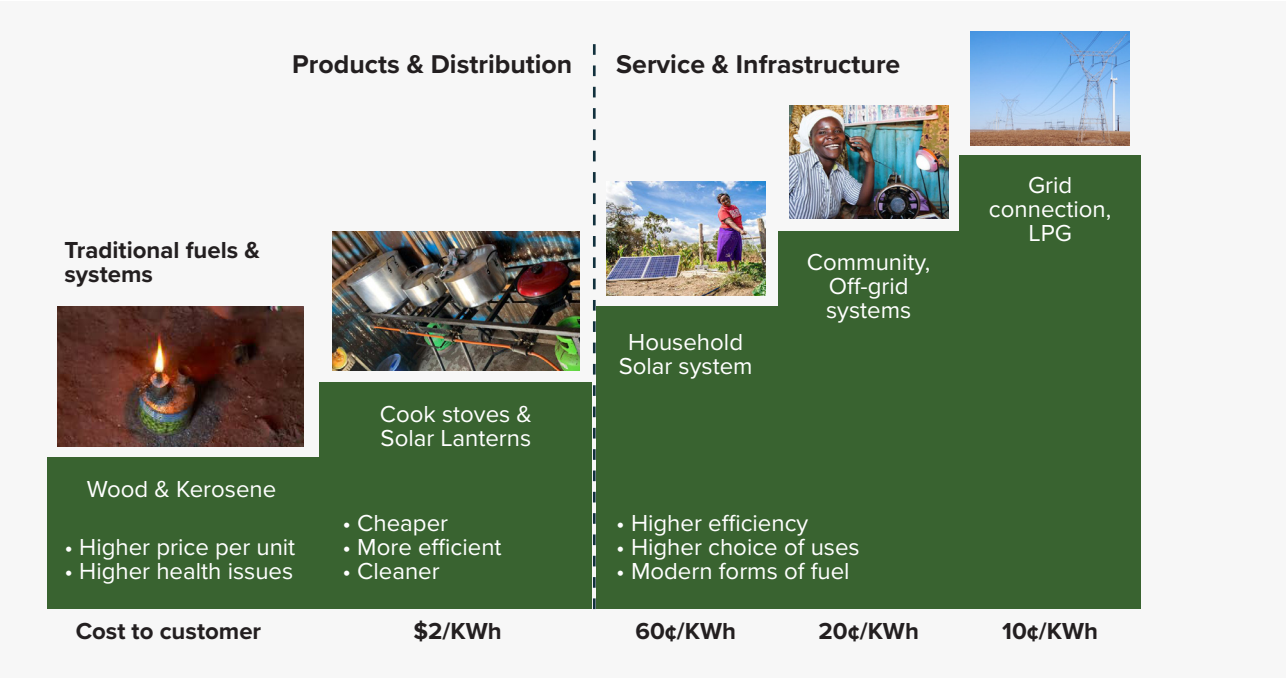
Clean and efficient cookstoves particularly benefit the economically disadvantaged, notably women, providing:

- Time savings from reduced fuel collection.
- Health improvements by curbing indoor air pollution and minimizing fuel wood carrying.
- Status enhancements through improved household appliances.
- Economic gains via potential job creation in the stove production chain and savings on charcoal and fuels.

43 Clinton Global Initiative: Empowering Girls & Women (https://www.un.org/en/ecosoc/phlntrpy/notes/clinton.pdf)

44 https://www.esi-africa.com/renewable-energy/addressing-sustainable-energy-access-in-the-sahel/

Figure 23 **Average costs of energy services applicable to Sahel households**



Source: ESMAP/World Bank

However, achieving universal access to clean cooking demands unprecedented action, especially given recent spikes in liquefied petroleum gas (LPG) prices. This transition also mitigates greenhouse gas emissions and liberates women's time for increased societal and economic engagement.

The increased efficiency of modern stoves allows for a payback of up to four times the initial investment within a year. For households relying on biomass collection, adopting improved cookstoves can liberate up to 15 hours per week spent on wood collection and cooking. This additional time offers women and children opportunities for work, education, or community involvement.

The evolution of the Sahel's energy system has the potential to generate decent jobs with diverse skill requirements. Many of these employment opportunities related to energy access serve as gateways into the formal economy, fostering greater employment and entrepreneurial prospects for women.

An additional challenge to development in the Sahel is data availability. Without updated and comprehensive data to capture a variety of development indicators, it will be difficult to understand opportunities and challenges in the Sahel and leverage points for both policy and practice. Data is missing for several years and countries on issues directly pertinent to the Sahel countries (see Figure 32, Annex 2 for a missing data heat map). For example, data points are scarce for several benchmark socioeconomic indicators and composites such as multidimensional poverty, and environmental and climate-related indicators such as freshwater withdrawals. To better understand the human development situation in the Sahel, data collection and enhancement should be made a policy and programmatic priority including on the national and sub-national levels. The cross-section of human development indicators can be a useful tool to identify where data is insufficient and should be prioritized.

Conclusion

Using the latest available data, this chapter has provided an update on human development indicators in the Sahel which reveals that the Sahel faces no shortage of human development priorities that must be urgently addressed in order to change the course of development in these countries. This reality, in the context of scarce resources, makes it critical that the Sahel finds an energy pathway forward that leverages synergies to maximize the impact of investments. Looking ahead, the Sahel can meet these challenges by adopting the policy priorities of the BGG pathway to effectively meet the urgency these problems require, transforming lives in the short and long term.

CHAPTER

4

Balancing Climate Imperatives with Human Development

The Energy Challenge in a Sahel full of Opportunities

CHAPTER 4

Balancing Climate Imperatives with Human Development – The Energy Challenge in a Sahel full of Opportunities

A profound energy transition centered on renewables and energy efficiency is increasingly understood to be not only feasible but essential for a climate-safe future in which sustainable development prerogatives can be met. However, in such an event there is little-to-low emphasis on human welfare-oriented outcomes. In fact, a sophisticated understanding of the intimate connections between the energy system and the economy at large is essential to designing policies, as is an appreciation of the ways in which both are linked to the world's ecosystems and human well-being. The pursuit and deployment of appropriate energy development strategies in line with the 1.5°C climate target is necessary to achieve SDG7 by 2030, but progress in general, and in the Sahel in particular, has been modest.

Climate change has and will increasingly have detrimental effects on the Sahel region as temperatures rise, sea levels rise, and rainfall changes. These consequences can seriously affect livelihoods, increase food insecurity and health concerns, limit economic growth, and drive conflict. At the same time, the region contends with low levels of electricity, especially in rural regions, which limits human development progress. This, coupled with rising population growth and urbanization rates, means that the region will require significant energy investments to drive the energy transition necessary for the growth of inclusive economies, the improvement of livelihoods, and the achievement of universal access to clean and affordable energy. This chapter dives into the effects of climate change in the Sahel, the current energy situation and overall energy environment, and the range of financing players and instruments that could be leveraged to achieve these goals. By doing so, the chapter helps shine a light on the second problem and imperative that this HDR seeks to understand: addressing the energy deficit in the Sahel.

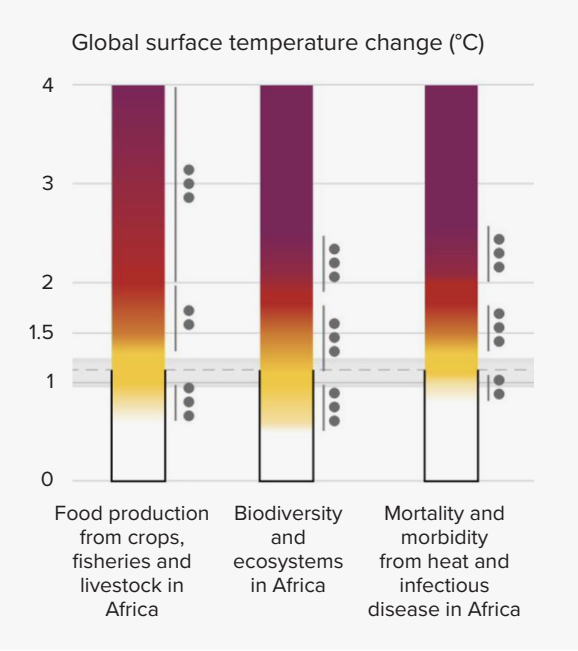
Climate's Unequal Toll: The Sahel's Unique Challenges Amid Low Emissions

Climate change could wreak havoc across Africa, even though the region contributes very little to greenhouse gas emissions. The Sahel, among the lowest contributors to these emissions, has borne the brunt of this global crisis. Human-induced climate change has inflicted substantial loss and damage in Africa, manifesting as biodiversity loss, water shortages, diminished food production, loss of life, and hindered economic growth.

Limiting global warming to 1.5°C stands as a crucial intervention to mitigate these profound impacts on Africa's economies, agriculture, human health, and ecosystems. The Sahel, in particular, faces a unique set of challenges exacerbated by its geography – sand deserts and proximity to the sea. Projections indicate that by 2050, the frequency of warm extremes will surge by more than tenfold in the Sahara and Sahel regions compared to current levels. These alarming predictions paint a dire picture for the Sahel, implying intensified heatwaves and extreme climate events that could significantly impact the region's environment, agriculture, and human populations.

In light of these concerning forecasts, a Balanced Green Growth pathway emerges as a pivotal strategy for the Sahel. This approach not only aligns with global ambitions to limit warming but also holds the promise of mitigating the adverse effects of climate change in the region. By emphasizing sustainable and

Figure 24 Potential impacts of climate change on some key risks in Africa; increase in temperatures is simulated since the first industrial revolution (1850-1900)



balanced economic development, alongside investments in renewable energy and environmental conservation, the BGG pathway offers a comprehensive solution.

This approach acknowledges the urgent need to curb global warming while recognizing the disproportionate impact of climate change on the Sahel. By steering toward a balanced and sustainable growth model, the Sahel can fortify itself against the escalating challenges posed by climate change and chart a resilient and prosperous course for its future.

The BGG pathway offers strategic solutions to alleviate the complex impacts of climate change in the Sahel region. BGG's multifaceted approach addresses the complex challenges presented by climate change in the Sahel, emphasizing sustainable solutions that offer resilience and adaptation strategies across various sectors, from agriculture and water resource management to urban development and healthcare.

Biodiversity under Strain

Rising temperatures have detrimental effects on biodiversity in the Sahel. A recent Intergovernmental Panel on Climate Change (IPCC) report[45] found that if Earth reaches a 1.5°C temperature increase, half of the species assessed would lose more than 30% of their population or habitat; if it reaches 2°C, 7-18% of species will go extinct. More than 90% of West and East African coral reefs are expected to be severely degraded by bleaching. Rapid urbanization is a key contributing factor due to the conversion of the natural environment into urban areas, the increased use of natural resources, and increased waste generation, which threatens soil and water quality while also disrupting hydrological cycles.

The BGG pathway implicitly includes eco-friendly practices and forest preservation. Investments in green initiatives can help restore ecosystems and mitigate habitat destruction, combating the decline of species and preventing further losses. The pathway's focus on sustainable development includes urban planning that minimizes the conversion of natural environments into urban spaces, reducing threats to biodiversity.

Rising Risks on Agriculture and Food Production

Rising temperatures negatively impact food systems by increasing water stress and shortening growing seasons. Since 1961, 34% of agricultural productivity in Africa has been lost due to climate change – more than any other region – with lower yields and reduced fish harvesting. With global warming rising to 1.7°C, reduced fish harvesting could leave 1.2 to 70 million people in Africa vulnerable to iron deficiency, up to 188 million to vitamin A deficiency and 285 million to vitamin B12 and omega-3 fatty acids deficiency by mid-century.[46] Crop yields will also clearly be affected by climate change. These include maize, millet and sorghum which will decline, while other yields, such as cow peas, groundnuts, rice and cassava, are projected to benefit from CO2 fertilization. Thus, it will be necessary for farmers to adapt to these changing conditions.

The Sahel, and the Northern Sahel in particular, is also suffering from reduced soil moisture due to the lack of rainfall and insufficient surface run-off or extracted water from rivers or wells. Rapid population growth and an overall market orientation toward agriculture led the Sahel region to expand croplands quickly, which has increased soil degradation. Agricultural production has not significantly increased in the past 30 years, leaving almost half (40%) of the Sahelian population food insecure.[47] Climate change is amplifying this, with uncertain drought predictions and vulnerable rainfall patterns.

Through education and resource allocation, BGG encourages farmers to adopt climate-adaptive agricultural practices, enhancing resilience against reduced crop yields caused by climate change. BGG

45 AR6 Climate Change 2021: The Physical Science Basis – IPCC.

46 Burton, Pauw, and Wellesley. (2021). The Climate Crisis and Global Food Systems – Global food trade and consumer demand are key drivers of carbon emissions from agriculture.

47 https://reports.unocha.org/en/country/west-central-africa/card/6uW0lQYfGL/

implies through the investment in agriculture the promotion of diversified agricultural methods, aiding in food security. It supports crop selection based on their resilience to changing climate conditions, optimizing food production.

Variable Threats on Water Availability

Water is the avenue by which lives and ecosystems are most directly impacted by climate change. Recent climate change effects have led to extreme variability in rainfall. It is widely observed that this variability led to strong negative and multi-sectoral impacts on water-dependent sectors across Africa. The projected changes pose even more acute, cross-cutting risks for water-dependent sectors and require planning within a context of deep uncertainty for the wide range of extremes the future will hold.

The Sahel region is irrigated by 11 essential rivers that flow into the Lake Chad, Queme, Volta, Niger, Bandama, Comoé, Senegal, Sassandra and Gambia-Gorubal basins. Water resources are managed collectively by several river basin authorities since they flow through a number of hydrological regions and across national borders. Generally speaking, water is unequally distributed across the region: some countries, like Nigeria, benefit from an adequate supply, while others such as Burkina Faso are facing water scarcity.

In essence, the Sahel region has abundant renewable water resources, but less than 1% of it is being extracted due to inefficient hydraulic supply systems and the difficulty of managing transnational water resources. Indeed, estimates of total renewable water resources per capita range from 745,600 m^3/year in Burkina Faso to 6,818,000 m^3/year in Mali, but, for example, over 40% of the water supply in Mali and Chad and 90% in Mauritania and Niger are sourced from other countries.[48]

In general, two features define surface water in the Sahel: it is limited, and it is mostly seasonal. Thus, a high proportion of the population depends on groundwater reserves. However, availability from both sources, along with accessibility, are declining as a result of reduced rainfall, temperature increases, and more frequent droughts. Furthermore, infrastructure is insufficient for accessing water supplies in the dry season or in dry years. Projections suggest that areas with 200-500 mm of annual precipitation, which includes the Sahel, may experience a further decline in groundwater recharge as an effect of climate change. This can cause prolonged drought and other precipitation irregularities. Growing populations combined with urbanization, increased irrigation, and land use change put additional pressures on the situation.

Over the last 30 years there have been increasingly low water levels due to an increasing demand for water supply, which has resulted in 25-60% reductions in flows. Lake Chad has lost about 95% of its surface since the 1960s due to intensive water use, changed rainfall patterns, and increasing temperatures. An immediate consequence of this has been increasing disputes over access to water, fishery and land ownership. In order to reduce uncertainties, dams are often constructed for water storage during dry seasons and times of water shortage. Of course, dams are also used to produce hydroelectric power, thereby reducing reliance on fossil fuels and fuelwood. However, this practice has some negative consequences, as dams often mean shortages in downstream water, the contamination of nutrients, and at times, conflicts arising over the use of and access to these water resources. Beyond quantity, water quality will also be impacted by predicted temperature changes and extreme weather events. With increased temperatures comes the growth of algae and bacteria in water, while oxygen solubility decreases. Taken together, these have negative effects on the ecological integrity of aquatic systems – and, naturally, for the communities depending on them.

The BGG pathway advocates for better water resource management. It focuses on sustainable practices to conserve water, especially in areas vulnerable to decreased precipitation and drought.

By advocating collaborative strategies and transnational agreements, BGG ensures equitable water

48 USAID. "Climate Change Risk Profile. West Africa Sahel". 2017. https://www.climatelinks.org/sites/default/files/asset/document/2017%20April_USAID%20ATLAS_Climate%20Change%20Risk%20Profile%20-%20Sahel.pdf

distribution among countries, addressing the inequality in water access and scarcity.

Cities, Towns and Infrastructure Exposed

Climate change is also exposing urban residents, property, and infrastructure to various risks at an increasing rate. Urbanization in the context of climate change means higher environmental risks such as urban heat islands and landslides. As the population grows and urbanization increases, 108-116 million people will be exposed to sea level rise by 2030 and 190-245 million people by 2060 (compared to 54 million in 2000), with populations in low-lying coastal areas affected the most. The number of vulnerable people (aged 5-64) affected by heat waves of over 42°C for more than 15 days a year will increase from 27 million in 2010 to 360 million by 2100 if Earth hits 1.8°C, and up to 440 million if Earth reaches >4°C. Urbanization is also exposing more people to landslides and floods. Floods affected 256,000 and 250,000 people and damaged or destroyed 41,000 and 21,000 houses in Chad and Niger respectively in 2021.[49]

Climate change has reduced economic growth in Africa, increasing income inequality between African countries and temperate countries in the northern hemisphere. In almost all African countries, GDP per capita is expected to be at least 5% higher by 2050 and 10 to 20% higher by 2100 if global warming is capped at 1.5°C instead of 2°C.[50] Extreme weather events have significantly impacted infrastructure in the Sahel, from high precipitation causing flooding roads to high temperatures causing cracks and degradation in roads, bridges, and coastal infrastructure. In the vast majority of rural areas in the Sahel, the road access index is estimated to be in the range of 25-50%, with Nigeria's being the highest at 64% and Chad's the lowest, at 24%. Makeshift homes built on unstable geographical sites, such as steep slopes or riverbanks, are particularly vulnerable to extreme weather events, especially where strong winds and flooding occur, which can lead to injury, water contamination, loss of housing, and death.

BGG's integrated approach includes urban development plans that address climate-induced risks such as extreme temperatures, floods, and landslides, ensuring infrastructure is designed to withstand these challenges. The pathway emphasizes the need for robust infrastructure development that considers climate resilience, reducing vulnerabilities to extreme weather events.

Exacerbating Health Challenges in the Sahel

The health and climate change nexus is becoming increasingly relevant in the Sahel as more frequent incidences of droughts, floods, storms, and heatwaves increase mortality and morbidity, putting pressure on health and economic systems in the region. At 1.5°C of global warming, the distribution and seasonal transmission of vector-borne diseases are expected to increase, exposing tens of millions more people. At above 1.5°C of global warming, the risk of heat-related deaths increases sharply, with at least 15 additional deaths per 100,000 people per year in much of Africa.[51]

It is projected that the share of the population in the Sahel that will be affected by at least one heatwave per year will rise from 4.3% to 19.9% between 2000 and 2080.[52] This corresponds to an average of about 59 additional very hot days per year over that period. The number of days with temperature above 35°C will be around 211, 141, 280 and 257 for Senegal, Nigeria, Niger and Mali, respectively, at a moderate emission scenario (RCP 4.5).[53] Projections on extreme weather impacts on health and labor supply in the region from the Human Climate Horizons platform show that Sahel countries are very exposed: Mali would incur around 55 (Senegal, 21; Niger, 88) additional

49 Intergovernmental Panel on Climate Change (IPCC). (2022). Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.

50 Intergovernmental Panel on Climate Change (2018). Special Report: Global Warming of 1.5°C. In Press.

51 Gasparrini, A.,Guo, Y., Sera, F. et al. Projections of temperature-related excess mortality under climate change scenarios. Nat Clim Chang 8, 360–364 (2018).

52 See UNHCR, Sahel risk profile at https://agrica.de/wp-content/uploads/2021/11/PIK_Climate-Risk-Profile-Sahel_09.pdf

53 https://horizons.hdr.undp.org/

deaths per 100,000 people by 2059 under a moderate emissions scenario, and almost 45 less working hours (Senegal, 27 hours; Niger, 47 hours) per year per worker in high risk sectors. These livelihood and health impacts, along with the climate change stressors, may have multiple effects – including driving displacement and migration.

An assessment of malaria and meningitis prevalence under climate change found that in the case of Nigeria there is robust correlation between cases of these diseases and precipitation. For the Sahel region, meningitis has also shown a strong correlation with temperatures and aerosols. Thus, higher temperatures and increasingly variable precipitation patterns are likely to make governments' efforts to fight malaria and meningitis even more urgent.

The BGG pathway prioritizes healthcare system strengthening, focusing on preventive measures and on providing resources to address health challenges associated with climate change-induced diseases, heatwaves, and extreme weather events. Through better disease surveillance and preparedness, BGG aims to counteract the projected increase in vector-borne diseases, like malaria and meningitis, by addressing their correlation with changing climate patterns.

Increasing Migration Flows

Climate-related migration in Africa has occurred mainly within countries or between neighboring countries, with more than 2.6 million and 3.4 million new climate-related displacements in 2018 and 2019 respectively.[54] Transhumance, rural-urban migration, nomadism, and temporary migration to neighboring countries (exodus) all constitute types of migration in the Central Sahel. In the Sahel, migration is most often in the direction of coastal countries, which can put more pressure on them.

Forced displacement due to violence or climate shocks is also prevalent. The number of internally displaced persons (IDPs) in the region exceeded 2 million in 2021, mainly from Mali.[55] Most IDPs are in Burkina Faso, followed by Mali and Niger. This number has rapidly increased from 72,000 in 2018.

BGG's emphasis on inclusive development and job creation can mitigate climate-induced migration by providing opportunities in rural areas, reducing the need for migration due to environmental stressors. By advocating peace-building initiatives and resource allocation in conflict-affected regions, the BGG pathway aims to minimize forced displacements due to violence exacerbated by climate shocks.

Insights into the Present Energy Landscape in the Region

The Balanced Green Growth pathway seeks to address the energy challenges prevalent in the Sahel region by leveraging both nonrenewable and renewable energy sources to achieve transformative outcomes in the short and long term.

Electrification Challenges in the Sahel: Disparities, Regional Insights, Affordability and Reliability and Rural Concerns

About half of the Sahelian population (364.7 million) does not have access to electricity. This is one of the lowest rates of consumption of modern electricity on the planet. The current state is the result of a combination of low levels of generation, volatile or high petroleum prices, and a lack of financing for relevant electricity grids, leading to very poor connectivity.

The IEA finds that in the Sahel, the estimated level of power generation is about 35 watts per capita, which represents a third of the sub-Saharan Africa average and is close to 4% of the global average.[56] There are, however, high regional disparities. For instance, in Senegal, the level of access is as high as 70%, while in Chad it stands at just 8%. Electricity

54 Internal Displacement Monitoring Centre. (2020). Global Report on Internal Displacement 2020. https://www.internal-displacement.org/global-report/grid2020/

55 Internal Displacement Monitoring Centre (2022). Africa Report on Internal Displacement. https://www.internal-displacement.org/sites/default/files/publications/documents/IDMC-Africa-report-2022.pdf

56 International Energy Agency (IEA). (2022). Africa Energy Outlook 2022: World Energy Outlook Special Report. IEA Publications, Paris. https://www.iea.org/reports/africa-energy-outlook-2022

access in urban areas is increasing faster than in rural areas. Electricity is completely absent in many rural areas in the Sahel, forcing people to use firewood for cooking stoves which leads to health (and deforestation) issues.

Currently, many Sahelian countries generate at least 90% of their energy from an economically volatile fossil fuel (diesel or heavy fuel), making the power generated costly. Affordability problems have been exacerbated over the past few years due to global economic shocks, which have caused the prices of all types of energy sources as well as of energy-related equipment such as solar home systems to rise. In the absence of policy changes, energy poverty is set to ravage the region for the foreseeable future. Reliability of electricity in the Sahel is also among the lowest in the world, creating a critical roadblock for development by hindering business operations, healthcare, and cooking.

Traditional biomass is still the most utilized source of energy, now representing 60% (70% over the last decade) of energy consumption in Sahel. Senegal and Mauritania are exceptions, as they are dominated by oil. The remaining 40% of the overall energy mix is predominantly made up of fossil fuels.

Almost half of Sahel countries experienced a growth of more than 4% in primary energy demand over the last two decades. By 2030, the population in the Sahel will grow to about 140 million people, 40% of which is expected to be in urban areas. If current policies and development patterns continue, around 80-120 million people will be left without access to electricity and one million will not have access to energy that powers clean cooking techniques. To avoid this fate and support a growing population and economy, it is estimated that an energy level of 1200 PJ – 25% above today's levels – will be needed, including almost 11% from renewable sources. The development community cannot allow inaction that leads to millions left unconnected. In order to take action, the region must address the challenges and seize the opportunities present in both nonrenewable and renewable energy sources.

Nonrenewable Energy in the Sahel

The BGG pathway acknowledges the role of nonrenewable sources, like oil and natural gas, in accelerating progress toward broader energy and development goals in the short term. This is vital due to the existing infrastructure and the need for immediate economic development. It highlights how strategically using these nonrenewable resources can bolster country revenues, which, when directed to critical sectors like education and healthcare, can enhance overall socioeconomic development.

The pathway recognizes natural gas as a transition fuel that significantly reduces emissions compared to coal and oil, making it an attractive option for reducing greenhouse gas emissions. Natural gas power plants' ability to balance intermittent renewable energies aligns with the need for stability in power grids, contributing to the integration of renewable sources.

Doing so, however, presents a range of opportunities and challenges given the dynamics between development partners and international partners that are looking to phase out financing to nonrenewable energy projects. The following background information helps to explain how these dynamics are playing out currently and how natural gas could be an opportunity for the Sahel to use energy as an enabler as explored in Chapter 2.

For nearly 10 years, West and Central Africa have experienced an average growth in electricity demand of around 6.2% per year.[57] To meet this growth in demand, nearly 7,385 MW of new thermal power plant capacity has been developed, alongside renewable energy capacity. Following a transition period,[58] liquid fuel power plant projects gave way to gas-fired power plant projects, either through the conversion of existing plants or through the construction of new plants. To finance these new or converted gas power plants, most of the multilateral and bilateral development institutions present on the continent have played a key role, notably providing concessional funds, capital contributions, or guarantees.

57 Electricity Governance Initiative (EGI)-EUEI PDF. (2019). Towards Inclusive Electrification in West and Central Africa - Annual Report 2019. EUEI PDF. https://www.euei-pdf.org/sites/default/files/2021-02/sagre_2019_en_final_world_bank.pdf

58 International Renewable Energy Agency (IRENA). (2022). Africa 2022 Energy Status Report. IRENA Publications, Abu Dhabi. https://www.irena.org/publications/2022/Aug/Africa-2022-Energy-Status-Report

By replacing oil and coal (which represent 58% of the primary energy in the world)[59] for electricity generation, natural gas significantly improves air quality and carbon dioxide emissions. In the Sahel, power plants are highly dominated by oil-based generation, representing some 75% of total generation, with unavoidably high and volatile electricity prices. Switching from coal to natural gas reduces emissions by an average of 50% for electricity generation and 33% for heat supply. The replacement of liquid fuels – in particular heavy fuel oil and diesel – with natural gas for convertible power plants makes it possible to reduce greenhouse gas emissions by around 25% to 30%. By adding a steam cycle, the thermal efficiency of the gas-fired power plant increases by around 30-40% to nearly 60%, thereby reducing GHG emissions per kWh produced.[60]

Moreover, in the context of increasing power from intermittent renewable energies, the characteristics of natural gas power plants, which can be mobilized instantly, are particularly well-suited to balancing the network, and they play a significant role as spinning reserves. Thus, since 2010, globally, the switch from coal to gas has saved around 500 million tons of CO2 – an effect equivalent to putting an additional 200 million electric vehicles into circulation during the same period globally.[61]

Previously praised for its potential for decarbonization in the short and medium term and for supporting intermittent energies, natural gas has more recently been perceived as a potential risk for "maintaining" fossil fuels in energy networks and slowing down renewable energies, especially in developed countries. Some donors have adopted demanding criteria for gas power plant projects. With the exception of regional institutions such as AfDB, AFC, BOAD, AfreximBank, Africa 50 or institutions in the Middle East (OPEC fund, IsDB, AFESD), most of the development actors subsequently announced an immediate or gradual abandonment of their financing for gas projects, with rare exceptions. This was, for example, the position of American institutions (MCC, USAID, USTDA) and European institutions (GIZ/KfW, BIO, IFU, SIDA), which turned away from new gas projects.

Following COP 26 in Glasgow and faced with a scarcity of funding for gas projects, many developing countries with high gas potential such as Senegal, Mauritania and Nigeria called for the maintenance of natural gas funding for African countries, in order both to achieve universal access to electricity and lower the factors of production to ensure the competitiveness of economies. This would provide youth employment and give people, especially in rural areas, access to affordable and reliable modern energy services. Currently, a growing number of donors seem to be moving toward a compromise that makes investments in downstream gas projects possible but exceptional, provided they meet a certain number of eligibility criteria.

In Senegal, where almost 75% of electricity is produced from liquid fuels and to a lesser extent from coal, the conversion of existing power stations to natural gas and the construction of new combined cycle power stations appears as powerful vehicles for economic development and a tool for short-term decarbonization, likely to lower the cost of electricity production by nearly 40% and CO2 emissions by around 30%.[62] Thus, capitalizing on its world-class discoveries of natural gas, Senegal quickly placed natural gas at the center of its economic and social development and decarbonization policy. In December 2020, in its NDC, Senegal noted that its energy and other commitments would help the country reduce its GHG emissions by 7% (unconditional) or 29.5% (subject to support) by 2030, relative to baseline projections. Natural gas played a key role here, as did biogas and LPG.[63]

59 British Petroleum p.l.c. (2022). Statistical Review of World Energy 2022 (68th edition). BP. https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2022-full-report.pdf

60 International Renewable Energy Agency (2015). Africa Power Sector: Planning and Prospects for Renewable Energy. IRENA, Abu Dhabi. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2015/IRENA_Africa_Power_Sector_2015.pdf

61 International Energy Agency (IEA). (2021). World Energy Outlook 2021. IEA Publications, Paris. https://www.iea.org/reports/world-energy-outlook-2021

62 Dussaux, D. (2020). The benefits of switching Senegal's power plants to natural gas. Institut Montaigne. https://www.institutmontaigne.org/en/blog/benefits-switching-senegals-power-plants-natural-gas

63 The Republic of Senegal (2020). Updated Nationally Determined Contribution. UNFCCC Submissions. https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Senegal%20First/Senegal%20Updated%20NDC%20December%202020.pdf

As discussed further in Chapter 5, various players from national governments to oil and gas companies themselves will have a role to play to strategically use nonrenewable resources in the short run while making progress toward developing the necessary infrastructure, financing, distribution, and storage needed to advance renewable energy production in the long run

Renewable Energy in the Sahel

The BGG pathway recognizes the immense potential of renewables in the Sahel, especially solar and wind energy, and aligns with the regional governments' ambitions to increase their share in the energy mix. It emphasizes the socioeconomic benefits of renewable energy, aiming to diversify energy sources away from fossil fuels, improve energy access, and mitigate environmental impacts. The pathway emphasizes the need for investment in grid extension, interconnections, and decentralized solutions like mini-grids and off-grid systems, crucial for ensuring wider electricity access and deeper electrification.

In the Sahel, renewable energy (wind and solar in particular) has tremendous potential. One encouraging fact is that governments in this region are increasingly including renewables as a central piece in their energy transition strategies.

Table 6 below provides examples of some of the targets set by five of the countries in the Sahel for the nearest future. All five countries are looking for renewable energy solutions to both diversify their energy mix away from reliance on fossil fuels and achieve their energy access targets.

With a good mix of financial support measures and policy, the clean energy sector can drive transformational change. However, a further step is necessary to reach a new scale of progress toward SDG 7.2 (Increase global percentage of renewable energy). In fact, meeting energy access targets with renewables requires the right combination of several ingredients, as part of an integrated approach (i) building on and integrating renewable energy generation, (ii) improving grid extension and interconnections, and (iii) investing in on-grid, off-grid and stand-alone solutions.

As of today, the mini-grid industry in the Sahel is at an earlier stage of development compared to East Africa. However, Senegal appears to be a leader in terms of the quantity of installed mini-grids. The extension of grids has the potential to reach almost half of the households that currently have no access, with up to one-third of the population able to connect cost-effectively through mini-grids. For one out of five people gaining access to electricity, stand-alone power systems are the best option.

The potential to increase electricity through solar power is high given the high amount of sunlight in the region and the vast amount of land available for PV panels in rural areas. For 65% of rural populations in the Sahel, individually owned (off-grid) solar power systems represent the lowest-cost energy option. Off-grid power is estimated by the International Energy Agency (IEA) to be the source of 70% of new rural

Table 6 Renewable energy

Country	Renewable energy target
Mauritania	To increase the share of modern renewables in the energy mix to 60% by 2030.[64]
Mali	To increase the share of renewable energy in the energy mix to 59% by 2025, 64% by 2030 and 70% by 2036.[65]
Burkina Faso	To increase the share of renewable energy in total electricity production to 50% by 2030.[66]
Niger	To reach at least 30% of the energy balance from renewable energies by 2030.[67]
Chad	To reach a 20% share of renewable energy in national electricity production by 2030.[68]

Source: International Futures (IFs) v8.01.

64 https://unfccc.int/sites/default/files/resource/BUR2-MAURITANIE-VF.pdf
65 National Renewable Energy Plan for Mali (PANER) 2015-2020 / 2030.
66 Burkina Faso's Sector Policy Letter of Energy adopted in 2016 (LPSE) and the sectoral policy "industrial and craft transformations" (2017).
67 Niger's *Plan d'Action d'Energie Renouvelable* (PANER), 2019.
68 Chad's Lettre de Politique Energétique adopted in 2018.

power by 2040.[69] Wind, hydro, and sustainable biomass also present important opportunities. With a share of 12% of the region's electricity and close to 40% in Mali, hydropower is the major source of renewable power.

Investment in distribution and infrastructure/grid transmission coupled with improved regional integration through power pools and an expansion of domestic generation fleets is necessary to ensure that power shortages elsewhere do not jeopardize Sahelian countries' energy security. In remote or rural areas, the near-term cost-effective access solutions provided by decentralized micro-grids play a significant role. These solutions allow for a higher penetration rate of renewable generation in addition to deeper electrification: the foundation for electric mobility adoption and all-electric buildings in the future.

New technologies are scaling up, international markets and costs are shifting in favor of renewables, and the potential for regional integration is increasing. Attracting the necessary investment to implement plans, scale up the market and secure long-term access gains will require clear policies and strategies as well as strong regulations in each country which is explored further in Chapters 5 and 6. Understanding the opportunities, challenges, and financing dynamics related to both nonrenewable and renewable energy sources is key and central to this HDR to meet the energy imperative.

BGG underscores the significance of clear policies, strong regulations, and strategic investments necessary to integrate both nonrenewable and renewable sources effectively. It acknowledges the importance of regional integration and collaboration, advocating for power pools and improved transmission infrastructure to ensure energy security and access across Sahelian countries.

The BGG pathway recognizes the intricate relationship between nonrenewable and renewable energy sources, emphasizing the need for a balanced approach that leverages the immediate benefits of nonrenewable resources while strategically transitioning toward sustainable and environmentally-friendly renewable alternatives in the long run.

Financing the Sahel's Energy Transition: Players, Instruments, and the Quest for Balance

However, the reliance on nonrenewable sources poses challenges, especially concerning international partners looking to phase out financing for such projects. This highlights the need for a balance between short-term energy gains and long-term sustainability. The dynamics of international funding for gas projects post-COP 26 pose challenges. While some donors are withdrawing from financing gas projects, others, especially regional institutions, advocate for continued investment in natural gas for broader energy access.

Globally, by 2050, the financing needs for the energy transition are estimated at $131 trillion, i.e. around $4,700 billion per year. By comparison, in 2019, climate financing was around $622 billion.[70] Since the onset of the COVID-19 pandemic in early 2020, 36 major economies and 8 multilateral development institutions have committed at least $929 billion to support different types of energy through new or modified policies. Around $371 billion were directed toward fossil fuels and $341 billion toward clean energies. Among the 8 multilateral institutions, energy funding has been oriented largely – up to 88% – in favor of renewable energies. This is a clear signal that the Sahel countries will need to strategically align their policies and energy projects with the financing windows made available for them for nonrenewable and renewable energy projects.

The IFs model gives insight into what the financing needs could look like for the Sahel under the three pathways. For BGG, by 2030, across all 10 Sahel countries, the cumulative investment toward energy needed is $187.1 billion. By 2050, this rises to $797 billion and by 2063 the total is $1,898 billion. Investment levels differ by country (expanded upon

69 International Renewable Energy Agency (2022). Renewables in the Sahel. IRENA, Abu Dhabi. https://www.irena.org/-/media/Files/IRENA/Agency/Regional-Group/Africa/IRENA_Market_Report_Sahel_June_2022.pdf

70 IRENA (2022). World Energy Transitions Outlook 2022. International Renewable Energy Agency, Abu Dhabi. https://irena.org/publications/2022/mar/world-energy-transitions-outlook-2022

in Annex 4) ranging from $1,571 billion in Nigeria to $3.1 billion in Mauritania. The overall cumulative investment toward energy is lower for BGG than the Current Path and Renewable Path up until 2050, meaning these transformative impacts on energy and development could be achieved under similar or less investment levels than the other pathways. This level of investment is still a heavy lift and will require bold action by key financing players.

This section provides a deep dive into the key financing players and financing instruments relevant to financing energy projects in the region which is critical to better understand the complexities of scaling energy production.

Financing Dynamics and Key Players in the Sahel's Energy Sector

The World Bank Group: While the World Bank Group has not announced it will abandon support for gas-fired power plant projects, it has pledged to only consider investments in natural gas when a country has urgent demand for energy and a lack of renewable alternatives. The criteria and methodology determining what gas-to-power projects the group will support still need to be clarified, but given the voting make-up of the group, it is likely that its policy on gas-to-power financing will align those of its main shareholders – 45% of whom signed onto the COP 26 declaration on the abandonment of fossil fuels.

Regional institutions, multilaterals, and development finance institutions (DFIs): As far as the Sahel is concerned, the AfDB has established a desert-to-power initiative to leverage adequate financing starting with clean energy projects in G5 Sahel. However, the AfDB recognizes the need to include some gas-to-power projects into the transition path to realistically account for development considerations of countries in the Sahel region. Among multilaterals, the World Bank Group, the International Bank for Reconstruction and Development (IBRD) and the International Development Association, the AfDB and the Inter-American Development Bank (IDB), among others, provide additional guarantees to projects, by covering certain obligations of States and/or sub-sovereign entities. These collateral instruments can be deployed in a variety of ways to protect promoters, lenders or creditors from credit risk and/or political risk. The World Bank and AfDB, among others, are able to provide a variety of credit enhancement products, including partial credit guarantees, enabling projects to ensure liquidity and the non-payment of the State Party during the early termination of contracts.

US agencies, European players, and Asian players: The main US agencies that provide financing – USAID and DFC – have stated that they are committed to coworking with institutions and the international community to reduce coal consumption and, under extremely limited conditions, support oil- and gas-related projects if there are no viable alternatives for achieving priority national security, development, or humanitarian objectives, and when such support does not delay the transition to clean energy. The European Investment Bank (EIB) is mainly dedicated to investment in renewable energy with limited presence in gas-to-power in the Sahel. However, some exceptions are made within UK agencies and other DFIs such as the Financierings-Maatschappij voor Ontwikkelingslanden N.V. (FMO) in the Netherlands for projects that do not delay the transition to renewable energy. Asian players such as Japan, South Korea, China, and India, however, are more inclined to finance gas-to-power projects despite having their own definitions and methodologies for measuring greenhouse gas emissions within projects.

Understanding these dynamics among main players will be critical for Sahel countries to consider when strategizing how to approach these institutions to finance their energy goals in the short and long terms.

Instruments and Types of Financing for Energy Projects in the Sahel

Having understood what key players can support the deployment of clean energy across the Sahel, it is also essential to understand how financing can flow to targeted countries.

There are several types of financing available to a project company, with varying repayment profiles

and rates of return. Different lenders may also have different objectives for the same project, which will determine both the level and cost of their participation in financing. The ranking of debt (that is, the level of priority applicable to its repayment compared to other sources of financing) is governed by the cascade of project flows.

Senior Debt and Mezzanine Debt

Senior debt is generally granted by a wide range of financial institutions involved in a project and is typically the most significant form of project funding. Most energy projects require long-term senior debt, with repayment terms of at least 10 years but ideally more than 15 years. Like senior debt, subordinated debt is usually granted by a variety of institutions. This level of funding is commonly subordinated to senior debt tranches in terms of cash flows and certain contractual rights. Given its ranking, subordinated debt is usually more expensive. Generally, these debts are granted by the categories of lenders including insurance against political risks; commercial banks; export credit agencies (ECAs); and syndication.

Equity Capital

Lenders who finance a project usually require a certain amount of equity from promoters, depending on the level of debt. This will generally come in the form of equity contributions made by promoters. Possible types of capital providers are sponsor/developer; private equity funds; venture capital; and impact investments and donations.

Capital Markets

Domestic and international capital markets are a fourth source of funding to help finance energy projects. The term capital market refers primarily to markets on which it is possible to buy or sell debt and securitized equity instruments. In the context of financing energy projects in Africa, capital markets include both international and local capital markets. The depth of these two markets and the interest of investors operating in them may vary considerably. While capital markets in emerging and frontier countries are still developing, a number of structured financial products and equity instruments are suitable for financing energy projects in other parts of the world. Such products and instruments could develop on the African continent, including project bonds; sovereign and sub-sovereign bonds; refinancing; yield companies; and public offerings.

Multilateral and Bilateral Development Institutions Active in the Sahel

The role of development finance institutions has been key in the emergence of independent power producers (IPPs) in the Sahel. DFIs play a major role in the financing of both equity and debt projects. As the credit ratings of many Sahel countries suggest, they are very often rated as non-investment grade. This is because the risks weighing on power plant projects in the Sahel region are significant and diverse and are often synonymous with impossibility or high financing costs.

Beyond the financing conditions they can offer (term and rate), DFIs play a key role in risk mitigation. Some DFIs are heavily involved in the electricity sector of the countries in which they are likely to finance projects. This provides them with undeniable expertise in due diligence and risk assessment, as well as levers to implement reforms that can promote the project. As government interlocutors, these DFIs also have levers capable of enforcing investment contracts. Some DFIs are further able to offer guarantees and insurance that are often essential for limiting the most difficult to mitigate risks. While some risks (contractual, construction, natural force majeure, etc.) can be covered or mitigated by typical project finance arrangements, others require the support of DFIs. More specifically:

- Political risks (expropriation, repudiation of contracts, cancellation of permits or licenses,

restrictions on currency conversion and/or transfer, war or civil unrest, terrorism).
- Regulatory risks (changes in laws or regulations).
- Credit/payment risks (payment capacity of the lessee, often a utility company or end customer).

Leading International Commercial Banks in the Sahel Energy Sector

Oil and gas projects are mainly financed by large international banks with specialized departments. Thus, in the Sahel, major banks have been involved in these emblematic projects. During the period 2016-2020, major international banks financed liquefied natural gas (LNG) projects for about $1 billion in sub-Saharan Africa, including in Sahel countries. A list of the main banks financing oil and gas and LNG projects is provided in the annex.

Major Local Commercial Banks in the Energy Sector in Sahel

Besides major international banks with interest and participation in the Sahel region, some regional and sub-Saharan African banks are also crucial players when it comes to financing energy projects in Sahel countries. These are Nigerian banks, South African banks, Moroccan banks, among others. A list of these local banks is provided in the annex.

Private Equity Actors, Developers, and Other Financing Actors

Power plant projects are often financed by IPPs, with the support of private equity actors (IPP shareholders or project shareholders) and equipment manufacturers contributing to the financing of equipment. PPIs are generally controlled by private shareholders, although many involve public co-investment. Most IPP projects are developed within Special Purpose Vehicles (SPVs) and are based on non-recourse project funding. A few are funded on large corporate balance sheets. Debt and equity structures differ. More rarely, some sovereign wealth funds may invest in power plants or hydrocarbon infrastructure, usually in their own country. Examples include Fonsis (in Senegal's gas network) and NSIA (in Nigeria's gas and power infrastructure). Large sovereign wealth funds like Mubadala Investment may also invest in gas-to-power projects internationally. Some of these players are active in gas-to-power or thermal projects only, and others in renewable energies. The former category is of interest for energy transition financing and the latter is focused on renewable energy projects in the Sahel.

A key parameter for financiers in the energy sector to consider is the country rating, which will inform investors about the risk and hence the cost of capital injected into energy projects. Currently, for most Sahel countries, the ratings are modest and imply additional guaranties to support financing into pure renewable energy projects.

Net-Zero Banking Alliance

Another consideration applying to the banking sector is net-zero banking. This commitment of major banks will have a potential implication on how the banks involved will address financing in the energy sector, including in the Sahel region. The industry-led, UN-convened Net-Zero Banking Alliance brings together over 1300 banks representing almost a quarter of global banking assets who are committed to aligning their lending and investment portfolios with net-zero emissions by 2050. These banks come from 41 countries, with about $74 trillion in total assets. Combining near-term action with accountability, this ambitious commitment sees banks setting an intermediate target for 2030 or sooner, using robust, science-based guidelines. The Alliance will reinforce, accelerate, and support the implementation of decarbonization strategies, providing an internationally coherent framework and guidelines in which to operate, supported by peer-learning from pioneering banks. It recognizes the vital role of banks in supporting the global transition of the real economy to net-zero emissions. A sample of the members of the net-zero alliance is in the annex.

Conclusion

In the absence of durable partnership strategies and clear political commitments, it will be impossible to consistently scale up energy investment. Indeed, those governments in the Sahel countries that can improve regulatory systems and stability in the region must act to unlock the necessary international support to ensure that concessional financing can leverage the most from private investment. It is clear there is a huge need for energy expansion in order to deliver on other development goals. Any pathway forward will require commensurate financing to nourish the energy transition that is necessary for the growth of inclusive economies, the improvement of livelihoods, and the achievement of universal access to clean, affordable energy. This financing will require enhanced regional and international collaboration.

CHAPTER

5

Turning Opportunities and Regional Synergies into a Pathway for Success in the Sahel

Recommendations to Leverage Energy for an Accelerated and Sustainable Development

CHAPTER 5

Turning Opportunities and Regional Synergies into a Pathway for Success in the Sahel – Recommendations to Leverage Energy for an Accelerated and Sustainable Development

This HDR addresses the critical need for the Sahel region to adopt policies aimed at achieving both energy sufficiency and human development. It emphasizes the significance of the BGG pathway, highlighting its policy implications to enhance energy access and development outcomes. The suggested policies encompass various sectors like education, income equality, and infrastructure. While recognizing the diverse circumstances of Sahel countries, the report urges the adoption of policies to boost human development and achieve sustainable energy access. Leveraging both renewable and traditional energy sources is crucial, balancing short-term gains with long-term sustainability. The BGG pathway outlines this strategy, calling for substantial investments in energy production. Recommendations encompass a broad spectrum, targeting regional stakeholders, international bodies, governments, private sectors, academia, and civil society, bridging policy implementation gaps and considering the region's political economy.

This chapter provides actionable recommendations for the Sahel and the development players to make progress toward these policy opportunities while taking into consideration strengths, weaknesses, trade-offs, and synergies between countries, development actors, and policy areas. These recommendations revolve around eight levers which could enable Sahel countries to increase access to energy by accelerating renewable and nonrenewable energy production.

The Sahel Can Lead a Green Industrialization in Africa

Given its significant renewable energy resource potential, the Sahel can become the first region in Africa to pioneer and champion an industrial revolution based on, and fueled by, renewable energy. Investments in renewable energy would go beyond transforming domestic use (the transition from biomass) to focus on establishing green regional value chains that create jobs, leverage global value chains, and accelerate the attainment of the SDGs. Industries like the manufacture of photovoltaic cells/batteries, textiles, and agro-processing are potential candidates. Countries in the Sahel should adopt targeted green industrial policies, use the AfCFTA to widen market access, and work with the private sector to ensure (and expedite) necessary technology transfers and financing – including with the diaspora.

Sahel countries should use local industries and academics as gateways to localize energy technology development. Dependence on technology imports, especially energy technologies, makes Sahelian countries more vulnerable to supply chain shocks but also increases the cost of electricity overall. Clean technology transfer from developed countries to the Sahel will be key. The countries of the Sahel will need the technology to support generation, transmission, and delivery of renewable energy which requires the passing of software and hardware from developed countries. International trade and foreign investments help catalyze the transfer of clean technologies.[71]

Nigeria[72] approved a new National Renewable Energy and Energy Efficiency Policy in 2020 outlining plans to boost renewables from 13% to 30% in its energy mix and transition toward a low-carbon economy. It has set out strategy documents like the Nigerian Energy Masterplan which has detailed plans for building up domestic solar panel manufacturing and expanding the local skills base to maintain green industries. With 206 million people, there is a massive market that renewable energy powered manufacturing could target while creating jobs.

Burkina Faso[73] is home to the largest solar farm currently under development in the Sahel region – a 50 MW solar PV facility called Zagtouli near Ouagadougou. This $60 million project funded by the EU and France demonstrates the potential to power industrial activities sustainably. Burkina Faso has less than 1% electrification in rural areas currently but is aiming for 26% by 2030, showcasing the opportunity

71 https://link.springer.com/article/10.1007/s00267-022-01704-w

72 https://www.powermag.com/nigeria-plans-phaseout-of-petrol-cars-transition-to-electric-vehicles/

73 https://www.power-technology.com/marketdata/power-plant-profile-zagtouli-solar-park-burkina-faso/?cf-view

for decentralized solar power to transform rural development.

Senegal[74] already sources 30% of its energy from renewables and is home to Africa's first utility-scale wind farm – the 158 MW Taiba N'Diaye facility which powers 20% of the country's generation capacity, demonstrating viability of grid-connected renewable projects. The $2 billion Grand Tortue Ahmeyim natural gas project positions Senegal as a major gas producer with the potential to develop associated industries.

Mali also has substantial potential for solar power and other renewables. Its government aims to increase renewables' share of electricity generation to 70% by 2036. Mali could leverage this to power green industries.

Universities should be empowered to produce the technical capabilities for renewable energy technologies so that its students can eventually influence local industries and governments.[75] Initiatives such as the annual civil camps and the Incubator INNODEV at the Polytechnic Dakar in Senegal are examples of ways to strengthen the interaction between academics and industry. These efforts must be significantly expanded in order to improve knowledge and technology transfer.[76] To do so, universities can partner with international universities to promote shared educational resources. International institutions should also scale their efforts in joining joint research proposals to increase the strength of applications from Sahel universities.[77] Overall, the Sahel countries should consider strengthening public-private partnerships for knowledge exchange and technology development as well as strengthening the university-industry-government partnership.

Sahel governments should prioritize strong engagement in enacting enabling policies to support the localization of energy technologies.[78] Some policy options to do so and attract private sector participation include import tariffs and quality standard controls, using economic zones and industrial parks to prepare infrastructure, and incentivizing demand for locally manufactured technological components.[79] Off-grid providers should be incentivized and regulated which could be through clean energy targets, tax breaks, net metering, and carbon pricing.[80] For off-grid solar power, countries should use technological, digital, and business model innovations that could increase energy access in rural areas. These types of innovations could follow the example of programs such as the UNDP's Africa Minigrids Program (AMP)[81] and the UNDP's Energy Offer.[82]

Developing Private Sector Partnerships to Drive Long-Term Decarbonization

The oil and gas industry itself will need to play an active role in scaling up energy production while balancing the long-term shift toward increasing renewable energy's percentage of the energy mix. Overall, oil and gas companies need to create credible net-zero pathways in coordination with national governments that have tangible shared benefits for the public in order to gain trust, communicate their role in a just energy transition, and operate effectively.

Oil and gas companies should integrate low carbon opportunities along the natural gas and electricity value chain.[83] Oil and gas companies have competitive advantages when it comes to strong balance sheets, project management skills, and expertise in supply chain management and market

74 https://www.esi-africa.com/industry-sectors/finance-and-policy/senegal-makes-strides-towards-universal-electricity-access/
75 https://www.sciencedirect.com/science/article/pii/S2468227622003921
76 https://www.sciencedirect.com/science/article/pii/S2468227622003921
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80 https://iea.blob.core.windows.net/assets/64c80f0d-2f5c-4c0b-9fbe-d33fde1df240/CleanEnergyTransitionsintheSahel.pdf
81 https://www.undp.org/energy/our-flagship-initiatives/africa-minigrids-program
82 https://climatepromise.undp.org/news-and-stories/west-africa-has-great-potential-solar-energy-its-time-release-it
83 https://www.atlanticcouncil.org/wp-content/uploads/2020/07/OGT-final-web-version.pdf

development. These companies should use these advantages in the Sahel to invest in downstream gas infrastructure that can help move users from fuel to gas and in other opportunities such as the hydrogen economy. Given the Sahel's high solar and land resources, oil and gas companies should consider gas-to-renewables projects that use natural gas as a backup for wind or solar energy production.[84]

The oil and gas industry should deploy decarbonization technologies and strategies to reduce the environmental impact of fossil fuel production and distribution. These decarbonization technologies include ones that target Scope 1 emissions (emissions produced by company activity directly); Scope 2 emissions (indirect emissions produced by company activity); and Scope 3 (all other indirect emissions not controlled directly by the company).[85] Some strategies to consider are making methane emissions more efficient which is cost-neutral, if not profitable, for the industry while being extremely valuable for the environment; developing carbon capture technology; and using hydrogen to decarbonize petroleum. The industry will play a key role for the energy transition in the Sahel and should be a leader in carving out and communicating how it can best serve as an enabler for a renewable future. (For example, the Oil and Gas Climate Initiative (OGCI) is led by 13 international and national oil companies that supports R&D for net zero-technology technologies).

Striking a Balanced and Coordinated Energy Transition for Sahelian Progress

Only a balanced and coordinated approach utilizing some natural gas and fossil fuels in the short term while scaling up renewables long term will succeed in transitioning the region's energy system. A balanced and coordinated strategy also provides a realistic transition timeline that is sensitive to each country's resources, avoids energy shortfalls as renewable capacity scales up, and keeps the lights on for Sahel communities.

While renewable energy production presents an incredible opportunity to unlock energy and development progress, there is still a clear role for nonrenewable energy sources. Depending on each country's natural resources and existing infrastructure, nonrenewable sources such as natural gas will be critical to leverage in order to accelerate energy production in the short term while working toward making renewable energy sources more affordable and accessible in the long term.

Sahelian governments must enact clear legal and regulatory frameworks that attract investment to facilitate a just green transition. Development partners and investors can provide funding and technical expertise to help update grids, build gas infrastructure where viable, pilot new technologies, and craft localized transition roadmaps rooted in data and community needs.

In the energy sector, Senegal has been a pioneer in many respects. The country has a recognized public electricity company which has implemented an extensive "butanization" policy, has developed an original biogas economic model, and is developing an effective universal grid and off-grid connection program. The country has significant comparative advantages for photovoltaic and wind power generation and has been able to set up an appropriate regulatory environment (especially for International Finance Corporation (IFC) scaling solar). In the gas sector, after having put in place an appropriate regulatory environment (gas code), Senegal is in the process of developing, in a relatively short time frame, an original and promising LNG export project (low production cost, border, deep offshore gas field and replicable technology with a phase 2). In the medium term, the country is preparing to launch additional gas projects (domestic GTA and phase 2, Yakaar Teranga and SNE gas phase).

84 https://www.atlanticcouncil.org/wp-content/uploads/2020/07/OGT-final-web-version.pdf
85 https://www.atlanticcouncil.org/wp-content/uploads/2020/07/OGT-final-web-version.pdf

Nigeria[86] has over 200 trillion cubic feet of proven gas reserves and extensive infrastructure already in place. Natural gas fuels 43% of power generation. Instead of abandoning operational gas power plants, Nigeria can attract investment to capture flared gas and channel it productively toward the industry and expanded electricity access utilizing existing pipelines and grids. Development partners like USAID are providing $600 million over five years to help rehabilitate gas infrastructure through the Nigeria Power Sector Program.

Recent offshore gas discoveries led by the Grand Tortue Ahmeyim project positions Senegalto scale up this lower-carbon transition fuel while renewables mature. Senegal aims to use gas proceeds to invest in education, health and other development areas to bootstrap growth. Regulations requiring gas investors to support electrification funds facilitates a balanced pathway. Access rate is 70% but gas can power expansion toward full connectivity.

Chad has over 1.5 billion barrels of proven oil reserves. While environmental concerns exist regarding fossil fuel expansion, using some proceeds from oil to develop solar and other green technologies avoids abrupt economic shocks. Only 8% of Chadians have access to electricity showing a short-term need for stopgap measures as capacity is increased. The African Development Bank has supported building interconnections with neighboring Cameroon to balance hydrocarbon and renewable imports as part of the transition.

Forging Trust and Collaboration: Empowering Communities for Sahelian Development and Green Transition

Consistent long-term engagements between governments, development partners, and communities will deliver tangible results on the ground and build trust in the process. This is crucial as it can nurture trust among citizens, officials, and development partners, fostering a more accommodating political economy that supports and advocates for green transitions. Policy strategies should also consider potential negative community impacts of green infrastructure development and renewable energy transitions, to minimize conflict and other risks.

Sahelian governments should establish inclusive energy and development planning processes that empower communities to shape priorities. Civil society and private sector partners can offer support in capacity building and participatory monitoring, while financiers should commit to multi-year funding linked to locally defined energy access and usage metrics.

Leadership in Sahel countries should reconfigure the distribution of roles between local and central governments while striving to build trust in both. Strengthening the relationship between local and central governments is paramount, given the existing lack of trust, resentment, and frustration stemming from inefficiencies and poor coordination between them. To achieve this, countries ought to consider public perception when assigning roles, particularly in conflict management. For instance, surveys conducted in Mali among informal firms indicate greater trust in local traditional institutions for resolving conflict-related issues like land and resource management. Similarly, both formal and informal business managers generally exhibit more trust in informal institutions for addressing such matters. These local and informal institutions rely on social capital and community networks, such as kinship and religious connections, to effectively resolve conflicts.

In contrast, surveys in Niger and Senegalese border villages reveal a preference for a stronger central government presence to maintain security, alongside trust in local institutions. This diversity in perceptions suggests a need for a balanced approach. To achieve this:

- The Sahel should expand central government control, including customs services for cross-border trade, even in conflict-affected areas. Simultaneously, decentralization in conflict zone villages will be crucial for inclusivity in decision-making, fostering community investment and protection. This approach can mitigate resentment

86 https://www.usaid.gov/nigeria

that might lead individuals to join violent groups. Collaboration between central and local governments is crucial. Central government services, such as security and customs, would benefit from local government support to ensure smooth local trade.

- Sahel leadership should empower local governments with more autonomy and resources, especially for social services. Current inadequacies in delivering social services, stemming from local issues like outdated equipment or shortages of teachers and healthcare providers, can be addressed more effectively by local governments. Central governments should collaborate with local counterparts through regulated resource-sharing agreements. Critics often argue that local governments lack the capacity to manage resources or address complex community needs. Overcoming this requires incentivizing capacity building, such as tying financial resource distribution to the acquisition of certain skills.

- Sahel national governments must complement traditional security investments with economic security initiatives. Employment and enterprise development policies are crucial for foundational stability. Prioritizing access to credit, resources, and technologies can drive job creation, small and medium enterprises development, and overall productivity growth.

The EU-funded FREXUS project in Niger[87] facilitates engagement between the government, Lake Chad Basin Commission, civil society, and local communities to co-develop context-specific solutions addressing the water-energy-food nexus in the Diffa region facing conflict and environmental pressures. The long-term focus on local buy-in and participatory planning for off-grid renewables has built trust and understanding. Community management committees will oversee sustainability after the five-year program ends.

Burkina Faso sent letters directly to the Energy Minister as part of the Bottom-Up Energy Planning methodology to highlight needs. The citizen feedback supported formulation of Burkina's energy policy targeting 26% electrification by 2030 and long-term funding commitments. The approach won UN recognition for effectiveness in inclusive planning and implementation.

The Self-Sufficient Village program in Senegal aligns government agencies, civil society, technical partners and locality representatives in co-planning decentralized solar solutions meeting village consumption needs for productive uses – leading to installed micro-grids, solar pumps, mills, etc., reflective of priorities.

International Partners (Multilateral and Bilateral) and Regional Initiatives: Integrated Approaches to Security

International partners and regional initiatives should focus on creating integrated approaches for communities to handle combined challenges such as climate change, development, and security. Partners should focus on a more integrated approach to security, including a special attention on community recovery and community development rather than relying solely on traditional military stabilization mechanisms.[88] Military approaches will likely be necessary in areas of extreme violence and territorial gains, but these strategies should only be one part of a broader equation. International partners should shift funding toward integrated development, peacekeeping, and humanitarian needs.[89] This could be by shifting funding in existing initiatives and new initiatives. For example, the Sahel Alliance has coordinated almost 1,100 projects since 2017 to improve security and development across the Sahel. Funding should continue and increase but should focus on long-term, integrated goals rather than conflicting short-term objectives that can make long-term security difficult.

87 https://www.water-energy-food.org/frexus-improving-security-and-climate-resilience-in-a-fragile-context-through-the-water-energy-food-nexus

88 https://cdn.cfr.org/sites/default/files/report_pdf/Climate%20Change%20and%20Conflict%20in%20the%20Sahel.pdf?_gl=1*1ui5515*_ga*MTc2MTU3ODMyOC4xNjkxNTkzNjcz*_ga_24W5E70YKH*MTY5NDk3OTY0NS4zLjAuMTY5NDk3OTc2NC4wLjAuMA

89 https://cdn.cfr.org/sites/default/files/report_pdf/Climate%20Change%20and%20Conflict%20in%20the%20Sahel.pdf?_gl=1*1ui5515*_ga*MTc2MTU3ODMyOC4xNjkxNTkzNjcz*_ga_24W5E70YKH*MTY5NDk3OTY0NS4zLjAuMTY5NDk3OTc2NC4wLjAuMA

There are important examples of successful regional programs for building strong integrated responses to complex challenges. One example is the Projet Régional d'Appui au Pastoralisme au Sahel (PRAPS) which is a regional project aimed at supporting pastoralism in the cross-border areas of the Sahel across six Sahel countries: Burkina Faso, Mali, Mauritania, Niger, Chad, and Senegal. Funded mainly by the World Bank with contributions from the Mauritanian government, PRAPS is able to address multiple issues through an integrated approach by addressing pastoralist issues through a combination of strategic investments, capacity building, and policy dialogue.[90] Its overall goal was to improve access to production means, services, and markets in the cross-border areas for pastoralists and agro-pastoralists. By engaging in capacity building for public actors at the local and national levels on peaceful access to pastoral resources and crisis management, the initiative was able to leverage synergies between agriculture, security, and climate adaptation. Improving the productivity and climate resilience of pastoralists in the cross-border region led to a decrease in severe conflicts in targeted areas over access to pastures.[91] Implementing this project on a regional level was ideal because it addressed shared challenges on the community level with positive spillover effects on security for a broader range of countries.

The FREXUS program is another regional initiative that has been successful in achieving its objectives of using a water-energy-food nexus to address a wide range of challenges in fragile contexts.[92] The nexus approach allows the initiative to avoid unintended consequences and impacts on other sectors and to improve efficiency of natural resources in a climate-conscious way. The project is based in Mali, Niger, and Chad led by the Lake Chad Basin Commission and Niger Basin Authority and includes capacity building for country stakeholders to address conflict and climate change in an integrated way. This regional initiative is a good example of the type of project that can address multiple challenges across countries with similarities such as fragility in this case. It is one of few initiatives starting from a specific river basin and working across. This type of initiative should be seen as an example for future regional initiatives that can take the lead in successfully addressing multiple issues in an effective way.

Regional responses to crises should be better coordinated based on the comparative advantages of regional initiatives. Similar to how comparative advantages play a role in streamlining progress on energy production, responses to security issues should consider these advantages as well to make sure that efforts are coordinated effectively. Coordination should be led and owned by local and regional initiatives.[93] For example, the Liptako-Gourma Authority (LGA), a regional organization working in Mali, Burkina Faso, and Niger, was created in 1970 to enhance resources in the area including mining, energy, agriculture, fisheries, etc., but extended its mission to include security issues in 2017. Now, the LGA is working toward developing a localized, non-militarized security approach along the border region. Their connection to the local community over the past 50 years is an important asset and comparative advantage that can be used to complement regional military responses to crises.

International funders should transition foreign aid toward rebuilding commercial and economic sectors in fragile states with prominent civil society and private sectors.[94] Private sector solutions and city-based approaches are two ways to help fragile states and leave no one behind. The private sector is underutilized in fragility strategies but has key strengths such as resources and management potential that can be used to contribute to conflict resolution mechanisms and to finance initiatives that include dialogue building, local negotiations and national conflict resolution.[95] At the same time, private sector involvement helps generate economic activity

90 https://www.food-security.net/projet/projet-regional-dappui-au-pastoralisme-au-sahel-praps-4/
91 https://www.food-security.net/projet/projet-regional-dappui-au-pastoralisme-au-sahel-praps-4/
92 https://www.water-energy-food.org/frexus-improving-security-and-climate-resilience-in-a-fragile-context-through-the-water-energy-food-nexus
93 https://ecdpm.org/work/seven-ways-support-resilience-and-crisis-responses-central-sahel
94 https://www.brookings.edu/wp-content/uploads/2019/09/LNOB_Chapter11.pdf
95 https://www.brookings.edu/wp-content/uploads/2019/09/LNOB_Chapter11.pdf

and creates jobs in immediate service delivery for relief.

Build solutions that promote effective governance to reduce the divide between local government elites, international actors, and the local population, especially in cities.[96] To do so, transparency and accountability are key and must be embedded in decentralized approaches through continual input from internal and external stakeholders. Cities and towns are typically the centers of resilience.[97] Regional and international programs should capitalize on these existing resilience mechanisms. There are examples out there already of regional actors that support community-level development cooperation such as the G5 Sahel and C3 Sahel that work together in cross-border areas to implement infrastructure projects.

Private Sector: Building Stability through Strengthening Economic Security

The private sector should contribute to stability, unlock investment and capital flows, promote long-term business, and facilitate the entry of new enterprises to local, national, and regional markets especially in post-conflict environments.[98] In post-conflict environments, instilling confidence in markets is key to promote stability in a way that is inclusive and encourages long-term business growth. The private sector can play a key role in instilling confidence and in partnering with the public sector at the local level while applying conflict-sensitive business practices, including by minimizing potential consequences of business operations on domestic politics, instability, and conflicts, avoiding corruption, and ensuring a fair redistribution of the benefits to relevant stakeholders of local communities.

Overall, there is a need to prioritize these transversal areas in order to overcome implementation challenges (discussed in detail in Chapter 6) that will allow the Sahel to effectively use energy as an enabler for development.

Maximizing Socioeconomic Impacts: The Central Role of Technology in Energy Access and Data-Driven Policy

Technology is at the core of expanding energy access and affordability in the Sahel, underpinning off-grid solar solutions, mini-grid connections, battery storage innovations and efficiency improvements. Granular geospatial and user data layered with machine learning can support dynamic, evidence-based policy targeting for subsidies, grid expansions, and renewable micro-financing so investments maximize impact. Sahelian governments should invest in nationwide energy user and market datasets while crafting interoperability standards; private sector and development partners should develop customer-centric pay-as-you-go solutions and provide analytics to model least-cost electrification scenarios as well as finance pilot innovations aligned to socioeconomic development metrics.

One way to do this is to scale the existing regional skills certification scheme of PV installers which was created by the ECOWAS Centre for Renewable Energy and Energy Efficiency.[99] This scheme is extremely helpful as it creates a standard recognized across all 15 ECOWAS member states that aligns procedures and operating requirements.[100] This is funded by multiple sources such as the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and the Australian Development Agency (ADA), among others, and should be expanded as planned to cover off-grid and on-grid PV systems and other renewable energy professional training.

GIS databases like Nigeria Energy Access supported by the World Bank provides geospatial data, market intelligence, and consumer data guiding

96 https://www.brookings.edu/wp-content/uploads/2019/09/LNOB_Chapter11.pdf
97 https://documents1.worldbank.org/curated/en/099750406292231519/pdf/P1756840200edb0f0a0640e7edeb63b29f.pdf
98 https://www.brookings.edu/wp-content/uploads/2019/09/LNOB_Chapter11.pdf
99 https://climatepromise.undp.org/news-and-stories/west-africa-has-great-potential-solar-energy-its-time-release-it
100 http://www.ecreee.org/certification

decision-making. It maps potential areas for off-grid developments. Machine learning informs the optimal least-cost electrification approach between grid, mini-grid or stand-alone solar for unserved communities.

Private companies like Oolu in Senegal are offering pay-as-you-go home solar systems where smart meters and IoT sensors allow custom usage-based payments from mobile money improving affordability. The data analytics and remote monitoring allows right-sizing systems and guides consumer upgrade offers increasing accessibility.

Orange Mali has launched three Solar Electricity Villages providing decentralized solar power to keep critical telecom infrastructure online while deploying pay-as-you-go home solar systems for additional households in the village using mobile money payments.

Niger's government plans to use GIS data to strategically target electrification investments and subsidies to maximize socioeconomic returns.

National Governments in the Sahel: Developing a Gas-to-Power Strategy and Communicating Its Role to International Partners

National governments in the Sahel should develop a gas-to-power strategy that is extended by an innovative decarbonization strategy, which can guarantee that in the long term, the country's gas infrastructures can serve as a catalyst for the development of renewable energies, including of renewable gas, if the technical and financial conditions allow it. For example, Senegal and Nigeria have an abundance of natural gas resources and infrastructure in place that can and should be used to create opportunities for local companies and international partners to drive economic growth.

Nigeria's President Bola Tinubu was elected in early 2023 and inaugurated in late May. Already the president has taken important actions to signal his political will to work together with the industry to accelerate natural gas production. Citing Nigeria's natural gas reserves as a transition fuel to restructure the nation's economy, President Tinubu met with the board of the Nigeria Liquified Natural Gas Limited to affirm their partnership and hear their concerns related to the challenges that impede growth.[101] These include regional security and the regulatory environment which the president then pledged to address. Meeting regularly with stakeholders to work together to remove barriers will be critical, and the Nigerian president showing leadership is a positive signal that the country will prioritize natural gas production in the future.

Patient Capital Must Underpin the Sahel's Renewable Energy Revolution

The Sahel requires patient, long-term capital to fund its renewable energy revolution because transforming distributed energy ecosystems requires sustained investments before commercial viability. Without concessionary and risk-tolerant financing that adopts a persistent lens, bankable projects will remain scarce, deal flows limited, and energy poverty entrenched across the region. Sahelian governments should explore mechanisms to attract and retain long-term capital that will improve investor returns over the medium term. Furthermore, development banks and impact funds provide credit enhancements and subordinate debt to catalyze private capital inflows; corporate partners can also embrace social responsibility mandates by supporting early-stage ventures.

Nigeria[102] has introduced a range of financial and market incentives to boost the adoption of renewable energy. In the immediate term, it proposes a freeze on import duties for renewable energy technologies. Looking ahead, it plans to develop additional measures such as tax credits, capital incentives, and

101 https://guardian.ng/news/well-leverage-on-gas-resources-for-economic-expansion-says-tinubu/
102 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9879844/

favorable loan options to promote long-term growth in renewable energy projects.

By championing initial private sector investments in a large-scale solar photovoltaic (PV) facility, the government, through the Segou Solar PV project (Mali), aims to significantly enhance the credibility of solar PV within a developing regulatory landscape. This effort not only drives down the total cost of power generation but also fosters increased private sector engagement in funding renewable energy initiatives.[103]

Accelerating Financing for the Energy Transition in the Sahel

Meeting the escalating energy needs of the Sahel demands a blend of financing, spanning renewable and nonrenewable sources. Coordinated efforts and a comprehensive understanding of financial instruments are pivotal to this endeavor. Chapter 4 delineates various financing instruments, each with distinct advantages and drawbacks. The global financing requirement for the energy transition by 2050 is estimated at $131 trillion – around $4,700 billion per year,[104] while current climate financing stands at $622 billion.[105] Since the onset of the COVID-19 pandemic in early 2020, 36 major economies and 8 multilateral development institutions have committed at least $929 billion to supporting different types of energy through new or modified policies with around $371 billion directed toward fossil fuels and $341 billion toward clean energies. Multilateral banks directed approximately $7.1 billion to fossil fuels and $29 billion to clean energies between 2020 and 2021.[106] Bridging this gap necessitates aligning Sahelian policies with available financing windows, especially for clean energy.

De-risking is fundamental to attracting private finance, given the perceived risks that deter private investment in African markets. These risks include regulatory risk, which may delay contracts; debt risk, which may mean higher payment risks from state-owned utilities; and political risks, which may lead to instability and unfavorable investment environments. These higher perceived and actual risks then increase the cost of capital to over two to three times more than in advanced economies.[107] While addressing these risks is vital, additional incentives like reduced connection prices or subsidized electrical appliances are imperative, as only around half of new electricity access connections in the Sahel appear commercially viable without such enticements.

An enabling regulatory environment, coupled with partnerships and joint ventures, is central to incentivizing private sector funds.[108,109] Sahel governments must foster an environment that encourages trade and investment and guarantees partnerships for technological and skill contributions. Furthermore, the region needs innovative financing strategies like green bonds, sustainable loans, and carbon markets to bridge the funding gap. Leveraging local financial systems, such as local banks, offers an advantageous financing channel due to their proximity to communities and markets.

Outside actors, including bilateral donors and development financial institutions, can play a pivotal role in facilitating private sector investment. The World Bank, through its extensive programs, should expand its delivery scope beyond central governments to local governments, private sectors, and civil society to have a more substantial impact.

Concessional finance providers and the private sector should collaborate to initiate sustainable business practices, incorporating long-term strategies into renewable energy projects. African governments that improve regulatory systems will garner essential

103 https://pubdocs.worldbank.org/en/495601531555510860/1926-PSREML502A-Mali-Project-Document.pdf

104 https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2021/Jun/IRENA_World_Energy_Transitions_Outlook_2021.pdf?rev=71105a4b8682418297cd220c007da1b9

105 https://www.climatepolicyinitiative.org/wp-content/uploads/2020/12/Updated-View-on-the-2019-Global-Landscape-of-Climate-Finance-1.pdf

106 https://www.energypolicytracker.org/institution_analysis/mdbs/

107 https://www.iea.org/reports/financing-clean-energy-in-africa/executive-summary

108 https://www.sciencedirect.com/science/article/pii/S0301421512002765

109 https://www.weforum.org/whitepapers/world-economic-forum-regional-action-group-for-Africa-financing-the-future-of-energy

international support for concessional financing, vital for leveraging private investment.

Ultimately, comprehensive financing is indispensable for the Sahel's energy transition, essential for economic growth, enhanced livelihoods, and universal access to clean energy. This necessitates global collaboration and targeted efforts to attract the requisite opportunities and support the region's development. Concessional financiers, African governments, the private sector, and international partners all have distinct roles in achieving this, as underscored by the IEA Financing Clean Energy in Africa Report.[110]

Investment in the energy sector relies on stronger domestic financial systems, which national governments can support by:

- **Addressing key bottlenecks in the identification of projects that are suitable for funding by already-funded climate funds.** Unused climate funds are ready to be dispersed; however, projects must be "bankable" and overcome compliance costs. National governments play a key role in addressing these bottlenecks by promoting and supporting local financial institutions to identify projects and accredit implementing entities that meet climate fund requirements.[111]

- **Setting up a solid, transparent, and secure national emissions reporting system** that records internationally standardized data to facilitate auditing and adapt to bilateral (cooperative approach) and multilateral (sustainable development mechanisms) approaches. Capacity-building regarding carbon credits and climate finance can help support the overall strategy for how carbon credits will be sold, valued, and reported.

- **Improve the capacity of local finance actors such as commercial banks and institutional investors by creating public green finance facilities.**[112] Local finance holds key opportunities. Since local finance channels eliminate currency risks, reduce exposure and vulnerability to external shocks, and effectively price risks due to their proximity to communities and markets, they have great potential as sources of energy investment.

- **Adopt innovative financing strategies.** To bridge the financing gap, national governments in the Sahel should adopt innovative financial strategies including greenhouse gas trading systems, green bonds, green loans, sustainability-linked bonds, sustainability-linked loans, efficient carbon marks, debt-for-climate swaps, and forward-looking domestic resource mobilization instruments. Greenhouse gas trading systems establishes a market for buying and selling emission allowances which could be an opportunity for Sahel countries to generate revenue that can be reinvested in BGG priorities. Green bonds and loans can help Sahel countries align the interest of investors with the country's energy and climate goals including those of the BGG pathway. Sustainability-linked bonds and loans can help raise funds by tying financial incentives to the achievement of predetermined sustainability targets. Well-designed carbon markets can be used to attract investment in clean technology especially from international partners. Finally, debt-for-climate swaps can also be a way to restructure debt in exchange for climate action commitments which could help free some resources to be directed toward the BGG pathway's renewable energy investment.

There are also distinct roles that outside actors can play to help create an enabling environment that can attract partnerships and finance.

Other public actors such as bilateral donors, philanthropies, and DFIs should improve their role in creating enabling conditions for private sector investment.[113] These players should help identify and support systematic country-level interventions that address investment bottlenecks such as the World

110 https://www.iea.org/reports/financing-clean-energy-in-africa/executive-summary
111 https://www.imf.org/-/media/Files/Publications/REO/AFR/2023/April/English/ClimateNote.ashx
112 https://www.iea.org/reports/financing-clean-energy-in-africa/executive-summary
113 https://www.seforall.org/publications/energizing-finance-understanding-the-landscape-2021

Bank's Maximizing Finance for Development. Using evidence-based sources such as this report can boost investor confidence. These actors also play an important role in supporting national governments by increasing their borrowing capacity, thereby increasing access to international debt and capital markets. These development partners should play a role in building capacity in areas such as governance, public financial management, data collection, and macroeconomic stability.[114]

> The World Bank has been active across multiple energy and development projects from providing huge amounts of financing to contributing to transformative capacity building. The World Bank has primarily been focused on working with central governments to implement its programs. Going forward, the World Bank should consider broadening its program delivery to local governments, the private sector, and civil society in order to broaden its impact amidst the growing challenges. While central governments will be key for implementation, it is clear that more stakeholders need to be involved to implement the energy and development goals. The World Bank should also use its advantages in convening to mobilize climate finance from partners at scale.

Bilateral and multilateral funders should work with local organizations to overcome risk aversion that can help expand development work into marginalized communities. This will involve working with trusted actors at the local, sub-national, national, and regional levels.[115] Multilateral aid funds should reduce the administrative complexity for low-income and fragile countries to access funds such as the Green Climate Fund. At the same time, bilateral and multilateral institutions should open more avenues for climate adaptation funding.

Concessional finance providers should step in to provide financing for the early stages of local companies, which can then drive further private sector investment through the creation of additional equity financing vehicles, the use of off-balance sheet financing approaches, support for commercial banks in providing more affordable long-term debt, and the financing of productive uses. Blended finance that uses concessional financing to de-risk projects to crowd in private sector financing has proven to be successful. However, blended finance could be strengthened to make sure to obtain private finance as in the past, DFIs and multilateral development banks have used this approach and ended up attracting their own capital rather than de-risking enough to actually reach the private sector.

Concessional finance should also better target energy efficiency projects that have so far had little coverage from concessional financing instruments (less than 15% in Africa).[116] Efficiency projects are often on a smaller scale with less recognition. Public financers such as governments, development financial institutions, and donors should raise awareness of these projects and create finance schemes that target these areas such as making buildings and appliances energy efficient.

The private sector should engage in public-private partnerships and solidify sustainable business practices into long-term strategies. Through enabling business environments, national governments can attract private companies to renewable energy or climate-resilient projects. Collaborations between the public and private sectors that share risks and rewards can bring in more private players to invest in projects that promote economic growth and mitigate climate change. As the private sector engages in the Sahel, they should cement corporate responsibility and environmental stewardship into their business practices.

114 https://www.imf.org/-/media/Files/Publications/REO/AFR/2023/April/English/ClimateNote.ashx

115 https://cdn.cfr.org/sites/default/files/report_pdf/Climate%20Change%20and%20Conflict%20in%20the%20Sahel.pdf?_gl=1*1ui5515*_ga*MTc2MTU3ODMyOC4xNjkxNTkzNjcz*_ga_24W5E70YKH*MTY5NDk3OTY0NS4zLjAuMTY5NDk3OTc2NC4wLjAuMA

116 https://www.iea.org/reports/financing-clean-energy-in-africa/executive-summary

Those governments in the Sahel countries that can improve regulatory systems and stability in the region must act to unlock the necessary international support to ensure that concessional financing can leverage the most from private investment. It is clear there is a huge need for energy expansion in order to deliver on other development goals. Any pathway forward will require commensurate financing to nourish the energy transition that is necessary for the growth of inclusive economies, the improvement of livelihoods, and the achievement of universal access to clean, affordable energy. Such financing will require enhanced regional and international collaboration to attract the best opportunities.

Concessional finance providers: Take on more risk to increase the pool of bankable projects for investors especially in fragile countries.

African governments: Create the right enabling environment with stable regulations and financially reliable utilities.

Private sector: Accurately price risks and work with blended finance instruments.

International partners: Technical assistance and mobilize more funding to deliver on climate finance agreements.

Based on IEA Financing Clean Energy in Africa Report.[117]

Empowering Private Sector Collaborations in Advancing Renewable Energy Deployment

Private sector players themselves should engage in public-private partnerships to co-create enabling environments that support scaling mini-grids and other renewable energy technologies. For example, the Africa Minigrid Developers Association is an industry association made up of 42 members across 19 African countries that works together with governments and donors to ensure that mini-grids are effectively used as a key component in ending energy poverty through reliable, affordable, and sustainable energy.[118] The association takes the lead in creating multi-stakeholder policy and regulatory Advisory Committees with governments and donors to advocate for policies that support the mini-grid sector. Through its eight guiding principles in the box below, the association has successfully communicated its needs with specific actions that governments can take to attract further investment by the mini-grid industry. Private sector players within the renewable and nonrenewable energy industries should consider engaging in similar ways as a unified voice that engages stakeholders to make meaningful policy changes while deepening important relationships with governments and donors for the future.

117 https://www.iea.org/news/doubling-energy-investment-in-africa-requires-urgent-action-to-bring-down-financing-costs-and-boost-access-to-capital
118 https://africamda.org/about-us/

The Africa Minigrid Developers Association has eight guiding principles that the industry believes are critical for supporting mini-grids in the pursuit of Africa's energy goals.[119] These include:

Technical and Safety Standards: The Association believes private mini-grid developers must engage with governments to ensure technical and safety standards are practical, cost-effective, and robust.

Grid Integration Framework: The Association believes governments can establish mechanisms to integrate mini-grids within the main grid by: allowing independently-operated mini-grids to be efficiently and transparently connected to the main grid once it arrives in the area where the mini-grid operates; enabling the mini-grid to continue operating once the main grid arrives, by buying power from and/or selling power to the main grid in such a way that enables commercial viability of the mini-grid; and allowing independently operating mini-grids to sell their grid infrastructure assets to the national utility in an acceptable, transparent, and equitable manner when the main grid arrives.

Tariff Framework: The Association believes that governments in Africa should constructively engage with the process of transition from viewing power as a service rather than a commodity. This change in viewpoint may warrant recognition in tariff and/or the subsidy process to reflect the social value in commercial terms which could be through a transparent and equitable tariff calculation model.

Permitting Policies: The Association stresses that governments should ease the burden on mini-grid developers without compromising safety or compliance by allowing for both programmatic and tiered permitting.

Subsidy Parity: The Association applauds the efforts of some African governments in supporting subsidies for connection fees and other costs of grid expansion but notes that subsidy parity should include various mini-grid operators which would help in countries that impose uniform tariffs.

Infrastructure Financing: The Association recommends that project finance facilities be created in order to transition the mini-grid sector from proof-of-concept to scale. Investors have a key role in catalyzing this funding, but governments can help create more standardization of the mini-grid asset class, so investors better understand the projects they are investing in.

Off-Taker Bankability: The Association is committed to developing data sets and frameworks necessary to demonstrate that the portfolios of uncontracted off-takers can produce predictable, bankable cash flows.

Hybrid Energy Systems: The Association believes hybrid power sources will be important to ensure African consumers have access to affordable power, but developers are committed to a low-carbon future.

Scaling up the Sahel's Energy Ambition Means Prioritizing Cross-Border Initiatives to Boost Affordability and Reliability

Scaling up the Sahel's energy ambition requires prioritizing cross-border interconnectivity and regional power pools because no country has sufficient resources to independently achieve universal access. Regional approaches hedge against climate vulnerabilities as countries facing droughts or fuel shortages can import clean electrons from neighbors with surpluses. Such initiatives can build on existing regional arrangements like ECOWAS and WAPP. Sahelian governments should harmonize power sector regulations, lower duty barriers for equipment imports, and jointly plan least-cost generation additions with WAPP support, development partners can provide technical assistance to negotiate and broker agreements, while the private sector finances interconnections through transparent public-private deals.

119 https://africamda.org/about-us/

Initiated in 2015, the Kaleta dam marks the initial phase of Guinea's[120] comprehensive strategy, involving the overhaul of its electricity parastatal and the establishment of new power lines linking the country with neighboring nations. The 450 MW Souapiti dam has significantly augmented the available power capacity. Although there are persistent challenges in distribution and transmission, addressing these issues could position Guinea to export electricity to neighboring countries, aligning with the government's objectives. Furthermore, potential shifts in the power requirements, driven by increased bauxite processing within Guinea by mining firms, may impact the economic feasibility of exporting electricity to neighboring nations.

There are existing regional initiatives that successfully target key levers such as facilitating infrastructure development, production of renewable energy, improving affordability and reliability, or facilitating the financing. International actors, including multilateral organizations such as the World Bank and bilateral partners, should pour more resources into these initiatives or new initiatives with similar goals. Sahel countries should prioritize these partnerships by preparing projects with adequate monitoring and evaluation systems and approaching humanitarian and nontraditional actors with similar models to these projects. These types of initiatives can also provide the de-risking needed to crowd in private finance.

Successful regional initiatives rely on harnessing comparative advantages across existing programs. One such exemplary model is evident in the strategic collaborations fostered by UNDP's Energy4Sahel program. With a comprehensive scope encompassing off-grid electrification, clean cooking, and innovation in clean energy access, this initiative addresses barriers outlined in the HDR through targeted interventions. Its fundamental approach involves leveraging existing strengths to align diverse stakeholders toward common objectives.

An illustrative goal within the Energy4Sahel program is to enhance the skills and employability of youth and women in the energy sector. Building on UNDP's successful endeavor in Senegal, training women's groups in income generation through solar cooking, this program endeavors to amplify impact. By partnering with regional institutions, academics, and industry associations, the initiative aims to elevate and disseminate high-quality training on renewable energy. This scaling up of a proven small-scale intervention underscores the potential for amplification with adequate resources and technical expertise, notably facilitated by the UNDP.[121]

Another strategy involves replicating successful interventions from external contexts to capitalize on their efficacy. For instance, the AMP, a country-led technical assistance program for mini-grids operational in six Sahelian countries, has laid the groundwork in these regions. Leveraging insights gained from the AMP's preparatory work, the Energy4Sahel intends to extend support to the four unengaged countries (Cameroon, The Gambia, Guinea, and Senegal). This extension aims not only to prevent duplication of efforts but also to bolster impact and execute larger-scale mini-grid initiatives. This strategic alignment serves to complement existing efforts while expanding their reach, ensuring a more significant collective outcome.

The crux of these partnership strategies lies in meticulous pre-planning, integral from the project's inception. The UNDP, in this context, assesses ways to complement ongoing initiatives and enrich the collaborative landscape with its distinct resources and connections. Table 8 details the roster of partners involved, providing a framework for stakeholders to deliberate on leveraging these partnerships effectively. This deliberate approach highlights the importance of thoughtful planning and strategic alignment in maximizing collaborative potential within regional initiatives.

120 https://www.trade.gov/country-commercial-guides/guinea-renewable-resources

121 https://www.undp.org/sites/g/files/zskgke326/files/2022-10/Energy4Sahel_Prodoc.pdf

Table 7 **Sahel regional energy initiatives**

Initiative	Countries involved	Objective	Energy levers/enablers	Funding/partners
Desert-to-power	Burkina Faso, Ethiopia, Eritrea, Djibouti, Mali, Mauritania, Niger, Nigeria, Senegal, Sudan and Chad	Connect 250 million people to electricity by making the Sahel the world's largest solar production zone.	Infrastructure, financing, sustainability.	AfDB, Green Climate Fund, Africa 50
DESFERS	Senegal, Mali and Niger	Support the development of over 4,000 women-led renewable energy businesses in the Sahel.	Inclusivity	EU-Plan International
Zagtouli village solar plant	Burkina Faso	Construct a 33 megawatts solar power plant (largest in the Sahel region).	Infrastructure, sustainability	EU (grant), French Development Agency (loan)
The Gambia River Basin Development Organization (OMVG) Energy Project	The Gambia, Guinea, Guinea-Bissau and Senegal.	Increase access to electricity, expand power trade system, and create a regional electricity market by providing renewable energy at a competitive cost.	Affordability	African Development Fund, PMVGRN-OMVG
The Regional Electricity Access and Battery-Energy Storage Technologies project	Mauritania, Mali, Niger, Côte d'Ivoire and Senegal	Increase grid connections in fragile areas, build capacity of ECOWAS ERERA, strengthen WAPP's network with battery-energy storage technologies infrastructure. Partially subsidize connection charges.	Infrastructure, inclusivity, affordability	World Bank
Sahel Renewable Energy	Mali, Niger and Burkina Faso	Boost the supply of renewable energy and contribute to socioeconomic development of targeted communities.	Inclusivity, infrastructure	Swedish International Development Cooperation Agency, UNOPS, UNDP and LGA (Integrated Development Authority of the Liptako-Gourma Region)
West Africa Energy Program (WAEP)	G5 countries	To provide technical assistance, financial advisory services, and targeted use of grant funding to support new transmission lines and facilitate new on-grid connections.	Finance, infrastructure	USAID, ECOWAS
Energy4Sahel	Burkina Faso, Cameroon, Chad, The Gambia, Guinea, Mali, Mauritania, Niger, Nigeria and Senegal	To provide technical assistance and investment through regional- and national-level interventions aimed at off-grid renewable electrification and clean cooking.	Finance, infrastructure, inclusivity	UNDP
Regional Off-Grid Electrification Project (ROGEP)	Benin, Burkina Faso, Cabo Verde, Cameroon, Central African Republic, Chad, Cote d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone and Togo.	Expand off-grid access to electricity using stand-alone solar systems.	Adopt regional standards and regulations to establish a regional market, crowding in private investments to deploy innovative technologies	Credit and grant from IDA, recovery grant from the Clean Technology Fund (World Bank)
The West African Power Pool North Dorsal Project	Niger, Benin and Burkina Faso	Increase integration of regional energy systems and enable the transport of electricity at a lower cost from Nigeria to Niger, Benin, and Burkina Faso.	Affordability	World Bank, African Development Bank, EU, France

Table 8 Development partners for clean energy initiatives in the Sahel

Partner	Role
Financial institutions including the World Bank, AfDB, and Islamic Development Bank	Financial de-risking mechanisms and the roll out of off-grid electrification and clean cooking solutions.
Local financial institutions	Facilitate access to finance clean energy providers and consumers in the region.
UN sister agencies	Existing partnerships (UNCDF in Burkina Faso and The Gambia; UNOPS in Burkina Faso, Mali, and Niger; and UNICEF WFP, and WHO in Mali) and new partnerships (UNHCR and/or IOM) will be leveraged for interventions related to displaced populations.
UNISS Task Team on Renewable Energy	Building and strengthening UN partnerships.
UNV	Core of the volunteerism component of planned interventions.
The private sector (such as leading industry associations including AMDA, ARE, and GOGLA)	Key to project partnerships through financing and capacity building.
UNDP COs and other UNDP units and hubs (such as the Resilience Hub and Finance Hub)	Contribute monetary and or in-kind resources and serve as entry points to bilateral and multilateral partners.
National governments including Ministries of Energy and other relevant entities such as ministries in charge of environment, planning, finance, and statistics.	Main owners of project activities at the country level playing a central role in planning, implementation, coordination, evaluation and sustaining the results.
Regional bodies including AU, ECOWAS/ECREEE, and G5 Sahel	Targeting cross-border regions and playing a role in implementation.
Multilateral and bilateral development institutions including the EU and its member states, etc.	Co-design specific initiatives to fund.
Decentralized authorities such as municipalities or cross-border authorities (Liptako-Gourma Authority, Lake Chad Basin Commission)	Target remote, vulnerable communities in regions where the central governments have limited access and strengthen local ownership of the project.

Funding for the Regional Off-Grid Electricity Access Project (ROGEAP) received an increase of $22.5 million from the World Bank. The main objective of this project in the Sahel is not only to accelerate the deployment of stand-alone and off-grid solutions but also to advance solar market expansion in a unified effort to propel electricity access forward. Beyond accelerating deployment, the project will provide grants and credits for off-grid solar home systems as well as coordinate the set-up of relevant policies and standards paving the way for a prosperous and sustainable regional solar market.

Leaving No One Behind Requires Incentives, Not Just Subsidies

Achieving universal access in the Sahel requires incentives that spur commercial investments, not just temporary subsidies that could distort markets. With the right mix of smart incentives tied to milestones like new connections or kilowatt hours of renewable energy delivered, companies can profitably expand pay-as-you-go solar and mini-grids to rural villages while subsidies focus on those in most need. This approach will help close the gender energy gap and bridge the rural-urban divide in energy access and affordability. Sahelian governments should set up investment facilities that de-risk lending to decentralized players while streamlining licensing. Development partners can provide working capital loans via local financial institutions to support inventory and receivables, while impact-focused investors must structure innovative instruments like enterprise challenge funds.

Mali's initiatives to scale up renewable energy programs consists of ensuring gender expertise and applying a gender perspective in all project activities with a view to reduce disparities in access to resources, decision making, autonomy and voice, including participatory procedures. Key projects being implemented aim to include gender indicators as outcomes to empower women.

The government of Niger plans to create financial support programs that balance the necessity of ensuring the commercial sustainability of service providers with the goal of safeguarding customers from

elevated tariffs. Solar home systems constitute a key element of Niger's National Electrification Strategy (NES) and are particularly crucial for advancing rural electrification initiatives in the country. The predominant approach in current field implementations often adheres to a model driven by donors and the government, typically entailing subsidies for assets and an operator seeking to recoup only a portion of the initial capital costs, either through kilowatt-hour invoicing or a fixed charge.[122]

There are unique barriers specific to expanding electricity in rural communities in the Sahel. More so than in urban areas, rural areas have low demand density due to more sparse communities and high insecurity of payments.[123] These characteristics make it more difficult to attract private sector investment due to high risk and has made it difficult for the public sector to divert sufficient resources necessary for energy infrastructure in these areas. In order to overcome these barriers, governments need effective and agile leadership, dedication of national budget priorities, and cross-sector subsidies for different electricity customers and low interest rates on loans to state utilities.[124] Framing the issue around increasing agricultural yields could be an effective way to attract partners and increase local incomes and resources.[125] To do so, governments, development partners, and commercial partners should invest in enhanced data and modeling that evaluates what areas would benefit from the expansion of the national grid versus the development of decentralized solutions which could be tied to agricultural production in order to attract private sector partners.[126]

Development partners can help finance these projects together with countries. For example, the Agence Française de Development partnered with the Malian government to finance a project that converts thermal power plants to hybrid (solar and thermal) production and expands the mini-grids connected to them to provide reliable and permanent electricity to around 156,000 people in rural villages.[127] In the long term, governments should focus on expanding electrification through decentralized renewables-based solutions. In Mali, the southwest region alone has 53 gigawatt of solar potential which could meet the whole country's power demand.[128]

Garnering Sustained Political Commitment: An Alignment between National Policy Objectives and Programmatic Initiatives Being Implemented

Garnering ongoing high-level political commitment requires closing gaps between ambitious national policies and actual initiatives implemented on-ground. Without visible demonstrations that policy priorities like expanding off-grid solar or funding hydro plants translate into households getting connections, trust in government commitment erodes. Sahelian governments need to task relevant ministries, departments and agencies with tracking policy priorities against spending allocations and community-level energy access data while providing public dashboards; civil society should conduct citizen surveys and budget expenditure analyses feeding into oversight; and development partners can fund independent evaluators assessing rural connectivity against national electrification targets.

122 https://www.usaid.gov/sites/default/files/2022-05/PAOP-Niger-MarketAssessment-Final_508.pdf
123 https://iopscience.iop.org/article/10.1088/2634-4505/ac3017/meta
124 https://edoc.vifapol.de/opus/volltexte/2013/4677/pdf/fv_2013_03_elayo_en.pdf
125 https://iopscience.iop.org/article/10.1088/2634-4505/ac3017/meta
126 https://iopscience.iop.org/article/10.1088/2634-4505/ac3017/pdf
127 https://www.afd.fr/en/actualites/access-energy-sahel-five-afd-actions
128 https://www.irena.org/news/articles/2022/May/The-Big-Impact-of-Mini-Grids-in-Malis-Rural-Areas

Mauritania's Climate Policy Commitments in the NDCs aim to assess the accessibility of renewable energies and green hydrogen, as well as to revise legislation and legal frameworks to incentivize clean energy production and enhance energy efficiency.

Mauritania's revised NDC aims for an 11% economy-wide reduction in greenhouse gas emissions by 2030 compared to business as usual. The strategy focuses on tapping into national clean energy potential through green hydrogen, solar, and wind projects, with an estimated cost of $34.25 billion. A portion, $0.63 billion, is committed unconditionally from the country's resources.[129]

Development partners such as the IEA have developed public dashboards that can be used to track government energy spending in the Sahel.

Advancing Regulatory Frameworks

National governments in the Sahel should work together to align their regulatory framework and trade ecosystem toward greater regional integration. Regional integration efforts help harness and scale domestic energy resources and production. By continuing to integrate, countries such as Mauritania, for example, can leverage its wind energy resources to increase revenues from exporting its surplus and help achieve economies of scale that reduce costs and reduce import dependency for the region.[130] Regional integration also helps reduce the market risk faced by independent power producers because the accessible market is bigger and helps improve the financial sustainability of national utilities.[131] To promote deeper integration, countries, such as Mauritania in this case, should align their regulatory framework to integrate electricity markets, adopt standardized templates for bilateral electricity trade, and update power sector plans with export and import options in the region considered.[132] For the countries connected in the WAPP, establishing commercial and operating frameworks that financially strengthen utilities will be key to honor payment obligations within the envisioned regional power trade.[133]

For Chad, which is not part of or connected to the WAPP, strengthening regional integration will be key to develop an interconnector with Cameroon which will lead to lower import costs and cleaner hydro-based generation while significantly expanding its grid.[134] Chad should put in place a legal and regulatory framework that enables the national utility (SNE) to recover its efficient costs.[135] This framework should require competitive procurement of generation projects. This can help support imports from Cameroon while helping to attract private sector participation that can ultimately help Chad harness its natural solar energy resources to one day become an exporter to Cameroon during daytime hours.[136]

Balancing Energy and Development Investments

As seen through the comparison of the Balanced Green Growth pathway to other alternative futures, it is clear that investments in development priorities directly will also be critical in the short and long term to accelerate progress in the Sahel. Investing in energy production alone will not be enough to achieve sustainable development goals nor pull the region out of the complex cycle of fragility.

This HDR has made the case that the time is now for action given the current window of opportunity that exists for making energy and other development investments. While opportunities abound, there is

129 https://www.imf.org/en/Publications/CR/Issues/2023/02/03/Islamic-Republic-of-Mauritania-2022-Article-IV-Consultation-and-Request-for-42-Month-529136
130 https://www.coalition-sahel.org/wp-content/uploads/2023/04/P1773430dc79a10c09f600cf2ac1e0e9f3.pdf
131 https://www.coalition-sahel.org/wp-content/uploads/2023/04/P1773430dc79a10c09f600cf2ac1e0e9f3.pdf
132 https://www.coalition-sahel.org/wp-content/uploads/2023/04/P1773430dc79a10c09f600cf2ac1e0e9f3.pdf
133 https://openknowledge.worldbank.org/server/api/core/bitstreams/197f07e0-d3ec-48bc-9d52-38d551d5d312/content
134 https://www.coalition-sahel.org/wp-content/uploads/2023/04/P1773430dc79a10c09f600cf2ac1e0e9f3.pdf
135 https://www.coalition-sahel.org/wp-content/uploads/2023/04/P1773430dc79a10c09f600cf2ac1e0e9f3.pdf
136 https://www.coalition-sahel.org/wp-content/uploads/2023/04/P1773430dc79a10c09f600cf2ac1e0e9f3.pdf

also an overarching sense of urgency – inaction would be even more costly for the Sahel. Climate change alone poses a huge threat for the Sahel – one that is unjust and unfair for a region that has contributed minimally to the problem. A recent World Bank study forecasted that if the G5 Sahel countries have zero adaptation policies or investments in place, climate shocks alone could lead to 13.5 million more people falling into poverty with disproportionate effects on rural and border communities in these five countries alone.[137] These risks make it clear that by investing in development, the Sahel is also indirectly investing in climate adaptation. Adaptation needs to include strong safety nets, poverty reduction policies, health and education improvements, and policies targeting vulnerable groups that are disproportionately affected by climate and other risks.

The Balanced Green Growth pathway proposes that countries invest in diversifying the energy mix while also using the tradeoffs generated from leveraging oil and gas in the long term to finance key development priorities. While there is a vast array of priority areas that could use investment, this model focuses on agriculture, education, environment, women's empowerment, modern cooking, food insecurity, water and sanitation, and income inequality. These areas touch on a wide array of development issues that have positive, reinforcing implications. For example, by improving agricultural yields, food insecurity is reduced, jobs are created, incomes rise, and women can be empowered through greater economic inclusion. These priorities are deeply interconnected making each investment even more impactful if these relationships are considered.

Because the BGG pathway minimizes tradeoffs in terms of government expenditure, there is potential for increased public investment and private investment that can be directed toward these priorities. The projections from the BGG pathway predict that investing in energy in a balanced way that reduces trade-offs will allow the fiscal space for Sahel countries and development partners to simultaneously invest in these key development areas.

Synergies between energy, human development and the SDGs: Improving water and sanitation access has clear synergies with other development priorities. Reducing water contamination through expanded accessible sanitation infrastructure reduces the prevalence of water-borne diseases such as cholera, schistosomiasis, and diarrheal diseases, improving overall health, while also reducing water waste in scarce environments. Climate change exacerbates risks as higher temperatures host a higher concentration of algae and bacteria in water.[138] Growing populations and urbanization rates make water and sanitation a critical investment now to improve operational efficiency, reduce costs, maximize resources, and increase resilience.[139] Improving access to clean water also reduces the time spent collecting water, with positive effects for women and girls who have more time for education or participation in economic and social activities and could be more involved in water management decisions. Improving water access is also critical for reducing conflicts that arise due to food and water scarcity. There are also synergies with renewable energy such as solar power. Solar power can be used for irrigation pumping which can be incredibly useful for small-scale producers.

Yet meeting the goals set out in the BGG pathway for these priority areas will still take a huge, concerted effort for both Sahelian countries themselves and for development partners to deliver. The Sahel countries and the wide landscape of development partners must scale up their efforts in these policy areas to maximize the impact of existing resources while accelerating the mobilization of more resources. These recommendations are practical and achievable if actors move together with a sense of urgency to propel the Sahel into a new future – one that will improve livelihoods and deliver on sustainable development goals.

137 https://openknowledge.worldbank.org/server/api/core/bitstreams/197f07e0-d3ec-48bc-9d52-38d551d5d312/content
138 https://openknowledge.worldbank.org/server/api/core/bitstreams/197f07e0-d3ec-48bc-9d52-38d551d5d312/content
139 https://openknowledge.worldbank.org/server/api/core/bitstreams/197f07e0-d3ec-48bc-9d52-38d551d5d312/content

CHAPTER

6

Political Economy Considerations for Successful Implementation and Transformative Outcomes in the Sahel

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Political Economy Considerations for Successful Implementation and Transformative Outcomes in the Sahel

This HDR has shown that the time is right for the Sahel to adopt a new policy which will help leverage energy for development: The problem, policies, and politics are aligned, and we have a window of opportunity to bring forward a new pathway based on a Balanced Green Growth investment approach. This chapter discusses the final stream – the politics – sharing a way forward for successful implementation of the recommendations, taking into account the context of the drivers of successful policy implementation based on the context of various countries. Each country and the region overall face their own unique considerations when it comes to the political economy which impact the ability to successfully implement policies such as the Balanced Green Growth investment approach. By understanding these unique contexts, countries and the region will have a stronger sense of what can be done to drive successful implementation of the HDR's recommendations. The considerations discussed in this conclusion will help guide policymakers and international players to maximize their impact and realize long awaited energy and development goals. Providing this analysis helps ground the recommendations included in the HDR in the reality of the Sahel and provides a pathway forward for turning recommendations into outcomes.

The Sahel is a unique and complex region in terms of the political economy. The 10 countries examined in this HDR have both similarities and differences when it comes to the economic and political power dynamics at play. This HDR argues that the time is right for action across the Sahel toward a balanced energy and development investment approach to be implemented. Yet how this approach can be implemented will likely look different in each country depending on their specific contexts. For example, countries that are facing security and fragility issues will require much more than just the acquisition of resources to be able to implement the energy and other development recommendations included in this HDR. By diving into two specific dynamics that was developed originally in the Matland model and further adapted by Signé[140,141] – policy conflict and policy ambiguity – this concluding chapter helps expand on the way forward for countries in various contexts which allows them to achieve both energy and development goals.

Policy Conflict

According to the model, policy conflict increases when there are disputes or incompatibilities between different players over the objectives or plans around an issue (Matland, 1995). This policy conflict intensifies when the stakes are higher for different players. This is important because depending on the different levels of policy conflict, there are different conflict resolution mechanisms that will be most effective. For example, low levels of policy conflict could be resolved through problem solving or persuasion, while higher levels of policy conflict may lead to bargaining or coercion in order to be resolved. In terms of an energy transition, policy conflict can exist if there are conflicting views on when and how to implement an energy transition amongst country leadership, if there are opposing views between different players such as oil and gas companies versus renewables, or if there is political conflict that leads to incongruence or inability to carry out policy changes or the continuance of policy goals.

Policy Ambiguity

Policy ambiguity, the second dimension of the model, is characterized by the ambiguity of goals and the ambiguity of means (Matland, 1995). Ambiguity of goals is the misunderstanding or uncertainty of policy goals which leads to implementation failure. Ambiguity of means is the misunderstanding or uncertainty of how to reach the policy goal and is often seen in cases where the necessary technology to reach the goal is insufficient or unavailable, the roles

140 The Matland model, originally published in 1995, describes how the factors needed for successful implementation of a policy are varyingly dependent on two characteristics – the level of policy ambiguity and policy conflict. Matland describes four paradigms based on these two characteristics (low policy ambiguity and low policy conflict; high policy ambiguity and high policy conflict; etc.). This model was later adapted by Signé in 2014 to include details on the types of factors needed for each paradigm for the successful implementation of a policy.

141 https://www.policycenter.ma/sites/default/files/OCPPC-PB1623.pdf

of different players in reaching a policy goal are unclear, or when the complex environment makes it difficult for players to act or leverage tools or financing opportunities to reach a policy goal. For the Sahel in the context of energy transitions, policy ambiguity can vary and likely rises due to a lack of infrastructure, technology, or finance available to implement policy goals, the overall ambiguity of the problem and goals, or the lack of coordination nationally across players.

Four Categories

Through the lens of policy conflict and policy ambiguity, it is possible to better understand the unique political economy situation taking place in each country in the Sahel. The four potential scenarios are based on the level of policy conflict and policy ambiguity and describe what factor is likely to be the most important with the most influence on overcoming implementation barriers. For example, if policy conflict and policy ambiguity are low, successful implementation is administrative, and the most important factor for overcoming implementation challenges is the availability of resources. Comparatively, if policy conflict and policy ambiguity are high, implementation is symbolic, and the most important factor would be the coalition strength, translated into the capacity of diverse stakeholders dedicated to achieving specific policy goals to mobilize and implement their preferences. Using this model, we will be able to dive into the specific characteristics of each Sahel country and for the region as a whole and recommend actions for overcoming implementation barriers so that the recommendations included in this report are actionable and realistic given each country's specific context. As each section shows, even within each category, there are variations in the level of policy conflict and ambiguity. Countries can also move between categories over time due to internal or external shocks. This means that priorities can change over time for how to best overcome implementation challenges. The following grouping is a helpful framework to think about the political economy factors that are at play and address the barriers to successful policy implementation of BGG in the Sahel.

Administrative Implementation: Low Policy Ambiguity and Low Policy Conflict

The first category is a group of countries with low policy ambiguity and low policy conflict. Low policy ambiguity in this context means that the solution seems clear and the goals and means (technology) are known. Low level of policy conflict means that the players involved in this issue (political leaders, utilities, private sector, etc.) are stable over time, meaning that the outside environment and context has little influence on the policy implementation progress. In this context, the most important factors for overcoming implementation barriers are the availability of resources, motivation, learning, staff competency, and processes.

A key goal for the countries that fall into this description is to ensure the sustainability and continuance of resources, to strengthen monitoring, to continue to ensure coordination, and to efficiently plan the different stages of implementation. Despite having low levels of both ambiguity and conflict, this category still requires substantial efforts in mobilizing these resources in order to successfully implement and achieve outcomes.

To meet both energy and development goals, the countries in this category will need to focus on ensuring the acquisition of resources and making sure that financing can be sustained in the long term for their energy and development goals. This will require significant coordination but will be critical for implementation success. To do so, each country will need to examine their financial resources and create a strategy for which financial actors to approach and how. In addition to financial resources, this category of countries should focus on maintaining motivation for the energy transition through greater coordination of government ministries and outside stakeholders while also increasing training for the public and private sector on renewable energy technologies.

Nigeria and Senegal are two countries that have the lowest levels of both conflict and ambiguity. Both countries are relatively stable democracies, and the various actors seem aligned (low policy conflict), while the way forward seems clear (low ambiguity). Nigeria and Senegal are two of the three countries in the Sahel classified as a democracy by the Polity Score, and both score higher than the others on the

Mo Ibrahim Index of African governance which assesses governance performance over the past 10 years. This score is important as it indicates the overall stability which also helps to lower policy conflict. Policy ambiguity is low in the two countries as well given their current plan and commitments around energy. Nigeria and Senegal also both have some of the highest rates of electricity (59.5% and 68% respectively) in the Sahel.

Senegal

Senegal outperforms the rest of the Sahel countries across the World Governance Indicators, especially in Government Effectiveness which is critical for implementation as it measures the perceptions of the quality of public services, the independence from political pressures, and perhaps most importantly, the quality of policy formulation and implementation. Senegal also outperforms the rest of the countries in the Sahel on the Fragile State Index, which is key for keeping policy conflict low, at the very least by reducing external conflict that makes it impossible to implement any policies at all.

Senegal is also experiencing support outside of the government's actions for attracting climate finance and strengthening climate commitments. Civil society and grassroots organizations such as the Dynamique pour une Transition Agroécologique au Sénégal (DyTAES), a multisector platform that advocates for climate resilient agricultural policies, are in alignment with reaching development and environment goals which reduce conflict.[142] Senegal also has a National Committee on Climate Change which coordinates climate action[143] in the country, ensuring that there is coordination among players which helps to reduce policy ambiguity. Furthermore, Senegal has the Senegal Emerging Plan which is a five-year action plan for development. The current plan through 2023 includes a focus on developing oil and gas while limiting emissions to be in line with the country's NDC.[144]

Funding remains a challenge for Senegal which, despite making progress in attracting international support, still needs more sufficient funding. Senegal relies on international climate finance to achieve its NDC including both bilateral and multilateral partnerships such as the World Bank's Global Climate Fund and Global Environment Fund, which are some of the implementing entities of the United Nations Framework Convention on Climate Change (UNFCCC).[145] In the past, Senegal has struggled to implement adaptation priorities including, for example, its National Action Programme on Adaptation (NAPA), primarily because of inadequate funding mechanisms (NAPA's estimated implementation cost was $30 million, but only $3 million was mobilized).[146]

Nigeria

Nigeria fits in this category primarily because of its overall alignment and coordination toward an energy transition. Nigeria's government has been working on the Medium-Term Economic Growth Accelerator Plan 2021-2024 which includes a focus on new tax incentives for infrastructure and capital market.[147]

Although Nigeria fits in this category, when considering development and energy, there are considerable external risks that could increase policy conflict, the main one being that fragility is high in Nigeria. Nigeria ranks 14th in the world on the Fragile States Index and faces some of the highest compound fragility-climate risks in the world.[148] These climate risks contribute to food insecurity, land conflicts, and overall instability that feeds into a loop of fragility and climate concerns. The Global Terrorism Index, which measures the impact of terrorism, is also high even compared to other countries in the Sahel. This reality presents a major barrier and threat to stability.

Similar to Senegal, Nigeria has made progress in terms of developing plans and government policies for the energy sector over the years such as the National Energy Policy in 2003, the National Energy Master Plan in 2007, the National Gas Policy and Master Plan Electric Power Sector Reform in 2005, the Power Sector Reforms Roadmap in 2010, the Biofuel Policy in 2007, and the Petroleum Act of 1969.[149] Yet despite having well-intentioned plans, implementation remains a challenge.

142 https://climateactiontracker.org/publications/climate-governance-in-senegal/
143 https://climateactiontracker.org/publications/climate-governance-in-senegal/
144 https://climateactiontracker.org/publications/climate-governance-in-senegal/
145 https://www.bu.edu/pardeeschool/files/2016/11/RE-NDC-Africa_Final.pdf.pdf
146 https://idl-bnc-idrc.dspacedirect.org/server/api/core/bitstreams/e7bdb55b-3c85-4902-ac03-3b6ff445046a/content
147 https://africandchub.org/sites/default/files/2021-06/NIGERIA%20Scoping%20Study_05.03.pdf
148 https://eprints.lse.ac.uk/111549/1/Sacchetto_priorities_for_renewable_energy_investment_published.pdf
149 https://www.se4all-africa.org/fileadmin/uploads/se4all/Documents/Country_RAGAs/Nigeria_RAGA_EN_Released.pdf

The Gambia is the third country that could fall into this category of low policy conflict and low ambiguity. The country has embedded the SDGs into a comprehensive Green Recovery National Development Plan 2023-2027, and the country is in alignment that electricity needs to be expanded and renewable energy production, while underexploited, should be prioritized in the long term. Overall political conflict is also lower than other countries in the region given the newly stabilized government. Compared to Nigeria and Senegal, the Gambia could be classified with higher policy ambiguity and conflict, but still maintains a relatively low level making the recommendations for resource infusion critical.

Since these three countries seem to have low policy ambiguity and low policy conflict, they should focus on factors related to resource mobilization, including financial resources, but also human capital and technical resources. Inadequate resources stand in the way of the goal and outcome as long as these two factors remain low.

Senegal and Nigeria should develop and enhance their resource mobilization strategy for funding its NDC. Senegal has a strong mobilization of international climate finance strategy; however, it could work on strengthening its domestic climate finance mobilization strategy. This includes coordinating the domestic budget with climate goals and considerations which will require more resources. Training sessions for private companies on how to attract climate finance could be a useful tool which could be done in coordination with the National Committee on Climate Change utilizing accredited entities such as the Centre for Ecological Monitoring (CSE) and the La Banque Agricole.[150]

Nigeria's Energy Transition Plan estimates that $410 billion in incremental funding is needed between 2021-2060 which is about $10 billion above annual investments each year split evenly between the public and private sectors.[151] Nigeria's government budget cannot keep pace with the need, and therefore the country will require significant outside resources to bridge the financial gap. Nigeria's financial industry is impressive compared to other Sahel countries with a wide range of players (impact investors, private equity, fund managers, transaction and accounting firms, pension funds, insurance companies and law firms, sovereign wealth fund, stock exchange, securities and exchange commission).[152] Opportunities abound for the private sector as sustainable investment in Nigeria is estimated to be $92 billion annually until 2030 in areas such as renewable energy, agriculture and land use, healthcare, education and transport.[153] Significant opportunities exist in infrastructure services as well, such as water, waste, sanitation, and transport by 2050. Technical support can help assist previous interventions that have stalled, such as the public-private partnership on grid renewable energy projects and gas flare commercialization projects.[154]

Enhanced coordination and continual renewal of plans will be key to make sure that all the stakeholders are heard and aligned with the long-term goals of a balanced investment path similar to the BGG path and to ensure that policy conflict and policy ambiguity remain low. Senegal's discovery of oil and gas could be a potential challenge if players are not aligned. So far, Senegal has done well at increasing its renewable energy production, but this discovery has the potential to dilute the willingness of political players or the oil and gas industry players to transition toward more renewable energy which could increase both policy conflict and ambiguity. Overall, a comprehensive and unified framework will help streamline progress, reduce overlaps, and attract sustainable finance. Focusing on resources will help Senegal move from stated goals to tangible outcomes.

For Nigeria, this continual renewal of plans also includes focusing on strategic climate diplomacy with its international finance partners. As the finance players are shifting toward a reduction in the financing of

150 https://idl-bnc-idrc.dspacedirect.org/server/api/core/bitstreams/e7bdb55b-3c85-4902-ac03-3b6ff445046a/content

151 https://www.brookings.edu/articles/delivering-nigerias-green-transition/

152 https://africandchub.org/sites/default/files/2021-06/NIGERIA%20Scoping%20Study_05.03.pdf

153 https://africandchub.org/sites/default/files/2021-06/NIGERIA%20Scoping%20Study_05.03.pdf

154 https://afripoli.org/nigerias-energy-transitions-in-a-political-transition#:~:text=Nigeria%20nevertheless%20proposed%20an%20ETP,above%20resolving%20Nigeria's%20economic%20crisis

new oil and, notably, gas projects, Nigeria will need to be strategic about how to approach financiers and how to allocate its own resources toward leveraging its oil and gas reserves while still reducing dependency through diversification. The European Union, for example, is one of Nigeria's largest development partners but they have some of the strictest policies against financing new fossil-fuel investments. Climate diplomacy can help Nigeria present the use of oil and gas as an enabler for development in the short term while backing it up with progress toward emissions reductions to build the best possible position for accessing capital.

Nigeria and Senegal also need to focus on acquiring resources specifically for developing human capital that can develop and deploy the technology needed for the energy transition. This is one piece of the puzzle for mobilizing appropriate technologies.[155]

These recommendations shed light on the specific drivers that can help accelerate and ensure the successful implementation of the HDR's energy and development recommendations in this specific political economy context. These countries will need to work to maintain low policy ambiguity and low policy conflict so they can continue focusing on leveraging resources.

Symbolic Implementation: High Policy Ambiguity and High Policy Conflict

The second category is a set of countries that are characterized by high policy ambiguity and high policy conflict. This means that the goal and means of a policy are unclear and the players disagree or are being influenced by external conflict or competing priorities. Policies then often become symbolic and focus on values rather than actual implementation. The high ambiguity makes the goal unclear or abstract, which can fuel conflict when players try to impose their own interpretation or vision for a way forward. When multiple players conflict with one another, different coalitions are likely to form. This high conflict leads to coercion and bargaining as the main forms of resolution rather than problem solving. The process is likely to be highly political but dominated by local actors (Matland, 1994). In this context, the most important factor for implementation is the strength of the coalition on the local level, including strengthening democracy and building capacity.

Perhaps the most relevant example of local context influencing the strength of a coalition and therefore the increase in policy conflict is when there is fragility, violence, or other instability. Countries that are facing conflict in terms of war, violence, terrorism, or nondemocratic changes in government are facing policy conflict, as a lack of stability makes it impossible to have alignment in policy goals or in political will. In this context, countries with high external conflict face an even greater multitude of short-term challenges, reducing the ability for any coordinated long-term implementation plan.

In the context of energy and development, this combination of factors can happen when the goal is unclear and there is disagreement over how and what to do when it comes to development and energy, especially in the context of pressing security challenges.

Five countries currently fall into this category: Niger, Burkina Faso, Chad, Guinea and Mali. These countries have high policy conflict because they are all dealing with transition governments in a highly political environment, causing political instability. All four will face challenges when preparing for the next election. These countries are also facing policy ambiguity because they are faced with other priorities that are taking away from the urgency or the agreement on the energy transition and development policies. All four are also focused primarily on security issues given their current contexts. This contributes to ambiguity over what actions, if any, should and could be taken concurrently related to energy and development. These countries likely move across the spectrum of policy ambiguity because they do have renewable energy plans and NDCs, but the ambiguity rises when there are predominant issues that take over the ability to focus on any other policy priority besides conflict reduction and attempting to exit the cycle of fragility.

155 https://www.sciencedirect.com/science/article/pii/S1364032117303544#s0020

Niger

Niger is one of the countries that falls into the high ambiguity and high conflict category. Niger's ongoing external conflict is driving the policy conflict up. It experienced its record year of violence measured by fatalities in 2021[156] and recently faced an undemocratic transition of power in 2023 which has created conflict within the country but also with key stakeholders and partners including ECOWAS, the EU, the United States, and France who condemned the transition. These conflicts could lead to suspended development aid which would heighten conflict and ambiguity as the means for implementing energy and development goals would be significantly impacted.

Policy ambiguity is also high because of the low levels of development in Niger that make it one of the least developed countries in Africa. Its low levels of education and health and high levels of poverty make it a complex task to approach development. It will take significant effort to bring policy ambiguity down but communicating the benefits of BGG in terms of the potential for an improved development trajectory to relevant stakeholders could act as a first step.

Mali

Policy ambiguity and policy conflict are both high in Mali. Implementation of energy and development goals has been successful at times, but still lags given Mali's low HDI score and electricity access. Electrification rates are vastly different between the southern, more urban areas, which have an electrification rate of about 80%, and the northern, more rural areas, where rates are lower than 2%. This is a representation of the inequality that has fueled conflicts in the past which has led to high policy conflict and high ambiguity.

The peace agreement in 2015 specified efforts to increase electrification rates in the north and proposed investment in solar energy as a pathway forward. Unfortunately, implementation was slow due to political instability and the nondemocratic transition in power. Increasing access in the north has also been difficult to achieve due to the armed groups that have often controlled the fuel supply chains in the area.[157] As of 2021, Mali scored the worst out of the Sahel countries in an indicator for Political Stability and absence of Violence/Terrorism and the second to last in Government Effectiveness. Among Sahel countries, Mali has one of the worst scores on the Fragility Index (the only one below Mali is Chad) which presents the importance for Mali to work toward exiting the fragility cycle.

In terms of ambiguity, Mali does have and historically has had plans and strategies laid out for sustainable development and for renewable energy production. Multiple ministries have mandates related to the energy sector, and the country has multiple NGOs active in the energy sector as well.[158] Yet given the instability and violence, Mali is focusing on improving security and stability meaning there is high ambiguity about the role of an energy transition. This ambiguity creates barriers for the private sector and for financing as investors and international partners are also unsure about the future plans given the immediate security crises.

156 https://acleddata.com/2023/08/03/fact-sheet-military-coup-in-niger/
157 https://www.stimson.org/wp-content/uploads/2021/06/Stimson_FinalRelease_June25.pdf
158 https://www.afdb.org/fileadmin/uploads/afdb/Documents/Generic-Documents/Profil_ER_Mal_Web_light.pdf

Burkina Faso

Burkina Faso is part of the category of countries with high policy conflict and high policy ambiguity. Burkina Faso has robust policy frameworks dedicated to mainstreaming climate action as well as various strategies related to reaching their ambitious NDC and increasing its electricity access and renewable energy production.[159] It has also been praised as one of few countries in West Africa to integrate gender considerations within each line of its national budget.[160] Yet political conflict as well as violence and terrorism (Burkina Faso ranks second in the world on the Global Terrorism Index) have threatened the implementation of these plans. The electricity rate is also quite low, at 19% as of 2021, which means there is significant work needed to expand energy access. The violence and competing priorities have increased policy ambiguity and policy conflict over time. Unstable leadership has made the path forward unclear for the country and for development actors and has made the goal unclear because of the desperate need to address security. The government has struggled to address overlapping crises of security and human rights which subsequently contributed to demonstrations and two coups d'états in nine months in 2022.[161] Both leaders in the coups said that their focus would be on addressing the security crisis which has continued to deteriorate.[162]

Like the other countries in the region, resources will be important for implementing the balanced energy and development investments, but other drivers will also be critical given the current context of high ambiguity and high conflict.

Guinea

Guinea also falls into the category of high policy conflict and high policy ambiguity. Guinea has experienced challenges with adapting its NDC on the local level, mobilizing resources for awareness raising and technical assistance around its NDC, and engaging stakeholders in climate expertise.[163]

Policy conflict is also high as the country has a transitional government as well and has suffered from poor governance. The current timeline is that the country could return to civilian rule in late 2024 which could be a turning point for political stability if done smoothly.

159 https://www.climatepolicyinitiative.org/wp-content/uploads/2022/10/Landscape-of-Climate-Finance-in-Burkina-Faso.pdf

160 https://www.climatepolicyinitiative.org/wp-content/uploads/2022/10/Landscape-of-Climate-Finance-in-Burkina-Faso.pdf

161 https://www.hrw.org/world-report/2022/country-chapters/burkina-faso

162 https://africacenter.org/spotlight/understanding-burkina-faso-latest-coup/

163 https://www.expertisefrance.fr/documents/20182/703453/Stories+of+NDCs+in+West+Africa+-N%C2%B002-2022-ConcertationNDCs+%26+Covid19/2ce047b7-6320-dfb9-33ca-b4a6e68ee7e7

Chad

Chad is the final country that fits into this combination of high policy conflict and high policy ambiguity. Chad has the lowest rates of electricity in the Sahel, has the lowest governance score on the Mo Ibrahim Index of African Governance, and performs the worst on the Fragile State Index. Chad also has the lowest HDI score out of the Sahel countries and faces an abundance of energy and development priorities and challenges. These challenges increase political conflict because of the competing priorities. This conflict also increases because of external conflict similar to the other countries in this category. Regional terrorist groups threaten border areas, and political instability has increased after the longtime president died in 2021 and a transitional government has been in place ever since.[164] The country announced its plan to double its army size in 2021 to deal with security challenges which have increased defense spending.[165]

In terms of policy ambiguity, Chad has indicated that they plan to increase renewable energy, given their high potential, in order to increase electricity for rural areas by 2030. Energy costs are the highest in the world for households, and rural households use mostly wood energy. Going forward, Chad has partnered with Power Africa, lending millions for a solar power project, and the country hopes to continue to expand such partnerships. Yet challenges remain, especially due to its high dependency on oil and its lack of infrastructure and technologies which increases policy ambiguity by making it unclear how such goals will be implemented.

Given the unique political economy situations in these five countries, it is clear that they will need more than just resources to be able to implement the balanced investment approach. Resources will always be a key factor that should be prioritized, but these countries and partners should consider complementing resources with the following recommendations to overcome implementation challenges. To move forward with the implementation of the energy and development plans suggested in this HDR, countries in this context should focus on ensuring that conflict and security are addressed, transitions of power are smooth, and that the current and future leaderships understand the problem, show demonstrable commitment to the solution, and use incentives to demonstrate the importance of the policies.

These countries and international partners should commit support to ensure a peaceful and democratic transition of power so that leaders can start building a strong coalition that recognizes the long-term security gains of investing in energy and development. It will be critical for these countries and international players to ensure that post-transition leaders act in their national interest and embody accountable governance and ethics. This commitment to democratic principles will help maintain relationships with key financers going forward. Key allies should be identified as champions for democracy and for the commitment to making real development gains. This will help build stable internal political alliances. For example, in Chad, the overall political environment has created intense mistrust and a climate of uncertainty which has detrimental effects on implementation efforts. International players can be more assertive in supporting democracy and good governance in the country by putting pressure on the transitional government to ensure freedom of expression and civic space for the upcoming elections.

Each country in this category is facing an upcoming election that will, in theory, end the transitional government's rule. In Niger, the transitional government has stated that the transition period will last less than three years (until 2026), while Mali, Burkina Faso, Guinea, and Chad are set to have elections in 2024. Trust, motivation, and commitment to the solution will be critical going forward for future leaders.

International stakeholders and national governments must prioritize stability and security in order to bring policy conflict down. While resources will still be key, it is clear that stability and security must be prioritized in order to reduce conflict and

164 https://crisis24.garda.com/insights-intelligence/intelligence/country-reports/chad

165 https://www.reuters.com/world/africa/chad-plans-double-army-size-deal-with-security-challenges-2021-09-24/

be able to focus on a strategic energy and development future. These countries and their partners must dedicate time and resources toward addressing the root causes of conflict in these countries by improving governance and state capacity and by building a strong coalition which will become stronger with a successful transition of power.

In the midst of a crisis, leaders must build coalition strength through sense making and meaning making in order to create a powerful vision for the future. Leaders must have a sense of what is going on and a sense of urgency as well as the ability to craft a meaningful response to the crisis. It will likely be the charge of the new governments to rebuild trust through a transparent and inclusive process of rebuilding the nation and setting it on track for energy and development goals. Communicating the value of investing in both energy and development will be key so that there is political will and buy-in going forward. By engaging stakeholders and communicating the value of the solution (balanced investment in energy and development), leaders can help reduce policy conflict.

To strengthen its coalition, leaders should focus on multi-stakeholder collaboration and agile governance which will help communicate and instill the importance of taking the balanced pathway. This can include effectively implementing a systematic program aimed at capacity building and training for all stakeholders on issues related to renewable energy[166] while increasing coordination amongst stakeholders. This could include regular stakeholder meetings that guide the implementation of the energy transition policies and the formulation of knowledge assets and products, studies, and methodological tools to facilitate renewable energy investments.[167]

In Burkina Faso, agile governance and multi-stakeholder collaboration could help the country build a regulatory environment that is stable and as independent as possible from political turmoil.[168] Doing so will help strengthen a coalition between the government and the private sector that can be critical in maintaining progress even in the midst of political crises. Increasing multi-stakeholder collaboration, especially in the context of the National Adaptation Plan (NAP) for Burkina Faso, will help close the gap in coordination between the government and the sectoral actors.[169] This will also help reduce policy ambiguity as the strategies and pathways can be communicated effectively and championed effectively.

Leaders should use incentives to demonstrate the importance of the solution. The recommendations included in this HDR and in BGG span both energy investment and development investment in areas such as education and agriculture. These investments can be used as incentives for building a coalition and mobilizing key allies who will benefit from them. Successful regional and national projects should be leveraged, and their benefits communicated clearly in order to strengthen the coalition to advocate for these types of projects and policies. For example, Niger has several electrification initiatives funded by a wide range of international donors, the largest being the Niger Solar Electricity Access Project (NESAP) and the Niger Electricity Access Expansion Project (NEL-ACEP) which are both partnerships between the Government of Niger and the World Bank.[170] NESAP is an example of one project that successfully incentivizes buy-in from stakeholders because of its benefits for agriculture. For example, the project electrifies agricultural production through solar-powered irrigation pumps.[171] These have demonstrated to farmers how investment in energy can enable development gains.

Overall, this combination of high policy ambiguity and high policy conflict makes implementation more complex and requires certain steps forward that include, but are not limited to, the acquisition of resources. The next one to three years will be critical for these countries as they grapple with elections and

166 https://idl-bnc-idrc.dspacedirect.org/server/api/core/bitstreams/e7bdb55b-3c85-4902-ac03-3b6ff445046a/content
167 https://www.afdb.org/fileadmin/uploads/afdb/Documents/Generic-Documents/Profil_ER_Mal_Web_light.pdf
168 https://www.climatepolicyinitiative.org/wp-content/uploads/2022/10/Landscape-of-Climate-Finance-in-Burkina-Faso.pdf
169 https://www.climatepolicyinitiative.org/wp-content/uploads/2022/10/Landscape-of-Climate-Finance-in-Burkina-Faso.pdf
170 https://www.usaid.gov/sites/default/files/2022-05/PAOP-Niger-MarketAssessment-Final_508.pdf,
171 https://www.worldbank.org/en/news/feature/2023/03/16/solar-energy-brings-water-to-niger-farms

transitions of power. Without stable governance, it is difficult to lower policy ambiguity and conflict. As the HDR lays out, there is a pathway forward for the Sahel countries, including these five in this complex category, to use energy as an enabler for development. With these political economy and implementation considerations in mind, it will be possible to move from broad policy goals to tangible results.

Political Implementation: Low Ambiguity and High Conflict

The third category of countries are ones that are characterized by low policy ambiguity but high policy conflict. This combination of factors means that there are clearly defined goals, but the means or the steps to achieve the goals are incompatible among players (Matland, 1995). Therefore, the key factor for how implementation outcomes are decided is power. This factor can come about either by forcing one's will on others or through bargaining. Notably, this combination typically means that the resources to implement a policy are often controlled by actors outside of the main implementers (countries) who might be skeptical or opposed to the goal or means. Power is more important here than administrative implementation because these countries will have to convince the players with resources that they should cooperate with the proposed policy. Implementation is therefore political, and top-down approaches such as strong political direction and sound governance are more likely to be successful.

In the context of energy and development, this could manifest itself through conflicts between resource holders (international partners, multilaterals, regional bodies, etc.) and individual countries. This can be seen through the restrictions and guardrails that financiers have introduced to limit the funding of new fossil fuel investments. Countries that are looking to finance natural gas, for example, will have to bargain and argue their case in order to stand a chance in receiving resources for these types of projects. While power in terms of resources is concentrated in the financing partners rather than the individual countries, these dynamics are constantly evolving as we are seeing with new geopolitical considerations in the wake of the Russia-Ukraine war and as environmental justice is mainstreamed, putting pressure on large economies to contribute more to countries that are facing the brunt of their actions through climate change consequences.

This situation also means that implementation will be highly political. Whoever has the authority to make changes will be the deciding factor on whether or not the energy and development policies are implemented. This means the key drivers for implementation are governance, power, autonomy, and leadership.

Cameroon

Cameroon could be characterized with low policy ambiguity but high policy conflict. This is because Cameroon is relatively aligned on the understanding and urgency in addressing energy transition and development (low ambiguity) but is facing a potential future conflict regarding a power transition (high conflict). This power transition will likely have a large impact on whether these policies are implemented or not. So far, attempts at peace talks and mediation have been unsuccessful. The fractured peace attempts and the hostile political climate both stem from the overall uncertainty the country feels around the future leadership of Cameroon.[172]

International actors should work together to continue to support peace efforts and empower Cameroon's civil society to overcome internal divisions. Cameroon has regional implications when it comes to security and rule of law, and it will be critical for players to work together to make sure that the elections scheduled in 2025 run smoothly and that the country can make decisions in the best interest of the people rather than continued political fighting.[173]

Cameroon and its partners should continue to invest in coordination of its climate goals to prepare

172 https://www.cfr.org/blog/bad-worse-cameroon
173 https://www.cfr.org/blog/bad-worse-cameroon

the next generation of Cameroon leaders after the upcoming election and increase capacity for implementation. This could include the creation and empowerment of regional and district-level technical working groups to coordinate energy initiatives and build synergies among inter-sectoral technical commissions.[174] District working groups would help increase collaboration between the community and the central government's energy centers. This multi-stakeholder approach could help bring in women and youth voices at the program level.

Cameroon and its partners should invest in equipping the government and other stakeholder leaders with agile leadership skills and principles especially as they relate to energy and development.

Cameroon, and other countries that may eventually fall into this category, will need to focus on getting resources but also on these priorities to help reduce policy conflict. Agile leadership will be key.

Experimental Implementation: High Ambiguity and Low Conflict

The final category is low policy conflict combined with high policy ambiguity. This typically happens when there is an alignment on understanding the need to take action from main stakeholders, but the solution itself is unclear. The key factor in this category is context as environmental influences are important when the path forward is unclear. In this scenario, this is likely happening when there is a lack of clarity of the roles of each player or a lack of coordination toward a long-term goal. There may be political will to invest in energy and development, but the goal is unclear, making policies difficult to implement successfully. This unclarity leads to broad goals that are widely accepted but suffer from a lack of clarity in how they should be met. The roles of interested actors are then undefined, often leading to fragmentation.[175]

The drivers for implementation within this category are the contextual conditions, institutional factors, organizational structure, and culture.

Mauritania

Mauritania falls into the category of high policy ambiguity but low policy conflict because of its lack of a coordinated plan for climate adaptation and renewable energy production. While these goals are shared amongst leaders which brings policy conflict down, the goals are too broad and suffer from a lack of detail which can hinder implementation. Political conflict is also lower compared to some of the other Sahel countries, as the country had a peaceful transfer of power in 2019 for the first time since 1960, signaling a departure from its history of military coups.[176]

To reduce ambiguity, Mauritania should continue to prioritize the creation of its National Adaptation Plan in order to have an integrated approach to adaptation with coordination between donors and ministries.[177] Once the NAP process is completed (it began in 2019), Mauritania needs to commit to its implementation and be willing to be agile in its organizational structure. Having a cohesive plan will help attract support from international partners and private investment.

To advance institutional factors, Mauritania should work to improve its institutional and regulatory frameworks for renewable energy deployment. Mauritania should enhance the use of a multi-sectoral committee and a national energy access program in order to bring in the public and private sectors for greater collaboration.[178] The country should focus on creating an enabling regulatory

174 https://www.frontiersin.org/articles/10.3389/frsc.2023.1062482/full
175 https://www.policycenter.ma/sites/default/files/2021-01/OCPPC-PB1623.pdf
176 https://freedomhouse.org/country/mauritania/freedom-world/2022
177 https://www.elibrary.imf.org/view/journals/002/2023/074/article-A002-en.xml
178 https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2015/IRENA_RRA_Mauritania_EN_2015.pdf

environment for renewable energy production, specifically to support the development of green hydrogen.

By clarifying the goals and means to achieve them, countries in this category can move past broad policy goals and statements and toward meaningful action and implementation. This will be a helpful step which will likely have positive spillover effects when it comes to acquiring resources since external partners will also have a clearer picture of the policy goals and actions.

CONCLUSION

The Sahel Human Development Report offers a comprehensive analysis of the region's development challenges, focusing particularly on the intersection of energy development and broader development goals. The report examined three distinct scenarios.

The Current Path scenario continues the region's existing development and energy trends, with a heavy reliance on traditional fossil fuels. The CP scenario forecasts sluggish progress in renewable energy adoption, highlighting the dual challenge of fostering development while addressing climate change impacts. Key projections include a gradual shift from oil to gas, with renewables making a more significant appearance only by 2063. However, challenges in electricity access, especially in rural areas, and increasing carbon emissions are notable concerns. The scenario also projects significant growth in electricity generation capacity, yet per capita electricity production remains low compared to global standards, and universal electrification is not achieved by 2063.

The Renewable Push scenario is an ambitious strategy that emphasizes a rapid transition to renewable energy, prioritizing hydro, solar, and wind power. The RP scenario envisions a substantial increase in solar and wind production, significantly reducing reliance on fossil fuels. However, achieving this requires considerable financial investment and international support. The RP scenario illustrates the trade-offs involved in such a rapid shift, notably in reduced government expenditures on other crucial development sectors like education and health. Despite advancements in renewable energy, the scenario suggests that overemphasis on energy transition without balanced development investments can lead to neglected educational and health outcomes.

The Balanced Green Growth scenario proposes a gradual transition, balancing investments in renewable energy with the use of natural gas as a transitional fuel, alongside various development needs. The BGG scenario aims to achieve a wide array of development outcomes, such as reducing poverty, enhancing access to electricity, and improving educational and health indicators, all within an environmental framework that minimizes spending trade-offs. The scenario is based on a balanced investment approach that includes a mix of renewable energy, natural gas, and other fossil fuels. It also projects a 100% electrification rate by 2050. The BGG pathway is presented as the most viable option, offering a comprehensive strategy that addresses multiple development aspects simultaneously. It is seen as the optimal path for achieving both energy transition and sustainable, long-term development in the Sahel.

The report concludes that the BGG scenario offers the best way forward for the Sahel, reducing the trade-offs involved in the Renewable Push scenario and leveraging synergies for improved holistic development. It underscores the urgency of moving away from the status quo, advocating for a balanced and integrated approach to ramp up investments across various development areas. The Sahel HDR uses these scenarios to highlight the need for strategic decision-making in energy policy and development planning, emphasizing that a multi-faceted approach is essential for the Sahel's sustainable future.

Applying a political economy lens will help move the overall recommendations of this HDR forward for the Sahel as a region. As the HDR explored, there is a window of opportunity for the region to use energy as an enabler for development using a balanced investment approach. In order to successfully implement the recommendations for using this approach, the region and its partners should consider aligning their actions based on the relative complexity of the political economy of the region and of the recommendations.

For example, for policy areas in which we know what the goal is (low ambiguity) and we have political alignment and consensus around the policy (low conflict), actors should be focused on pouring in resources. These areas include renewable energy production and investment, improving agricultural yields, promoting gender empowerment, improving education, expanding water and sanitation access, and leveraging existing regional initiatives and synergies as well as international cooperation initiatives, financing, and synergies. These policy areas and their accompanying recommendations have lower implementation barriers because the solution is clear and the political will to do them is there. International partners and financial institutions should apply their resources to these areas as they provide an opportunity to achieve quick wins. For example, ongoing regional initiatives related to electricity access and renewable energy production already have a clear goal and way forward as well as a willingness to implement from both the

financiers and regional/national leaders. Infusing resources to expand or leverage these and other new initiatives will be an area for quick wins that can have transformative impacts.

Investing in the improvement of agricultural yields and education are also areas where there is low conflict because leaders and financers alike understand the implications and incentives to invest. The policy pathway forward is clear as well in terms of improving primary and secondary education and acquiring skills and technologies that can improve agricultural activities. Actors should pour resources into these areas to maximize impact. Given the positive synergies between energy, development, and security, as demonstrated empirically in this HDR, infusing resources into these "quick win" policy areas will actually help achieve some of the more complex and long-term goals such as reducing fragility and improving governance.

Policy areas that fall into a category that have clearly defined goals (low ambiguity) but disagreement on how to achieve them (high conflict) will require further help in addition to the infusion of resources. Some of these areas include expanding electricity use, curbing climate change and emissions, and creating an enabling environment. These fall into this category because there is an overall consensus on the goals – universal electricity access, lowering emissions in accordance with NDCs and other regional commitments, and attracting capital and investment through an enabling regulatory framework. These goals face implementation challenges because of disagreements on how to reach these goals as seen in the Sahel region due to variations in the countries and due to political instability in some areas that hinder consensus and implementation of regional interventions or polices.

As discussed, in this scenario of low ambiguity and high conflict, in addition to resources, implementation will be driven by power, autonomy, governance, and leadership. In these policy areas, the Sahel as a region and its international partners should improve regional leadership and increase dialogue and collaboration. The Sahel needs significant international cooperation and alignment in order to attract enough resources to achieve universal electricity access, but it also needs alignment with the Sahel country leaderships. Capacity training, knowledge sharing, and leadership development will be key to these issues specifically, especially as countries face new leaderships in the coming years. Overall, actors should focus on developing strong leaders nationally, regionally, and globally who will be able to overcome implementation barriers and reach these policy goals.

There are also areas where there is a general understanding that steps should be taken to address an issue (low conflict) but a lack of clarity on what the solution is (high ambiguity). These areas include leveraging conventional or nonrenewable energy production, lowering income inequality, and leveraging the private sector. The Sahel as a region has a broad consensus that these should be prioritized, but the solution and the role of each actor is not clear. For example, reducing income inequality is an important, but broad, goal for the Sahel and the path to get there is unclear and fragmented. In this scenario, actors should leverage the drivers of context, institutional factors, organizational structure, and culture, to overcome this ambiguity. To do so, international actors should invest in providing empirical evidence and strategies for these topics as a region, and the Sahel should think through the specific roles that each stakeholder will play. By clarifying goals and means, the Sahel will be able to attract more resources and overcome implementation barriers.

The most challenging policy goals and recommendations to implement include addressing conflict and war, fragility, governance and spending, and state capacity. These are particularly challenging to overcome because there is a lack of consensus on what the goal and steps to achieve it are (high policy ambiguity and high policy conflict). For example, fragility is complex with a multitude of overlapping factors contributing to the cycle, including governance, clientelism, and ethnic and religious tensions, with climate change amplifying these factors.[179] Resources, while critical, are not enough to overcome such complex situations. Improving state capacity must be

179 https://www.brookings.edu/wp-content/uploads/2022/03/Climate-development-Sahel_Final.pdf

prioritized and working to improve democracy and smooth transitions of power in the next few years will be key. There is still a cause for optimism in the long run. As this HDR has explored, synergies between energy, development, and security exist and are strong. By successfully implementing some of these recommendations in the short term such as those with low ambiguity and low conflict, actors are simultaneously making progress on reducing some of the factors that are contributing to fragility.

As explored in this conclusion, there is an abundance of priorities to be met with action. To make action more meaningful, actors should consider the political economy nationally and regionally as well as for the recommendations themselves in order to make the most impact quickly while still making progress toward long-term goals. There are immediate actions which can be taken that will have transformative impacts on other energy and development outcomes as explored in the BGG pathway. This HDR provides a way forward for the Sahel that minimizes tradeoffs when it comes to policy decisions and spending while delivering on key energy and development goals that will have maximum impact on livelihoods in the Sahel. Opportunities are embedded across the Sahel and with focused, empirically driven actions nationally, regionally, and globally, these opportunities can be brought to light to forge a new future of a resilient, sustainable, and thriving Sahel.

ANNEXES

A Pathway for Success in the Sahel – Foresight Analysis of Sustainable Energy Transitions – Balanced Green Growth

Table 9 Renewable energy production – percentage of total production

Year	Current Path	Renewable Push	Balanced Green Growth
2017	1.48	1.48	1.48
2018	1.54	1.54	1.54
2019	1.64	1.64	1.64
2020	1.76	1.76	1.76
2021	1.88	1.88	1.88
2022	1.96	1.96	1.96
2023	2.02	2.02	2.02
2024	2.08	2.21	2.08
2025	2.15	2.46	2.19
2026	2.23	2.79	2.33
2027	2.32	3.20	2.49
2028	2.39	3.72	2.67
2029	2.48	4.36	2.89
2030	2.56	5.13	3.14
2031	2.65	5.86	3.41
2032	2.73	6.70	3.67
2033	2.82	7.67	3.93
2034	2.91	8.75	4.19
2035	2.99	9.95	4.47
2036	3.04	11.28	4.76
2037	3.12	12.75	5.07
2038	3.30	14.39	5.40
2039	3.52	16.22	5.75
2040	3.78	18.27	6.14
2041	4.13	20.51	6.57
2042	4.58	22.95	7.14
2043	5.13	25.62	7.84
2044	5.76	28.48	8.70
2045	6.47	31.47	9.89
2046	7.31	34.54	11.14
2047	8.19	37.67	12.55
2048	9.15	40.84	14.07
2049	10.19	44.06	15.69
2050	11.32	47.32	17.43
2051	12.59	50.61	19.32
2052	13.99	53.90	21.37
2053	15.51	57.16	23.69
2054	17.20	60.36	26.16
2055	19.00	63.45	28.82
2056	20.91	66.40	31.63
2057	22.97	69.20	34.60
2058	25.13	71.85	37.71
2059	27.39	74.35	40.93
2060	29.76	76.68	44.24
2061	32.26	78.86	47.63
2062	34.89	80.87	51.01
2063	37.64	82.73	54.41
2064	40.45	84.43	57.77
2065	43.34	85.98	61.05

Source: IFs v8.01.

Figure 25 **Electricity connections – total (in millions)**

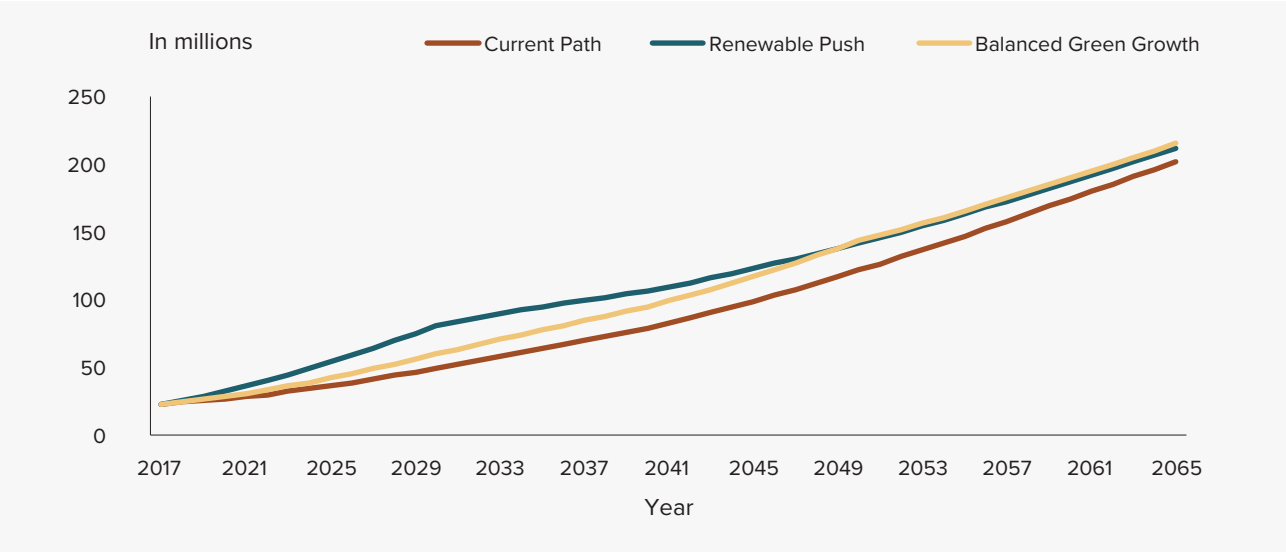


Figure 26 **Electricity generation capacity (in GW)**

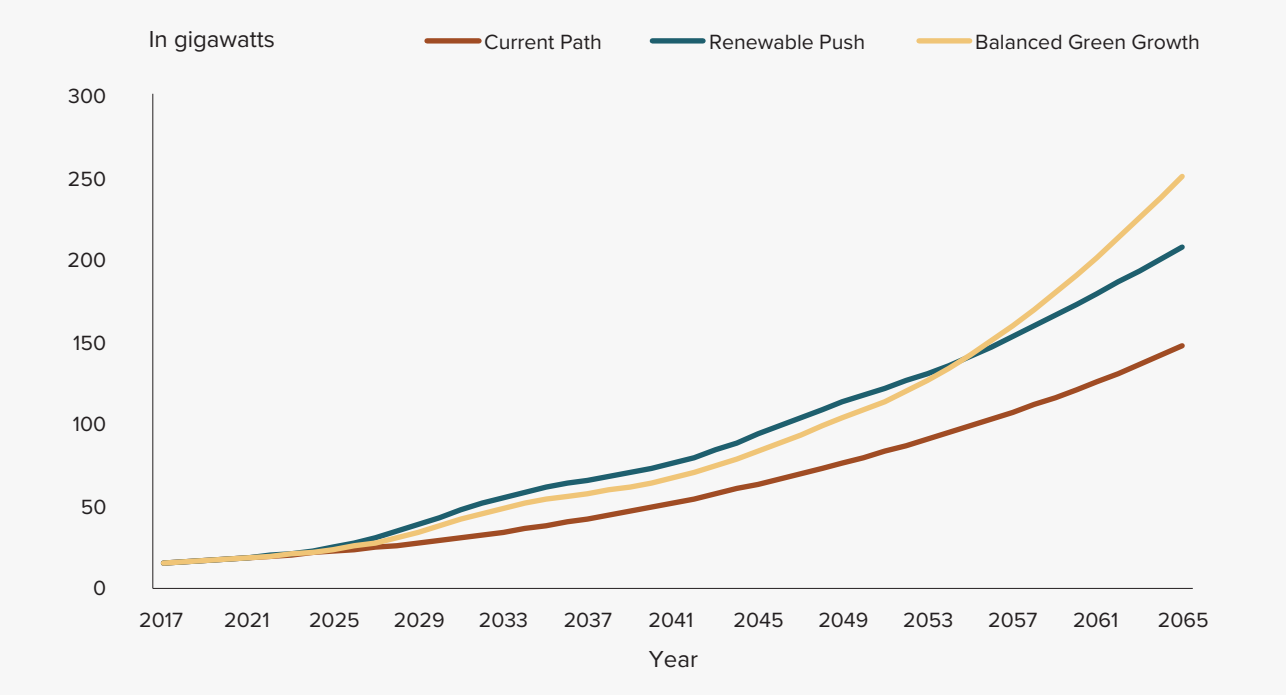


Table 10 Electricity generation capacity (in GW) per country

Year/Scenario	2030		2063	
Country	**Current Path**	**Balanced Green Growth**	**Current Path**	**Balanced Green Growth**
Burkina Faso	0.004 GW	0.006 GW	0.013 GW	0.03 GW
Cameroon	0.008 GW	0.01 GW	0.37 GW	0.51 GW
Chad	2.33 GW	4.03 GW	6.03 GW	11.8 GW
Gambia	0.23 GW	0.3 GW	0.34 GW	0.49 GW
Guinea	1.15 GW	1.57 GW	3.04 GW	5.23 GW
Mali	0.004 GW	0.005 GW	0.011 GW	0.02 GW
Mauritania	1.02 GW	1.29 GW	1.6 GW	2.73 GW
Niger	0.006 GW	0.01 GW	0.1 GW	0.15 GW
Nigeria	21.45 GW	27.83 GW	112.7 GW	188.2 GW
Senegal	2.84 GW	2.77 GW	12.21 GW	16.34 GW

Figure 27 Electricity use per capita (in kWh/capita)

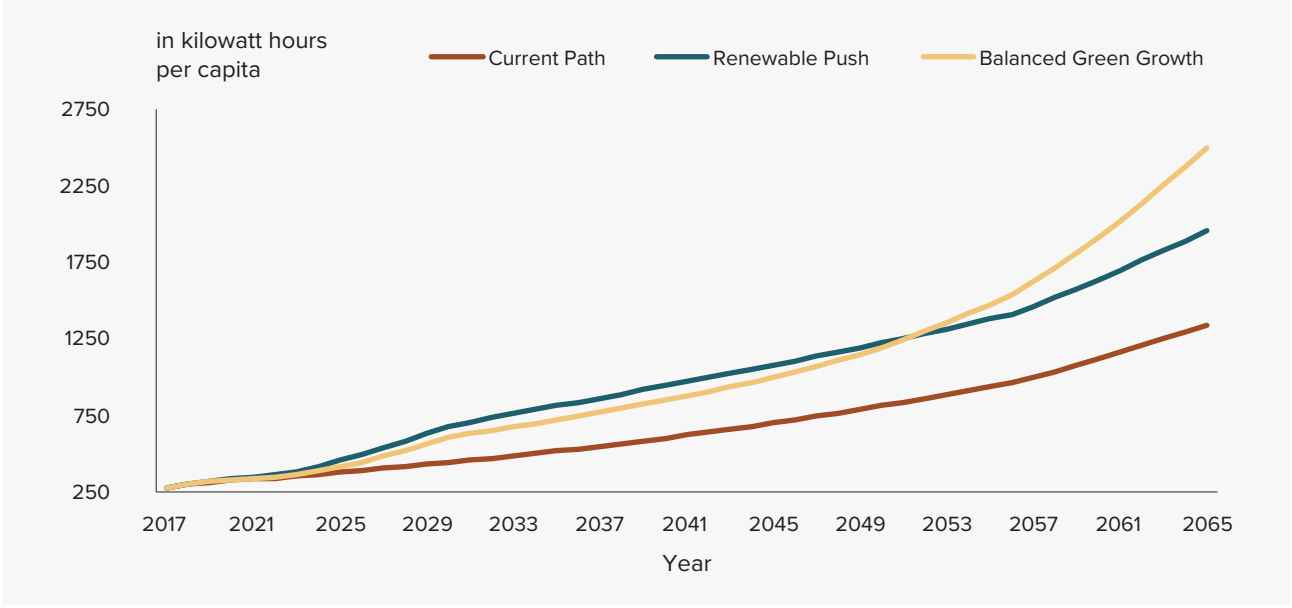


Table 11 Electricity use per capita (in kWh/capita) per country

Year/Scenario	2030		2063	
Country	Current Path (kWh/c)	Balanced Green Growth (kWh/c)	Current Path (kWh/c)	Balanced Green Growth (kWh/c)
Burkina Faso	972.3	1,395	1,881	3,826
Cameroon	454.8	593.3	1,577	2,432
Chad	667.9	1,168	815.7	1,742
Gambia	1,277	1,719	650	1,054
Guinea	1,107	1,530	1,694	3,209
Mali	869.8	1,219	1,393	2,557
Mauritania	2,084	2,788	1,793	3,290
Niger	121.1	178.8	1,111	1,955
Nigeria	267.4	354	1,115	2,034
Senegal	586.2	589.8	2,152	3,036

Figure 28 Population without electricity access (in millions)

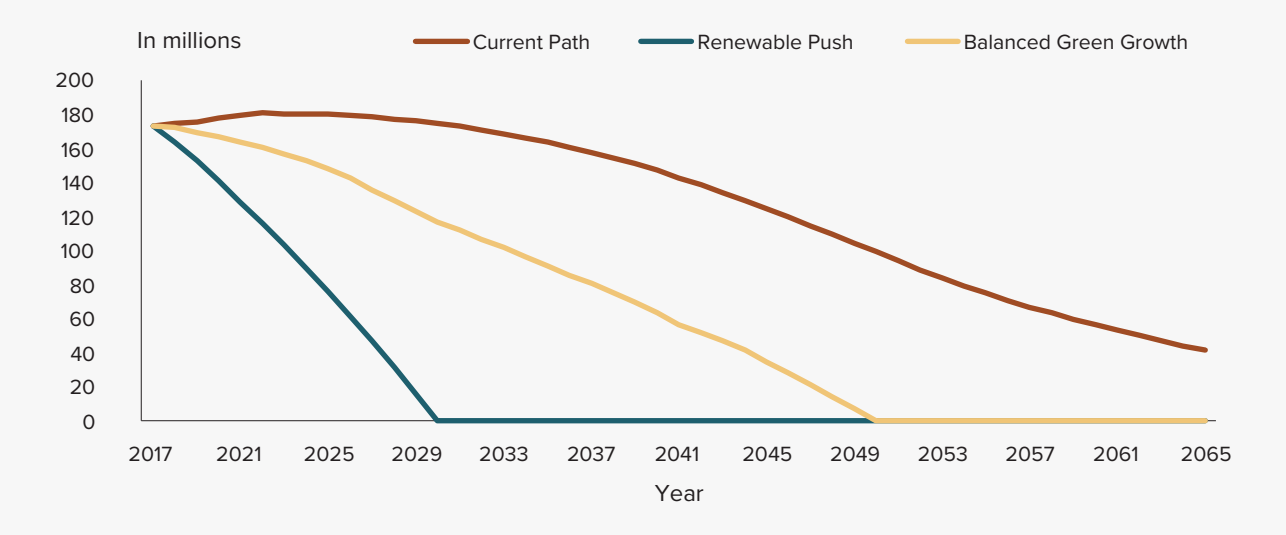


Table 12 Gross Domestic Product per capita (thousand $)

Year	Current Path	Renewable Push	Balanced Green Growth
2017	3.81	3.81	3.81
2018	3.82	3.82	3.82
2019	3.83	3.83	3.83
2020	3.70	3.70	3.70
2021	3.74	3.74	3.74
2022	3.84	3.83	3.84
2023	3.87	3.87	3.87
2024	3.92	3.91	3.89
2025	3.94	3.94	3.92
2026	4.03	4.03	4.09
2027	4.11	4.11	4.22
2028	4.19	4.20	4.37
2029	4.28	4.29	4.53
2030	4.38	4.39	4.70
2031	4.48	4.50	4.84
2032	4.59	4.61	5.00
2033	4.69	4.72	5.17
2034	4.81	4.85	5.35
2035	4.93	4.98	5.54
2036	5.06	5.12	5.74
2037	5.20	5.26	5.96
2038	5.35	5.42	6.20
2039	5.50	5.58	6.45
2040	5.66	5.75	6.72
2041	5.82	5.93	7.00
2042	6.00	6.12	7.31
2043	6.18	6.32	7.63
2044	6.38	6.53	7.99
2045	6.58	6.76	8.39
2046	6.80	6.99	8.81
2047	7.02	7.23	9.27
2048	7.26	7.49	9.76
2049	7.50	7.76	10.29
2050	7.76	8.04	10.85
2051	8.02	8.33	11.43
2052	8.30	8.63	12.04
2053	8.59	8.95	12.69
2054	8.89	9.28	13.39
2055	9.21	9.63	14.13
2056	9.53	9.99	14.94
2057	9.88	10.36	15.79
2058	10.23	10.76	16.70
2059	10.59	11.17	17.67
2060	10.98	11.60	18.70
2061	11.37	12.04	19.80
2062	11.78	12.49	20.94
2063	12.20	12.95	22.15
2064	12.63	13.43	23.42
2065	13.08	13.91	24.76

Source: IFs v8.01.

Table 13 Annual GDP gains across the Sahelian countries in 2063 from the BGG scenario, relative to the Current Path

Country	2030	2063
Burkina Faso	$4.3 billion	$231 billion
Cameroon	$5.8 billion	$291.5 billion
Chad	$2.9 billion	$127.6 billion
Gambia	$0.4 billion	$14.3 billion
Guinea	$2.1 billion	$117.3 billion
Mali	$3.2 billion	$125.7 billion
Mauritania	$1.7 billion	$33 billion
Niger	$3.1 billion	$263.6 billion
Nigeria	$85.3 billion	$5,605 billion
Senegal	$6.4 billion	$203.5 billion

Table 14 FDI inflow estimates across countries as per the CP and BGG scenarios in 2063

Country	Current Path	Balanced Green Growth
Burkina Faso	2.4%	2.9%
Cameroon	2.7%	3.4%
Chad	5.3%	6.2%
Gambia	5.6%	6.4%
Guinea	4.1%	5%
Mali	3.5%	4%
Mauritania	6%	7.1%
Niger	5.1%	5.8%
Nigeria	3.1%	4.2%
Senegal	2.8%	3.3%

Table 15 Mean educational attainment among 15-24-year-olds as per CP and BGG estimates

	2030		2063	
Country	**Current Path**	**Balanced Green Growth**	**Current Path**	**Balanced Green Growth**
Burkina Faso	6.84 years	6.86 years	8.79 years	9.37 years
Cameroon	9.45 years	9.53 years	11.16 years	11.76 years
Chad	6.19 years	6.18 years	8.82 years	9.51 years
Gambia	7.12 years	7.16 years	8.38 years	8.77 years
Guinea	6.92 years	7.03 years	8.88 years	9.83 years
Mali	6.45 years	6.5 years	8.03 years	8.38 years
Mauritania	7.84 years	7.87 years	9.91 years	10.48 years
Niger	5.95 years	6.02 years	8.82 years	9.49 years
Nigeria	8.82 years	8.88 years	10.02 years	10.93 years
Senegal	6.61 years	6.64 years	8.73 years	9.27 years

Figure 29 Total deaths from various health burdens

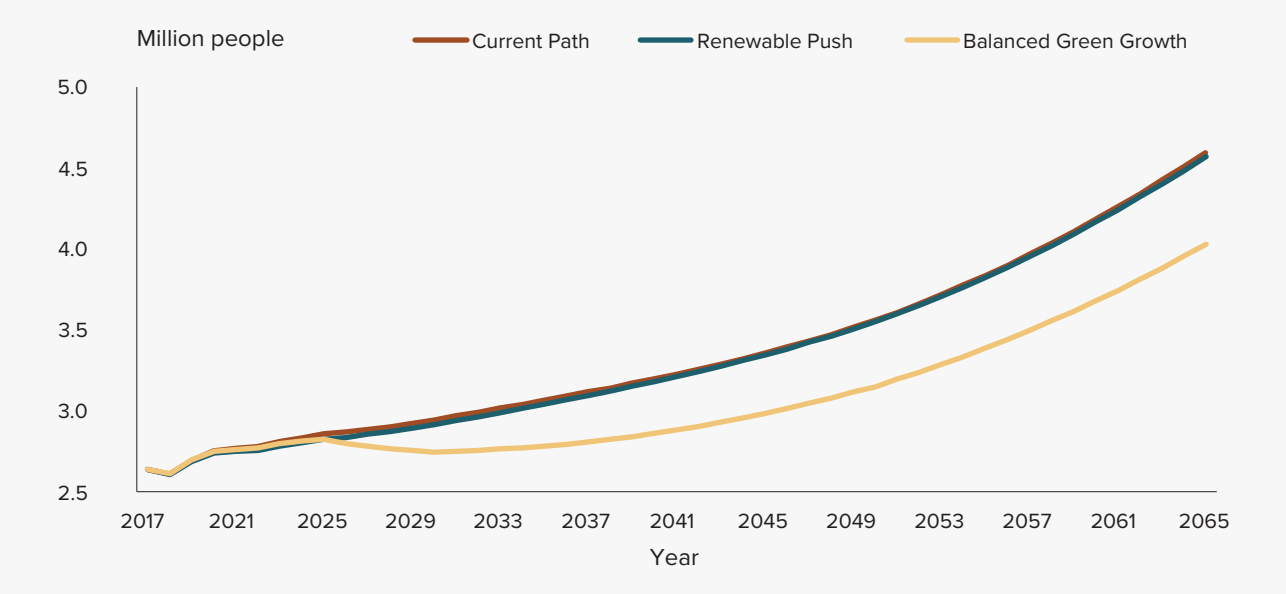


Table 16 Malnourished population in the Sahel (million people)

Year	Current Path	Renewable Push	Balanced Green Growth
2017	33.31	33.31	33.31
2018	33.32	33.32	33.32
2019	33.24	33.24	33.24
2020	34.04	34.04	34.04
2021	33.64	33.65	33.00
2022	32.38	32.39	31.77
2023	32.27	32.28	31.51
2024	31.97	31.99	27.91
2025	31.72	31.74	24.41
2026	31.19	31.19	20.49
2027	30.78	30.76	17.14
2028	30.34	30.30	14.12
2029	29.91	29.84	11.57
2030	29.48	29.38	9.41
2031	29.05	28.91	8.93
2032	28.62	28.44	8.43
2033	28.47	28.25	8.02
2034	28.29	28.02	7.63
2035	28.07	27.76	7.22
2036	27.81	27.44	6.80
2037	27.49	27.07	6.37
2038	27.08	26.61	5.92
2039	26.60	26.07	5.44
2040	26.05	25.46	4.95
2041	25.36	24.71	4.45
2042	24.56	23.86	3.93
2043	23.70	22.95	3.40
2044	22.78	21.99	2.87
2045	21.82	20.99	2.35
2046	20.82	19.96	1.82
2047	20.12	19.24	1.64
2048	19.42	18.50	1.47
2049	18.69	17.75	1.31
2050	17.95	16.99	1.17
2051	17.22	16.23	1.04
2052	16.47	15.46	0.93
2053	15.73	14.70	0.82
2054	15.00	13.96	0.73
2055	14.29	13.24	0.64
2056	13.58	12.53	0.56
2057	12.90	11.84	0.49
2058	12.23	11.17	0.43
2059	11.60	10.54	0.38
2060	11.00	9.94	0.33
2061	10.43	9.37	0.29
2062	9.89	8.84	0.25
2063	9.38	8.35	0.22
2064	8.89	7.88	0.19
2065	8.44	7.46	0.17

Source: IFs v8.01.

Table 17 Poverty headcount ratio (<1.90/day) in the Sahel (million)

Year	Current Path	Renewable Push	Balanced Green Growth
2017	140.80	140.90	140.80
2018	142.60	142.70	142.10
2019	142.50	142.60	141.30
2020	142.90	143.00	141.10
2021	142.60	142.80	135.60
2022	143.10	143.30	131.70
2023	141.40	141.40	122.40
2024	140.70	140.50	114.20
2025	140.50	140.20	106.60
2026	140.70	140.10	99.18
2027	140.80	140.00	90.87
2028	140.80	139.70	87.73
2029	140.20	138.70	81.87
2030	139.20	137.10	74.11
2031	137.50	134.90	65.89
2032	135.50	132.30	57.76
2033	133.30	129.80	50.25
2034	131.40	127.40	43.77
2035	129.80	125.50	38.39
2036	128.20	123.50	33.76
2037	126.50	121.30	29.49
2038	124.30	118.90	25.41
2039	121.60	116.20	21.47
2040	118.40	113.20	17.72
2041	114.80	109.80	14.22
2042	110.80	106.30	11.06
2043	106.50	102.50	8.35
2044	102.20	98.50	6.11
2045	97.80	94.13	4.31
2046	93.27	89.55	2.93
2047	88.61	84.86	1.91
2048	83.85	80.05	1.35
2049	78.98	75.20	0.93
2050	74.06	70.32	0.63
2051	69.13	65.45	0.41
2052	64.22	60.57	0.26
2053	59.40	55.54	0.16
2054	54.67	50.52	0.10
2055	50.04	45.52	0.06
2056	45.43	40.66	0.04
2057	40.94	36.10	0.03
2058	36.61	31.87	0.02
2059	32.55	28.01	0.01
2060	28.75	24.46	0.01
2061	25.29	21.27	0.01
2062	22.09	18.41	0.00
2063	19.20	15.87	0.00
2064	16.58	13.67	0.00
2065	14.23	11.64	0.00

Source: IFs v8.01.

Table 18 Carbon emissions from fossil fuels (billion tons)

Year	Current Path	Renewable Push	Balanced Green Growth
2017	0.04	0.04	0.04
2018	0.05	0.05	0.05
2019	0.05	0.05	0.05
2020	0.06	0.06	0.06
2021	0.06	0.06	0.06
2022	0.07	0.07	0.07
2023	0.07	0.07	0.07
2024	0.08	0.07	0.07
2025	0.08	0.08	0.08
2026	0.08	0.08	0.08
2027	0.09	0.09	0.09
2028	0.10	0.09	0.10
2029	0.10	0.10	0.10
2030	0.11	0.11	0.11
2031	0.12	0.12	0.12
2032	0.13	0.12	0.13
2033	0.14	0.13	0.14
2034	0.14	0.14	0.15
2035	0.15	0.14	0.16
2036	0.16	0.15	0.16
2037	0.17	0.16	0.17
2038	0.18	0.16	0.18
2039	0.19	0.17	0.19
2040	0.20	0.18	0.21
2041	0.21	0.19	0.22
2042	0.23	0.20	0.23
2043	0.24	0.21	0.25
2044	0.26	0.22	0.26
2045	0.28	0.23	0.28
2046	0.29	0.24	0.29
2047	0.31	0.25	0.31
2048	0.32	0.26	0.32
2049	0.33	0.27	0.34
2050	0.35	0.28	0.35
2051	0.36	0.29	0.37
2052	0.38	0.30	0.38
2053	0.40	0.31	0.40
2054	0.41	0.32	0.42
2055	0.43	0.33	0.43
2056	0.45	0.34	0.45
2057	0.47	0.35	0.47
2058	0.48	0.37	0.49
2059	0.50	0.38	0.51
2060	0.52	0.39	0.52
2061	0.53	0.40	0.54
2062	0.55	0.41	0.55
2063	0.57	0.42	0.57
2064	0.58	0.43	0.59
2065	0.60	0.44	0.60

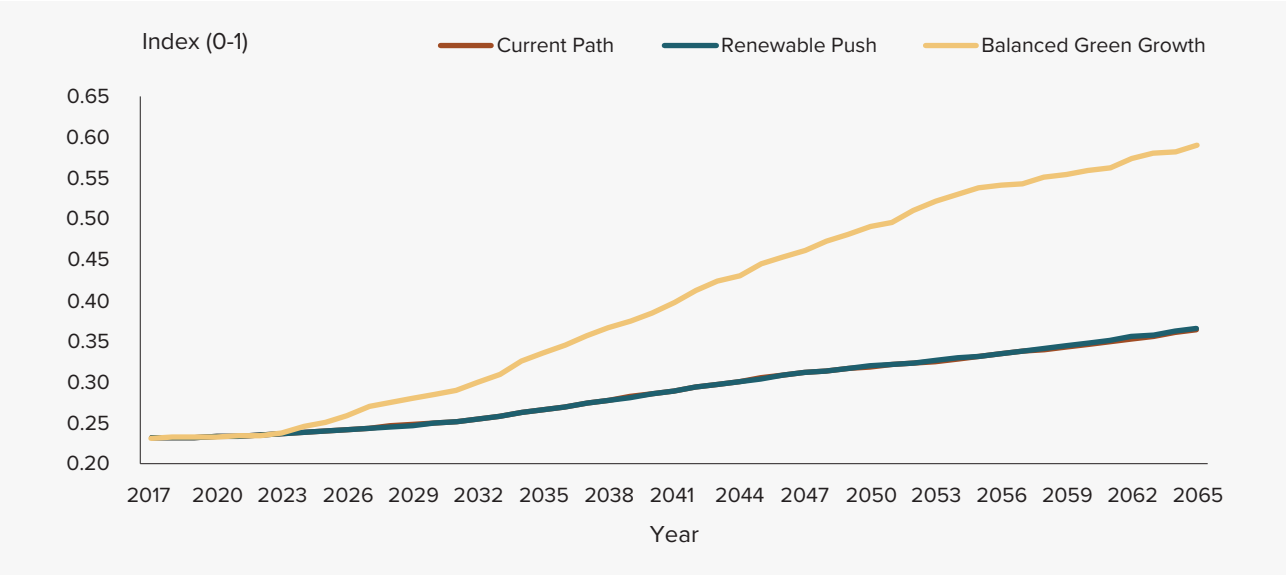
Source: IFs v8.01.

Table 19 Health and education spending as a percent of GDP

Year	Current Path	Renewable Push	Balanced Green Growth
2017	4.39	4.39	4.39
2018	5.53	5.42	5.42
2019	5.63	5.49	5.49
2020	5.57	5.42	5.42
2021	5.66	5.49	5.49
2022	5.72	5.57	5.57
2023	5.73	5.60	5.60
2024	5.83	5.49	5.94
2025	5.92	5.37	6.23
2026	5.92	5.18	6.40
2027	5.91	4.98	6.59
2028	5.92	4.79	6.79
2029	5.94	4.62	6.99
2030	5.95	4.45	7.19
2031	5.97	4.58	7.52
2032	5.99	4.63	7.73
2033	6.01	4.68	7.94
2034	6.04	4.73	8.14
2035	6.06	4.78	8.34
2036	6.09	4.83	8.41
2037	6.12	4.87	8.47
2038	6.14	4.90	8.53
2039	6.17	4.92	8.58
2040	6.19	4.94	8.62
2041	6.22	4.96	8.67
2042	6.28	5.00	8.72
2043	6.35	5.05	8.78
2044	6.42	5.11	8.85
2045	6.49	5.17	8.92
2046	6.55	5.23	9.00
2047	6.63	5.30	9.08
2048	6.70	5.37	9.16
2049	6.77	5.45	9.25
2050	6.84	5.52	9.33
2051	6.92	5.58	9.42
2052	6.99	5.65	9.51
2053	7.06	5.71	9.59
2054	7.12	5.76	9.67
2055	7.19	5.82	9.75
2056	7.25	5.87	9.84
2057	7.32	5.93	9.93
2058	7.38	5.98	10.03
2059	7.44	6.04	10.12
2060	7.50	6.09	10.22
2061	7.56	6.15	10.32
2062	7.61	6.20	10.42
2063	7.66	6.24	10.52
2064	7.71	6.29	10.61
2065	7.75	6.33	10.70

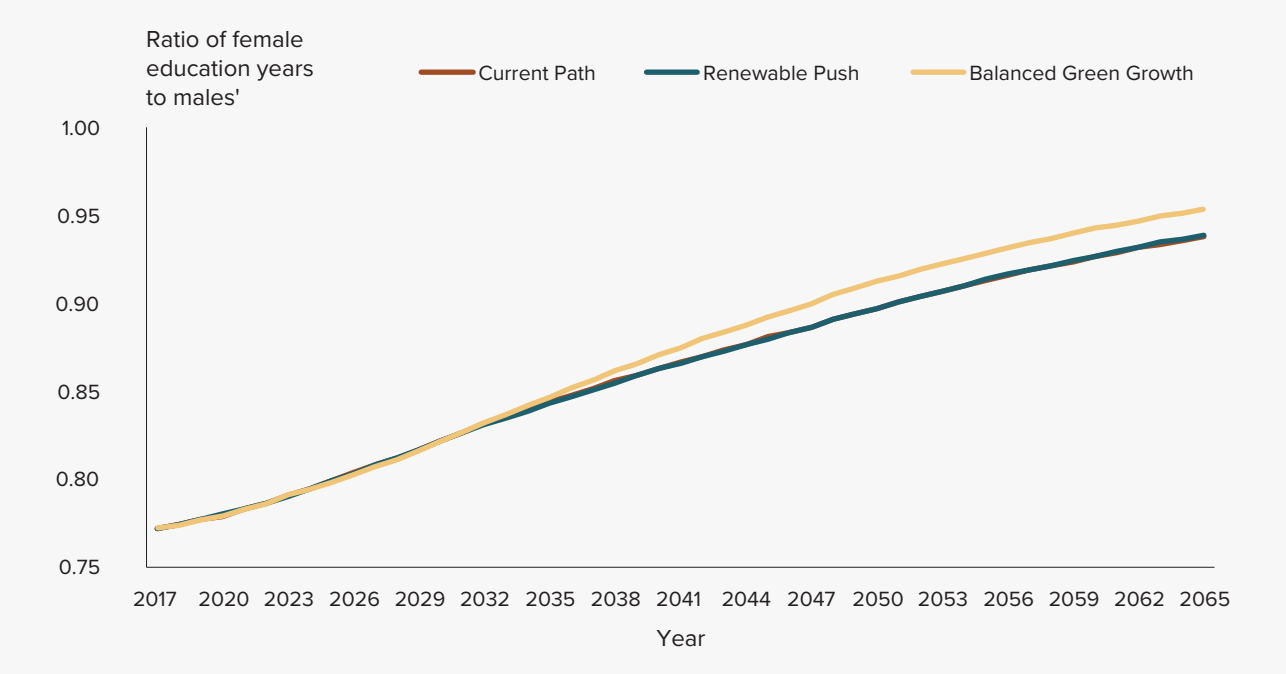
Source: IFs v8.01.

Figure 30 **Gender Empowerment Index projections across scenarios**



Source: IFs v8.01.

Figure 31 **Gender parity in educational attainment across scenarios in the Sahel**



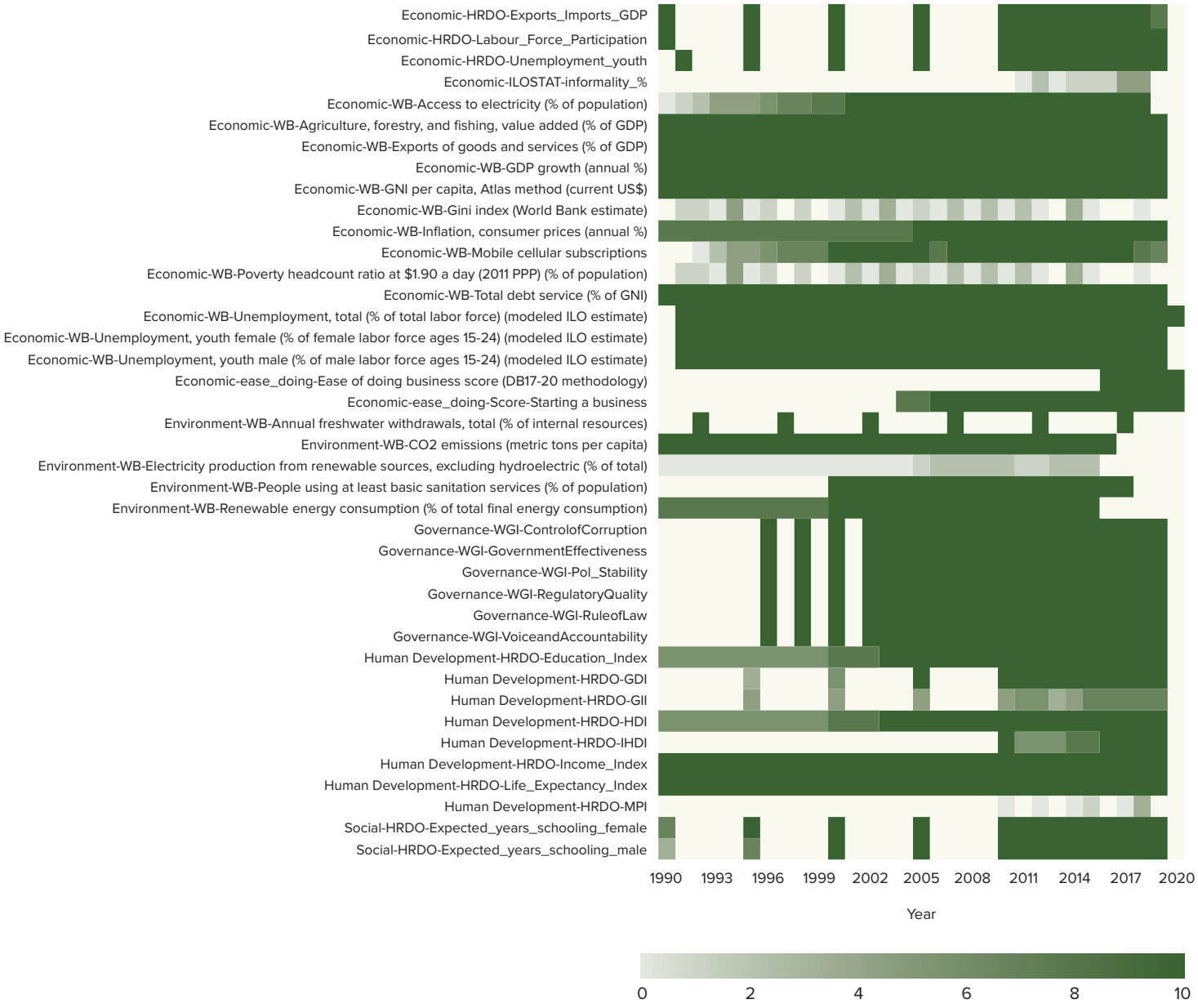
Source: IFs v8.01.

Table 20 **State failure through Instability Index across CP and BGG scenarios in 2063**

Country	Current Path	Balanced Green Growth
Burkina Faso	0.0003	0.0001
Cameroon	0.0006	0.0003
Chad	0.0006	0.0002
Gambia	0.0006	0.0003
Guinea	0.0007	0.0002
Mali	0.097	0.057
Mauritania	0.075	0.049
Niger	0.004	0
Nigeria	0.0008	0.0004
Senegal	0.0004	0.0002

A Timely Human Development Update – The Imperative to Move from Incremental to Accelerated Progress in the Sahel

Figure 32 **Missing data heatmap**



A Timely Energy Update – The Imperative to Address the Challenges and Capitalize on the Enormous Energy Opportunities in the Sahel

Table 21 Human Development Index

#	Country	2000	2005	2010	2015	2020	2021
1	Burkina Faso	0.296	0.331	0.372	0.418	0.449	0.449
2	Cameroon	0.442	0.475	0.513	0.560	0.578	0.576
3	Chad	0.291	0.327	0.362	0.389	0.397	0.394
4	Gambia	0.404	0.431	0.460	0.478	0.501	0.500
5	Guinea	0.345	0.387	0.415	0.440	0.466	0.465
6	Mali	0.317	0.366	0.404	0.416	0.427	0.428
7	Mauritania	0.465	0.490	0.510	0.544	0.556	0.556
8	Niger	0.262	0.298	0.338	0.376	0.401	0.400
9	Nigeria	0.000	0.469	0.482	0.516	0.535	0.535
10	Senegal	0.388	0.419	0.468	0.505	0.513	0.511
11	Sahel	0.375	0.440	0.461	0.495	0.513	0.512
12	Sahel 5	0.303	0.341	0.378	0.409	0.427	0.427
13	Horn	0.373	0.419	0.466	0.493	0.512	0.511
14	Central Africa	0.391	0.423	0.463	0.503	0.514	0.512
15	Eastern Africa	0.377	0.422	0.470	0.499	0.519	0.517
16	Western Africa	0.407	0.451	0.474	0.506	0.526	0.525
17	Southern Africa	0.619	0.619	0.662	0.703	0.715	0.701
18	Northern Africa	0.592	0.615	0.647	0.673	0.687	0.687
19	Africa	0.453	0.485	0.519	0.549	0.564	0.562
20	South Asia	0.486	0.527	0.565	0.613	0.630	0.624
21	Latin America	0.685	0.707	0.730	0.755	0.752	0.750
22	OECD	0.836	0.855	0.872	0.890	0.893	0.895

Source: Author's calculation, Human Development Index (2021).
Note: Aggregated values by region were estimated using the human development methodology (https://hdr.undp.org/sites/default/files/2021-22_HDR/hdr2021-22_technical_notes.pdf).

Table 22 Health Index

#	Country	2000	2005	2010	2015	2020	2021
1	**Burkina Faso**	0.475	0.509	0.561	0.598	0.611	0.604
2	**Cameroon**	0.507	0.529	0.563	0.610	0.628	0.621
3	**Chad**	0.422	0.436	0.455	0.486	0.504	0.500
4	**Gambia**	0.568	0.591	0.626	0.654	0.656	0.647
5	**Guinea**	0.500	0.533	0.565	0.587	0.605	0.598
6	**Mali**	0.470	0.523	0.560	0.590	0.594	0.599
7	**Mauritania**	0.631	0.641	0.663	0.684	0.685	0.683
8	**Niger**	0.451	0.517	0.590	0.632	0.638	0.640
9	**Nigeria**	0.418	0.451	0.476	0.490	0.506	0.503
10	**Senegal**	0.568	0.629	0.686	0.721	0.739	0.725
11	**Sahel**	0.447	0.482	0.515	0.538	0.553	0.550
12	**Sahel 5**	0.467	0.508	0.554	0.589	0.598	0.597
13	**Horn**	0.494	0.536	0.606	0.651	0.672	0.664
14	**Central Africa**	0.471	0.509	0.553	0.593	0.612	0.604
15	**Eastern Africa**	0.471	0.528	0.592	0.648	0.672	0.662
16	**Western Africa**	0.463	0.497	0.531	0.554	0.570	0.567
17	**Southern Africa**	0.576	0.512	0.587	0.665	0.688	0.643
18	**Northern Africa**	0.726	0.738	0.767	0.786	0.789	0.787
19	**Africa**	0.529	0.558	0.603	0.640	0.656	0.647
20	**South Asia**	0.660	0.691	0.719	0.756	0.765	0.732
21	**Latin America**	0.788	0.810	0.821	0.840	0.816	0.802
22	**OECD**	0.877	0.894	0.911	0.921	0.909	0.908

Source: Author's calculation, Human Development Index (2021).
Note: Aggregated values by region were estimated using the human development methodology (https://hdr.undp.org/sites/default/files/2021-22_HDR/hdr2021-22_technical_notes.pdf).

Table 23 Education Index

#	Country	2000	2005	2010	2015	2020	2021
1	Burkina Faso	0.141	0.173	0.215	0.278	0.324	0.324
2	Cameroon	0.343	0.393	0.458	0.535	0.569	0.569
3	Chad	0.177	0.203	0.245	0.278	0.309	0.309
4	Gambia	0.250	0.292	0.327	0.369	0.416	0.416
5	Guinea	0.193	0.247	0.287	0.319	0.346	0.346
6	Mali	0.162	0.211	0.261	0.266	0.283	0.283
7	Mauritania	0.280	0.317	0.347	0.399	0.424	0.424
8	Niger	0.117	0.147	0.182	0.225	0.264	0.264
9	Nigeria	0.000	0.422	0.407	0.467	0.521	0.521
10	Senegal	0.209	0.233	0.298	0.351	0.347	0.347
11	Sahel	0.253	0.351	0.361	0.414	0.456	0.456
12	Sahel 5	0.155	0.190	0.231	0.267	0.300	0.300
13	Horn	0.261	0.327	0.372	0.391	0.412	0.412
14	Central Africa	0.323	0.359	0.413	0.472	0.499	0.499
15	Eastern Africa	0.301	0.360	0.410	0.426	0.448	0.448
16	Western Africa	0.308	0.368	0.381	0.429	0.469	0.468
17	Southern Africa	0.592	0.650	0.679	0.713	0.739	0.739
18	Northern Africa	0.454	0.484	0.526	0.575	0.612	0.611
19	Africa	0.366	0.409	0.443	0.480	0.510	0.509
20	South Asia	0.357	0.406	0.449	0.516	0.535	0.535
21	Latin America	0.574	0.606	0.640	0.682	0.710	0.710
22	OECD	0.762	0.790	0.816	0.848	0.867	0.867

Source: Author's calculation, Human Development Index (2021).
Note: Aggregated values by region were estimated using the human development methodology (https://hdr.undp.org/sites/default/files/2021-22_HDR/hdr2021-22_technical_notes.pdf).

Table 24 **Share of youth not in education, employment or training, total (% of youth population)**

Year	Burkina Faso	Cameroon	Chad	Gambia	Guinea	Mali	Mauritania	Niger	Nigeria	Senegal
2002					24.4					
2007		11.1								
2010		10.8				13.5				
2011								19.4	29.1	
2012				34.0			39.7			
2013						18.2			27.9	
2014		17.0				21.3		25.2		
2015						24.9				36.3
2016						34.0			27.1	29.5
2017						28.6	35.5	68.7		35.5
2018	41.0		37.1	29.4		26.7				39.7
2019					34.3		44.1		36.7	33.9
2020						30.9				

Source: Author's calculation, Human Development Index (2021).
Note: Aggregated values by region were estimated using the human development methodology (https://hdr.undp.org/sites/default/files/2021-22_HDR/hdr2021-22_technical_notes.pdf).

Methodology, Assumptions and Energy Finance in IFs

We use the International Futures model as a methodological tool for the purpose of formulating, investigating, and assessing a range of scenarios pertaining to energy transition and development priorities. This model facilitates the simulation and examination of the multifaceted impacts arising from varying energy dynamics and climate change. These impacts encompass shifts in economic production, financial dynamics, and human well-being. Our study specifically examines their interconnected influence on human development patterns and the attainment of SDGs within the Sahel region. The IFs model enables us to rigorously compare three distinct energy transition scenarios, differentiating between various energy mix combinations, and their corresponding climate change outcomes, all while aligning with the SDG objectives related to universal energy access.

About International Futures

International Futures is a comprehensive global modeling system (Hughes & Hillebrand, 2006; Hughes, 2019). The primary objective of the IFs forecasting system is to serve as a tool for analyzing country-specific, regional, and global long-term futures across a wide range of critical areas. These areas encompass agriculture, economics, education, energy, environment, health, infrastructure, population, socio-political systems. The IFs model covers interactions among 188 countries and incorporates a vast database of over 5,000 series of data spanning from 1960 to the most recent values.[180]

The purpose of IFs is to facilitate understanding about our shared developmental future and to create alternative scenarios that are empirically grounded and that connect to relevant political considerations. The model operates at the "policy strategy" level and is not a tool for granular and context-driven public policymaking. Instead, IFs is focused on broad questions of developmental strategies and uncertainty at the macro level. More granular policies must be developed to achieve the interventions described here.

The user interface of IFs is designed to facilitate seamless interaction with the data analysis, forecasting, and scenario-building functionalities, making it user-friendly and accessible. Notably, IFs has always been freely available to the public,[181] and the model's source code has been provided under a public license. These features have contributed to IFs becoming one of the most widely utilized and advanced global modeling systems, serving as a valuable resource for guiding thinking, analysis, and decision-making pertaining to global futures.

Figure 33 provides an overview of the major models incorporated within the IFs system. While it does not comprehensively depict all linkages within or across these models, detailed technical documentation for each model is accessible in the working papers available on the Pardee Center website.[182]

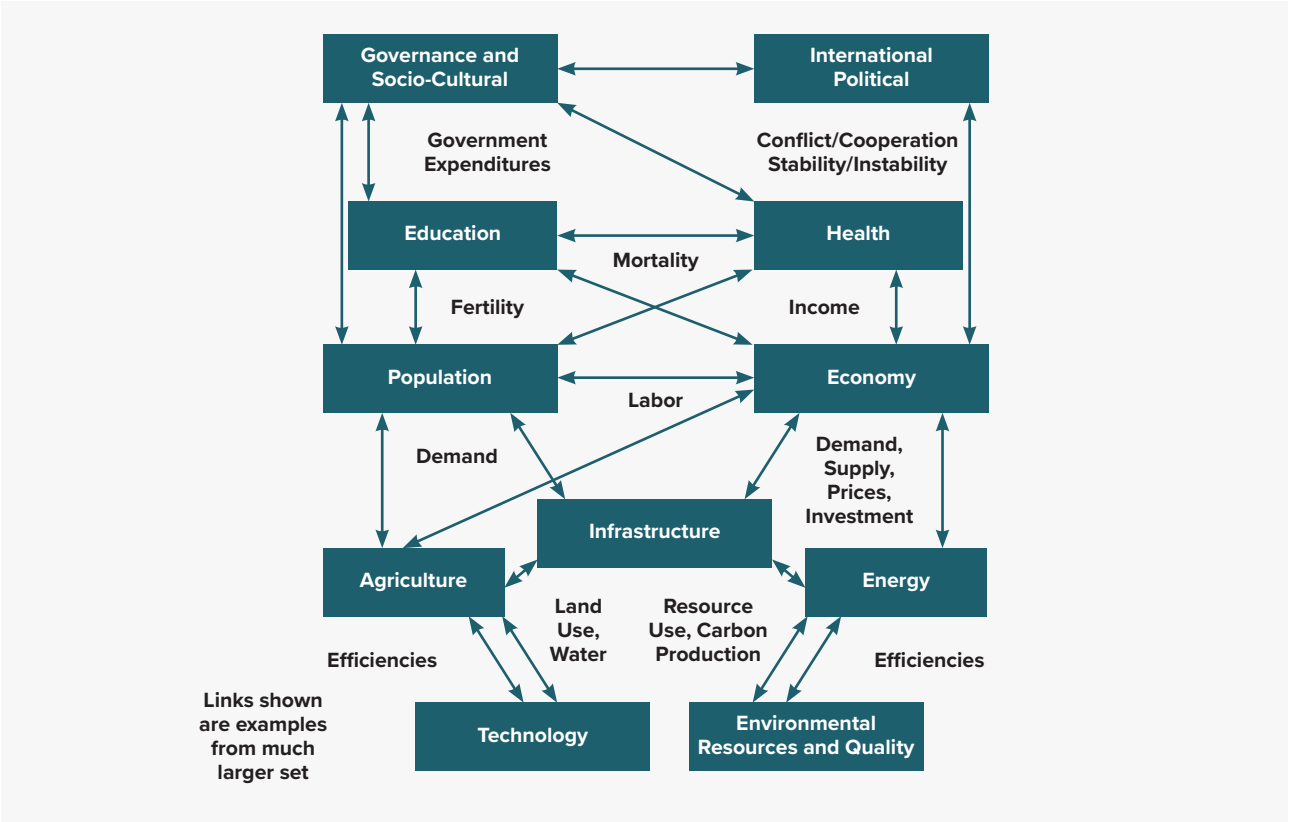
IFs can be described as a hybrid system that does not neatly fit into conventional categories like econometric or systems dynamics models. It is primarily a structure-based, agent-class-driven, and dynamic modeling system, with households, governments, and firms being the major agent-classes. While the system draws on standard modeling approaches for specific issue areas, it extends and integrates them as necessary across different issue areas. The hybrid approach is valuable as it allows close attention to

180 In this study, IFs uses 2017 as its base year. Essentially, 2017 serves as the model's starting point from which it computes its forecasts. According to IFs version 8.01, 2017 is chosen as the base year due to its extensive availability across various sub-models. However, it is important to note that in certain instances pertaining to economic data, more recent series take precedence over historical data values. This adjustment aligns growth forecasts with the most up-to-date short-term growth updates from the International Monetary Fund (IMF). For other sub-models, the most recent available data is applied to the year 2017.

181 Accessible at https://korbel.du.edu/pardee.

182 https://korbel.du.edu/pardee/publications/model-documentation

Figure 33 **Interactions across the International Futures**



Source: Hughes & Hillebrand, 2006.

stocks and flows, differentiation among them as seen in systems dynamics, and data-driven estimation of relationships. Moreover, IFs incorporates algorithmic or rule-based elements and even elements of control theory when it comes to equilibration.

The overall system places great importance on maintaining accounting structures, including cohort component structures to track aging populations, social accounting matrices to monitor financial flows among agent classes, and tracking of energy resources, production/demand, land use, and carbon stocks and flows. The system operates recursively with single year timesteps.

The demographic model in the IFs system utilizes a cohort-component approach to represent demographics in five-year categories, which is adequate for most users. However, the model builds on underlying one-year categories to maintain consistency with its computational timesteps. Notably, unlike many other demographic forecasting systems, IFs computes both fertility and mortality endogenously, while migration is specified exogenously, currently relying on forecasts from the International Institute for Applied Systems Analysis (IIASA). The inclusion of education and health models within the IFs system significantly enhances the capability for endogenous treatment of demographic aspects. Data for these models are sourced from the United Nations Population Division's latest revision updates, which occur every two years.

Regarding the economic model structure, IFs adopts a general equilibrium-seeking approach with a Cobb-Douglas formulation driving production. Multifactor productivity is notably treated as an endogenous function of various factors, including human capital, social capital/governance, physical capital (infrastructure and energy), and knowledge capital (Hughes, 2016). While capital and labor accumulations hold significant importance, productivity formulations play a central role in shaping the dynamics within the economic model and its interactions with other models. Additionally, IFs incorporates a foundational representation of global technology

development and diffusion, facilitating further representation of productivity dynamics and inter-country convergence or divergence.

The household demand is determined by a linear expenditure system, and a social accounting matrix structure flows across sectors and agent categories, ensuring full financial flow consistency (Hughes & Hossain, 2003). Data for these components are heavily sourced from the World Bank and the Global Trade Analysis Project. Furthermore, the IFs project has developed a treatment of the informal economy.

Many aspects of the full IFs model are at play in the work that is presented below, but many aspects of the model are not very significantly impacted by the scenarios created for this work. Notably, while aspects of civil conflict remain significant for the region today and are discussed in the presentation of the results, the scenarios do not have a significant impact on these outcomes. The same is true for other aspects of governance like democracy. Another area of the model that users may be interested in relates to regional governance and international relations, two factors that also feature in the structure of IFs. Regional trade is also not an explicit part of this analysis, and intra-African tariffs are not discussed. Neither of these factors were the focal point of the research done for this analysis, and many aspects of regional governance will need to be considered to pursue these scenarios that go well beyond the modeling work presented here.

Other notable factors that are included but that do not play a large role is the forward impact of climate change to human development – as the scenarios presented here do not significantly alter the course of climate change, this exclusion is logical.

The model's notable strengths lie in its comprehensive representation of a wide array of fundamental structures within global issue systems, as well as its ability to capture agent-driven flows that drive changes in these structures over time. Another strength is the extensive and robust data foundation that underpins the system, providing a reliable basis for analysis. Additionally, the model excels in integrating important global subsystems, enhancing its holistic approach to understanding complex interactions. Moreover, the model's usability and transparency are commendable, making it accessible and understandable to users.

However, like many models of its kind, there are certain weaknesses that need to be acknowledged. Chief among these is the substantial uncertainty surrounding crucial data, such as estimates of ultimately recoverable energy resources, which can impact the accuracy of projections. Furthermore, uncertainties surround fundamentally important relationships, including the drivers of economic productivity, which can influence the outcomes of the model's forecasts. Additionally, some crucial key dynamic forces, such as technological advancements, may also exhibit uncertainties that can affect the reliability of long-term projections.

Energy Module in IFs

The energy and agricultural models within the IFs system are partial equilibrium models with a physical basis, which is subsequently translated into monetary terms to interface with the economic model (Hughes, 2014). The energy model captures resources and reserves on the production side, distinguishing between different sources such as oil, gas, coal, hydroelectric, nuclear, and other renewables. Emphasizing the dynamics surrounding fossil resource stocks, their utilization, and the development of renewable sources is of utmost importance.

The energy model's demand side is driven by the size of economies and energy intensity of the economic activities. On the supply side, energy production necessitates not only resource bases but also the accumulation of capital stock through investments in competition with other sectors. Trade patterns are responsive to differential cost and price structures across countries. User interventions can represent geopolitically based constraints on production growth, as well as decisions to restrict exports. Although global prices are typically calculated to clear the market, user interventions have the potential to override market prices. Data for the energy model are predominantly sourced from the International Energy Agency, with a recent update incorporating data and forecasting related to contributions from unconventional fossil resources (such as shale oil and gas, tight oil, coal-bed methane, etc.).

The energy model in IFs is characterized by several key dynamics and user controls:

1. Energy demand (ENDEM) is a function of GDP and energy demand per unit of GDP (ENRGDP). Endogenous computations are made for GDP per capita and energy prices, while an exogenous trend is applied to energy efficiency. Users can control the price elasticity of energy demand and autonomous efficiency trend and also use an energy demand multiplier to directly modify energy demand.

2. Energy production (ENP) relies on the capital stock of each energy type, the capital/output ratio (QE) for each type, and capacity utilization factor (CPUTF). Users can use an energy production multiplier to directly modify energy production by type.

3. The capital/output ratio for each fuel type decreases over time due to technological improvements but factors may increase the ratio as remaining resources decrease. Users can further modify capital/output ratios with multipliers.

4. Energy capital is initialized based on initial production and capital/output ratios, depreciates at a rate determined by energy capital lifetime, and grows with investment. Users can influence desired investment by energy type using various factors, including expected profits, reserve production factors, and exogenous restrictions on maximum production.

5. Resources and reserves are separately represented in IFs, with reserves declining with production and increasing with discoveries. Users can modify ultimate resources directly or through multipliers. Discovery rates depend on remaining resources, current production, and world energy prices, which users can control.

6. Domestic energy prices are influenced by world and domestic stocks and the global capital/production ratio. Users have control over various factors affecting energy prices, such as domestic stocks, "cartel premium," carbon tax, and setting exogenous domestic prices for the first year or multiple years.

7. The energy model also incorporates energy trade, with imports and exports depending on production, demand, and past trade propensities. Users can set maximum limits on energy imports and exports, as well as general trade limits.

In summary, the energy model of IFs allows users to manipulate various factors affecting energy demand, production, capital, resources, prices, and trade, providing a flexible and comprehensive representation of energy-related dynamics.

Scenario Assumptions

The analysis is based on three scenarios – with one being the Current Path followed by two alternative scenarios that describe potential pathways for the Sahel toward sustainable energy transitions. The alternate scenarios refer to a Renewable Push that simulates a rapid adoption of renewable technology in the Sahel and a Balanced Green Growth that lays reasonable investments across energy types with an equitable focus on renewable energy in conjunction with interventions across other SDGs.

A note about the magnitude and timing of scenario interventions: Different interventions occur across different periods of time and at different levels. They are intended to be ambitious interventions, but also reasonable relative to what has been seen historically in socioeconomic development. There are some scenario interventions, like universal access to electricity by 2030, that are less reasonable though remain very ambitious. The purpose of including those interventions in this document is to explore both the cost and impact of this on development in the future, as this report is focused on energy and human development. However, the broader, integrated BGG scenario entails a more realistic assumption in this case, where countries in the Sahel aim for 100% electrification by 2050.

The Current Path scenario makes a broad set of assumptions about how development works and reflects the broad assumptions that stretch across issue areas within the IFs model. This scenario is under constant refinement by the Pardee Team with the goal of most accurately reflecting broad development trends and patterns that have characterized the international system since the end of the Cold War. The dominant systems – as noted above in the methodology section – have to do with demographic growth and transformation, economic production and consumption across sectors, and core strengths in various models reflecting human and social development.

The IFs tool is historically validated and calibrated, often by running the model from 1995-2015 and exploring how the model behaves across key indicators at the country, regional and global levels. The behavior of the model in these validations is very good at the global level, with the twenty-year difference between global GDP and population varying by less than 10% from measured data. For some regions the model has historical biases, but many of these are related to development in very large countries like China, India, and the United States. The model does less well in historical validation when forecasting long-term development in countries that have very small populations and are more prone to conflict. Many of the Sahelian countries fall into this category which suggests that long-term forecasts should not be used as point predictions about what will or will not happen, but as projections of what is most likely and understood to be still characterized by great uncertainty.

The scenarios and interventions presented in Table 25 below are also not meant to reflect narrow public policy-related concerns about future development. These kinds of concerns are often focused on narrow policy-related discussions about what specific set of context-related interventions make the most sense for changing patterns of socioeconomic development. Instead, the kind of modeling work embodied in this analysis is much broader and is intended to focus on the policy strategy level. Policy strategies are designed to chart a broad course about what multi-decade choices should be policy priorities which can then be narrowed down to more specific policy interventions that may be associated with the public policy academic discipline.

Table 25 below lists all interventions under the three scenarios for this report:

Table 25 Assumptions under the three scenarios in the IFs model for the Sahel HDR

		Assumption	
Scenario	**Impact area**	**IFs scenario assumption**	**Underlying logic – model structure**
Current Path (CP)		Most likely development path that involves a dynamic unfolding of current development patterns.	The model estimates the current path trajectory by assuming that the current trends and policies continue unchanged into the future. This involves no additional parameterization of variables in the model.
	Hydro-production	Adjusted Current Path trajectory that accounts for upcoming hydropower developments in the Sahel.	The CP is only marginally altered to raise hydro-based energy in Senegal, Guinea, and Gambia to reflect an increase by 10% over original CP forecasts once project comes into operation, i.e. 2025.
Renewable Push (RP)	Renewable energy production and investment	An increase in renewable production (primarily solar, tidal, geothermal and wind sources) for the Sahel by 60% by 2030 with additional monetary investments of over 200% the value of CP estimates.[183] An increase in hydro-production for the Sahel by over 60% on top of a 100% increase in energy investments in hydro-power developments – all assuming the Sahel matches over 90% of its energy demands with renewables by 2035.	The model ramps up the energy production and investment parameters (enpm and eninvtm) for solar, geothermal, tidal and wind sources by 30% and 200% respectively, over CP projections by 2030.[184] For hydro-production, this scenario simulates an increase in production and investment of 60% and 100% respectively by 2030 over the CP forecasts. The model also crudely computes energy use against energy produced in the region/country from the altered scenario.

183 It is important to note that country-level effects that arise through regional scenario interventions occur at different levels. Parameterization to 60% increase at the regional level will thus mean different increases for countries, as each country in the Sahel have distinct starting points/baselines.

184 The increase of 30% by 2030 means that the hydro-production increases by that amount up to 2030 before it levels off. This is not a representation of a 30% annual increment up to 2030.

		Assumption	
Scenario	**Impact area**	**IFs scenario assumption**	**Underlying logic – model structure**
Renewable Push (RP), cont.	Electricity use, access, and generation	An increase in electrification rates to 100% by 2030. An increase in electricity as a percentage of energy use by 30% at the country level by 2030 – the model thereby also makes estimations of increased electricity generation and capacity measures.	The model parameterizes *infraelecacctrgtval* (electricity access%) to a value of 100% and *infraelecacctrgtyr* (target year) to a value of 13 years. In effect, this aims for universal electrification in Sahel by 2030 (13 years from IFs base year, i.e., 2017). The proportion of electricity use in overall energy use (*enelecshrendemm*) is increased by 30% by 2030 over CP forecasts.
	Capital-output costs of renewables	Higher capital-output costs for hydro and other renewables are inherent to the model – although with time, diffusion of such technologies is eased. Additional government spending to boost renewable energy production.	Capital costs to output ratio for energy in IFs (*qem*) associated with renewables is assumed constant, and higher than other energy sources. The model assumes additional fiscal expenditure in the form of subsidies and other provisions to incentivize uptake of renewables. This is operationalized by the use of gdsm (other) raised to 25% over CP forecasts until 2030, followed by an increase to 50% over CP forecasts by 2050.
Balanced Green Growth (BGG)	Renewable energy production and investment	An increase in renewable production and investment by 30% by 2030.	The model raises energy production and investment (*enpm* and *eninvtm*) by 30% over CP forecasts by 2030. Note that this does not represent an annual increase of 30% every year up to 2030, but an interpolation to 30% by 2030.
	Conventional (or non-renewable) energy production and investment	An increase in natural gas production and investment by 30% by 2030, with a 20% increase in production and investment in other conventional sources of energy (mainly fossil fuel-based sources) in the Sahel.	*enpm* and *eninvtm* parameters associated with natural gas production and investment is increased by 30% over CP forecasts by 2030. For other conventional sources of energy, primarily oil, coal, and nuclear, it includes an increase by 20% by 2030.
	Electricity use, access, and generation	An increase in electrification rates to 100% by 2050 across the Sahel – a more realistic target. An increase in electricity share in energy use of over 20% by 2030 applied at the country level in the Sahel. Simulation toward reduction in electricity transmission loss by 25% by 2050 based on SDG Push interventions at the regional level (Hughes et al., 2021).	As opposed to the CP and RP scenarios, the parameter value for *infraelecacctrgtyr* is adjusted to 33 (to reflect universal electrification in 33 years from IFs base year 2017) and *infraelectrgtval* is adjusted to 100% for universal access value pertinent to electricity. Proportion of electricity use in overall energy use parameterized by *enelecshrendemm* is simulated to increase by an additional 20% over CP forecasts by 2030. Additional electricity-relevant parameterization include reduction in electricity transmission loss (*infraelectranlossm*) by 25% over CP forecasts by 2050. This brings in no additional cost implication, but simply allows for a greater availability of electricity for common household use.
	Agricultural yields	An increase in agricultural yields of over 20% of the CP levels by 2070 for high and upper-middle income countries; a 50% increase by 2050 for middle income countries; and a 30% increase by 2030 for the Sahel region (Hughes et al., 2021).	The parameter *ylm* or the agricultural yield multiplier is increased with 20% on top of CP projections for high and middle-income countries by 2070, a 50% increment by 2050 for middle income countries (including Nigeria) and a 30% increase for the Sahel region (excluding Nigeria) by 2030. This feeds on to productivity effects and increased food security.

		Assumption	
Scenario	**Impact area**	**IFs scenario assumption**	**Underlying logic – model structure**
Balanced Green Growth (BGG), cont.	Environment	A reduction in residential PM 2.5 levels by 25% for the Sahel by 2040, with an increase in carbon taxation to an additional $50/ton of carbon emission until 2030 followed by further $10/ton of carbon emission through 2050. Faster adoption of modern fuel and other improved technologies for indoor cooking – an additional 200% rise by 2030 and thereafter for the Sahel.	*envpm2pt5m* or the residential particulate matter levels is simulated to decrease by 25% by 2040 in the region. This compensates for policies that are suited to mitigation measures for increased growth in the region, thereby curtailing the environmental footprint. The carbon footprint is also minimized by the adoption of stipulated carbon taxation using the parameter *carbtax* in the model. It is simulated to represent an increase of an additional $50/ton until 2030, followed by a further increase of $10/ton through 2050. Variable *cookstovesadd* is parameterized in the model to reflect an increase in adoption of modern cookstoves of over 200% by 2030. The model also computes this transition accounting for an increased availability of electricity in homes under this scenario.
	Governance and spending	An increase in government effectiveness across countries in the Sahel by 30% by 2030, followed by an additional 20% increase by 2050. An increase in government spending toward household welfare transfers to skilled and unskilled labor force by 50% by 2040 for the world, barring low-income countries where we simulate a 100% increase by 2040. An increase in fiscal expenditures toward health, education and research and development sectors by an additional 75% over CP levels by 2050. This allows the model to identify that existing government resources may be constrained and thus requiring additional expenditure to support core sectors. An increase in the level of democracy by 30% by 2030, followed by an additional 20% increase by 2050 for Sahelian countries.	*goveffectm* or the government effectiveness parameter is increased by 30% by 2030 with an additional 20% improvement by 2050 over CP projections. This improves the state of governance and allows for a larger share of public funding toward the Sahel's core sectors that may have been lost due to implicit and explicit corruption costs. *govhhtrnwelm* or government spending toward household welfare transfers is increased by 50% globally over CP forecasts by 2040, excluding low-income countries where it is simulated to increase by 100% by 2040. This is indicative of a greater allocation toward public consumption spending in different forms as existing around the world, like cash transfers, public subsidies, minimum support prices, etc. *gdsm* (education, health and R&D) is simulated to increase by an additional 75% over CP projections by 2050. *democm* or the democracy multiplier in IFs is employed to bring about changes in the democracy indices. It is increased by 30% over CP projections by 2030 globally, with a further 30% increment for Sahelian countries by 2050.
	Labor-wage ratio by sex (gender gap) and gender empowerment	Interventions on gender empowerment measures and labor-wage sex ratio (female to male) – an increase of around 25% by 2030 followed by an additional 25% increase by 2050 applied at the regional level for the Sahel. Interventions for other countries stand between 15-30% by 2050 based on their income standing (Hughes et al., 2021).	Gender linking variables like gem and *labwagesexrat* are parameterized to reflect increased gender equity. These represent empowerment measures and wage sex ratios. They are increased by an additional 25% on top of CP forecasts by 2030, followed by a further increase of 25% by 2050 specifically for the Sahel. This intervention allows the model to compute other endogenous forecasts like multi-factor productivity of human capital, gender poverty, wages, and gender-specific access parameters.
	Caloric variation from mean	Coefficient of variation in caloric availability – an alternate, distributional measure for food insecurity – is reduced by 25% until 2030 for the Sahel, followed by an additional 5% by 2070.	*clpccvm*
	Education	An increase in lower secondary and tertiary graduation rates of over 200% by 2050, for the Sahel.	Revitalized revenue mobilization in education with greater share of budget devoted to the sector. Public-private partnerships and continued region cooperation (e.g., Alliance Sahel).
	Income inequality	Gini coefficient is simulated to a 15% reduction for Sahel countries until 2030, followed by an additional 15% decrease by 2050.	Progressive and fair tax and fiscal policies designed to: • Reduce income inequality. • Raise sufficient revenue to finance inclusive social and development policies.

Scenario	Impact area	Assumption	
		IFs scenario assumption	Underlying logic – model structure
Balanced Green Growth (BGG), cont.	Conflict/war	A reduction in the estimates of the likelihood and magnitude of conflicts arising due to an internal war or regime instability by 15% by 2030, followed by consistent reductions of over 5% until 2070 for countries in the Sahel.	Inclusive governance is paramount to reducing conflict-driven violence. • Closer functioning of a regional alliance or ombudsman for pragmatic political solutions to conflicts. • Rehabilitation of refugees and IDPs. • Dialogue and negotiations for sustained peace and security in the Sahel.
	Water and sanitation access	An increase in the provision of improved water and sanitation access to Sahelian countries of over 50% above CP levels by 2050.	Amplified energy needs met through diffusion of hydro-based technologies. Development of dams and decentralized irrigation systems can support needs for domestic use. Targeted WASH (Water, Health and Sanitation) programs in high-demand and low-supply Sahelian countries.

Energy and Electricity Investments in IFs

The tables below highlight annual as well as cumulative energy investments in the Sahel across the different scenarios considered in the study. IFs computes investment directed by destination that includes agriculture, energy, materials, manufacturing, services, and ICT. The energy investment component comprises of the spending directed toward expansion of energy infrastructure including all primary energy types like coal, oil, gas, nuclear, hydro and other renewables.

Table 26 Annual investments directed toward energy sector in the Sahel across scenarios

Year/ Scenario	Current Path (in billion $)	Renewable Push (in billion $)	Balanced Green Growth (in billion $)
2063	97.92	117.1	124.1

Source: IFs v8.01.

In 2063, IFs projects an annual energy investment of around $98 billion in the Current Path scenario. With further ambitious scenarios of the Renewable Push and the Balanced Green Growth, the annual investments in energy for the year 2063 climb to around $117 billion and $124 billion respectively. These additional investments are on the account of several interventions and assumptions under each scenario directed toward areas beyond energy and electricity.

Table 27 Cumulative investments toward energy starting 2017 across scenarios in the Sahel

Year/ Scenario	Current Path (in billion $)	Renewable Push (in billion $)	Balanced Green Growth (in billion $)
2063	1,735	2,062	1,898

Source: IFs v8.01.

Cumulatively, the investments until 2063 under the Renewable Push are higher than in the Current Path and Balanced Green Growth scenarios. This is due to aggressive interventions toward expanding energy and electricity access – specifically including attainment of universal electricity access in the Sahelian countries by 2030.

Table 28 below looks at the cumulative investments starting from 2017 required to be on the BGG pathway at a disaggregated country level by 2063.

Table 28 Cumulative investment in energy under BGG scenario across Sahel countries by 2063

Country	Cumulative investments needed by 2063 (in billion $)
Burkina Faso	23.4
Cameroon	86.3
Chad	104.8
Gambia	4.9
Guinea	19.6
Mali	11.6
Mauritania	3.1
Niger	68.9
Nigeria	1,571
Senegal	5.1

Source: IFs v8.01.

Rural and Urban Electricity Access Spending

Table 29 below shows the cumulative investments toward expansion of rural and urban electricity access by 2063 in the Sahel across different scenarios. These investments are specifically the public and private spending toward expanding electricity access in urban and rural areas. However, this does not include the electricity generation investments.

Table 29 Cumulative investments toward expansion of rural and urban electricity access by 2063 in the Sahel

	Current Path (in billion $)	Renewable Push (in billion $)	Balanced Green Growth (in billion $)
Electricity access (rural)	92.5	129	116.8
Electricity access (urban)	117.8	127.4	125

Table 30 below shows these cumulative investments for countries in the Sahel by 2063 under the Balanced Green Growth scenario.

Table 30 Cumulative investments toward expansion of rural and urban electricity access by 2063 per Sahel countries

Country	Electricity access (rural), in billion $	Electricity access (urban), in billion $
Burkina Faso	2.3	1.7
Cameroon	2.8	4.5
Chad	16.2	4.1
Gambia	0.4	0.7
Guinea	5.8	3.3
Mali	2.1	2.5
Mauritania	1.2	1.9
Niger	5.9	1.3
Nigeria	77.4	102.2
Senegal	2.8	3.1

Table 31 **Parameter list**

Parameter abbreviation	Description
Enpm	Energy production multiplier
Eninvtm	Energy investment by fuel type multiplier
infraelecacctrgtval	Parameter for simulating a fixed electricity access target value
infraelecacctrgtyr	Parameter for simulating a fixed electricity access target year
enelecshrendemm	Electricity as a share of energy use
qem	Capital costs to output ratio multiplier for energy fuel types
gdsm	Government expenditure multiplier by destination type
infraelectranlossm	Electricity transmission and distribution loss multiplier
Ylm	Agricultural yields multiplier
envpm2pt5m	Residential particulate matter 2.5 levels multiplier
Carbtax	Carbon tax
cookstovesadd	Net cookstoves added
goveffectm	Government effectiveness quality multiplier
govhhtrnwelm	Government to household welfare (non-pension) transfers multiplier
Democm	Democracy level multiplier
labwagesexrat	Ratio of female to male wage multiplier (gender wage gap multiplier)
Clpccvm	Coefficient of variation for calories per capita multiplier
ginidomm	Domestic Gini multiplier
sfintlwaradd	Additive factor to introduce a shift in the probability of internal conflict over time for a region/country
waterhhm	Multiplier for share of population with access to water services
sanitationm	Multiplier for share of population with access to sanitation services

Table 32 Data sources

Variable	Definition	Source
Energy use and production	Energy demand and production across five types (oil, coal, natural gas, hydro, nuclear and other renewables) in billion barrels of oil equivalent.	IEA World Energy Balances
GDP	GDP (MER) at constant 2017 $.	History – World Bank WDI, short-term forecasts – IMF World Economic Outlook
Total fertility rate	Number of children per woman over lifetime.	World Bank WDI
Population	Population by sex, age cohorts and urban/rural.	UNPD World Population Prospects
Electricity access	Percentage and headcount of population with access to electricity.	World Bank WDI
Carbon emissions	Carbon emissions from fossil fuels in billion tons of carbon.	Carbon Dioxide Information Analysis Center
HDI	Human Development Index (HDI), 2017 Revision Methodology.	UNDP HDR
Poverty	Percentage of the population living on less than $2.15 a day at 2017 international prices, estimation by World Bank, Poverty and Inequality Platform.	World Bank WDI
Infant mortality	Number of infants dying before reaching one year of age, per 1,000 live births in a given year.	World Bank WDI
Under five mortality	Number of children aged 0-5 dying per 1,000 of-age children.	IHME Global Burden of Disease
Malnutrition	Prevalence of malnutrition is the proportion of children under the age of five whose weight for height is more than three standard deviations below the median for the international reference population ages 0-59.	World Bank WDI
Stunting	Prevalence of stunting is the percentage of children under the age of five whose height for age is more than two standard deviations below the median for the international reference population ages 0-59. For children up to two years old, height is measured by recumbent length. For older children height is measured by stature while standing. The data are based on the WHO's 2006 Child Growth Standards.	World Bank WDI
Civil war event	Binary indicator of presence of civil conflict events (1=Present; 0 = Absent).	Center for Systemic Peace – INSCR
Democracy	Polity scores converted from -10 to 10 scale to 0 to 20.	Center for Systemic Peace – Polity
Domestic Gini	Gini index of income inequality.	World Bank WDI
Caloric distribution	For many countries, the coefficient of variation, taken as an indicator of the dispersion of the food consumption distribution within the general population.	FAO Food Security and Nutrition
Enrollment rates, education	Percent of of-age individuals by sex enrolled in applicable education levels (primary, lower secondary, upper secondary, tertiary).	UNESCO Institute for Statistics
Transition rates, education	Percent of of-age individuals by sex continuing from primary into secondary education.	UNESCO Institute for Statistics
Intake rates, education	Gross entry ratio to first tertiary programs by sex.	UNESCO Institute for Statistics
Deaths/mortality	Deaths from different disease causes disaggregated by sex.	IHME Global Burden of Diseases
Water and sanitation	Population with access to improved and safe water and sanitation services.	WHO/UNICEF Joint Monitoring Programme

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