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AN AFRICAN VISION FOR THE CONTINENT'S ENERGY TRANSITION

Anteneh Dagnachew, Andries Hof
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An African vision for the continents' energy transition

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Corresponding author

Anteneh.Dagnachew@pbl.nl

Authors

Anteneh Dagnachew, Andries Hof

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Contents

1	Introduction	4
2	Energy access and consumption	4
3	A vision for energy transition	7
4	Key elements of the African energy transition	9
4.1	Energy for agriculture, food, and water	9
4.2	Renewable energy pathways	10
4.3	Energy and industrialization	11
4.4	Household energy and clean cooking	11
5	References	13

1 Introduction

The African energy landscape is complex, both in resource heterogeneity and level of access to clean and modern energy. Hence, a transition to full access to modern and sustainable energy calls for a strategy to carefully balance the requirement for sustainable economic growth with the need to prevent stranded resources and assets. Such a transition will undoubtedly have consequences on global emissions and climate change, and it has long been an important theme in the African Union – European Union strategic partnership.

The importance of energy in the African – EU partnership is evident when looking at trade: more than a third of EU imports from Africa consisted of energy in 2020. With the EU moving to decarbonization by 2050, the interest in oil and gas import from Africa will decline, shrinking the finance in the region. At the same time, with rapid declining of renewable energy prices, the vast renewable energy potential of the continent and the supply chain of the renewable energy industry become highly attractive investment opportunities. Furthermore, the large potential for low-cost green hydrogen production could make Africa a preferred destination for several energy-intensive industries.

The EU already has proposed to make universal access to clean and modern energy as the main pillar of the green deal cooperation with Africa. In line with the sustainable development goals, the EU aims to “partner with Africa to maximise the benefits of the green transition and minimise threats to the environment in full compliance with the Paris Agreement” (European Commission 2020).

In this memo, we provide information that can help the Dutch government and institutes to explore how to facilitate and support the energy transition in Africa for mutual benefit. We do so by summarizing i) the current state of access to clean and modern energy and consumption in Africa in section 2, ii) the vision of Africa’s energy transition according to the African Energy Commission in section 3, and iii) the key elements of the African energy transition identified during a workshop with African energy experts in section 4.

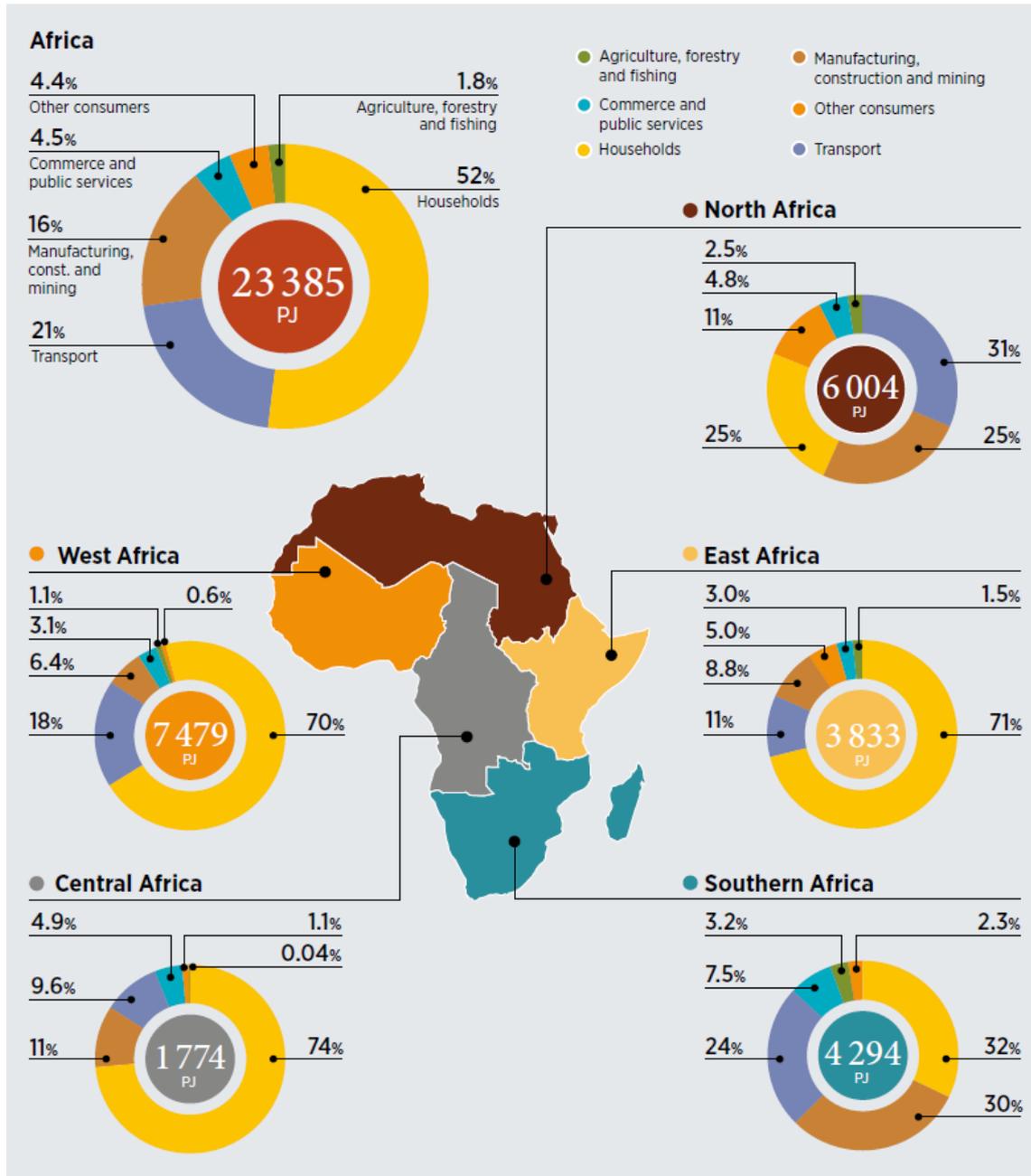
2 Energy access and consumption

Energy plays a critical part in the development of Africa. With large and fast-growing young population, the expansion of access to reliable and affordable modern energy is key to unlocking the continent’s development potentials. Universal access to clean and modern energy is essential not only for achieving health and educational goals, but also for improving productivity, enhancing competitiveness, unlocking economic potential, and creating jobs.

Final energy consumption in Africa in 2020 was 24.4 EJ, which comes down to 18.2 GJ per capita, compared to a world average consumption of 53.3 GJ per capita (IEA 2021). Dominated by inefficient biomass use, the residential sector is the largest consumer of final energy in Africa, particularly in west & central Africa and eastern Africa, followed by the transport sector. The share of electricity in final energy consumption in Africa remains extremely low (Figure 1, IRENA and AfDB 2022).

More than half of the population in Sub-Saharan Africa still lacks access to electricity, and over 80% does not have access to clean and modern cooking solutions (Figure 2, IEA 2022), even though Africa has more than enough energy resources not just for its own energy sovereignty but also for export. The untapped potential for both wind and solar energy is enormous, especially in the north and parts of South and East Africa (Figure 3, IRENA and AfDB 2022). There are several technical, social, cultural and behavioral, institutional, economic and financial barriers that impede the wider deployment of renewable energy in the region (Dagnachew, Hof et al. 2020).

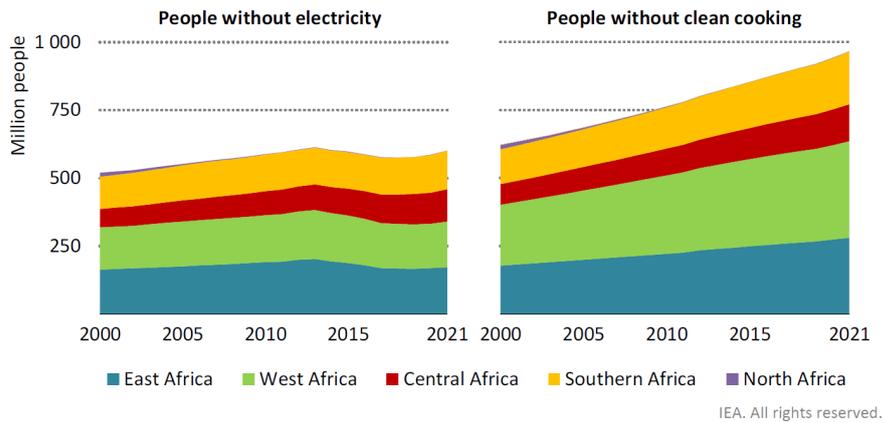
Figure 1: Final energy consumption in Africa by sector, 2018



Source: IRENA and AfDB (2022). Original source: UNSD (2018)

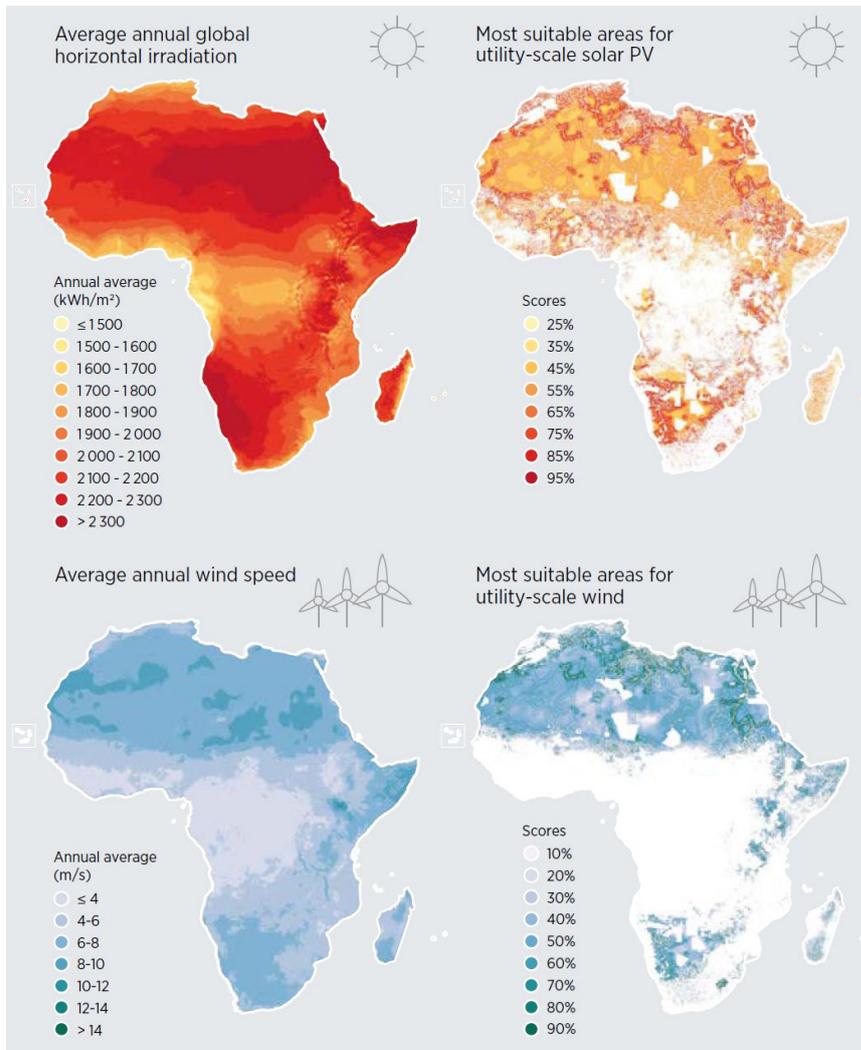
Note: PJ = petajoule

Figure 2: Lack of modern energy access in Africa



Source: Figure 1.6 from IEA (2022)

Figure 3: Solar and wind energy resources in Africa



Source: Figures 2.9 and 2.12 from IRENA and AfDB (2022). Original sources: ESMAP (2019), Technical University of Denmark (2015) and IRENA (2021)

Notes: kWh/m² = kilowatt hours per square metre; PV = photovoltaic; m/s = metre per second

3 A vision for energy transition

Africa is one of the regions most affected by climate change, but contributed little to greenhouse gas emissions in the past: energy-related CO₂ emissions in Africa have accounted for about 3% of total world CO₂ emissions so far (IEA 2022). Under the Stated Policies Scenario¹ of IEA, the contribution of Africa to global cumulative CO₂ emissions remains at 3% by 2040, despite the projected rapid economic growth in the region. As outlined by the United Nations Framework Convention on Climate Change (UNFCCC), actions to fight climate change should be “on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities”.

The energy transition path in Africa is complex and requires carefully navigating through the need for sustainable economic development and avoiding stranded resources and assets. There are countries with significant renewable energy potential that could leapfrog to a zero-carbon energy system, given strong financial and technical support. And other countries are endowed with natural gas and other fossil resources and rely on exports of these, which could risk stranded assets without concrete and economically attractive alternatives.

Driven by population growth, economic development, climate change and the goal to provide universal access to modern and sustainable energy for all, the energy sector in Africa will experience substantial structural change over the coming decades. This requires large-scale capacity building, mobilization of substantial amounts of finance, and most of all, a clear vision for the energy transition. The African Union puts “promoting renewable energy, energy efficiency and access, and supporting the Just Transition to clean energy” as one of the five key priority areas in its Green Recovery Action Plan 2021-2027 (African Union 2021).

The African energy vision is guided by Agenda 2063, the Sustainable Development Goals (SDGs), and the Paris Agreement and links the energy transition with social and economic development of the continent. Agenda 2063 includes not just Africa's vision for growth and development but also outlines essential flagship programs that can accelerate the continent's transformation. Agenda 2063 acknowledges energy as a key resource to drive the development of the region and emphasizes the need to ensure that the energy sector challenges are fully addressed to support all

¹ The Stated Policies Scenario provides a measured assessment of where today's policy frameworks and announced policies, together with the continued evolution of known technologies, might take the energy sector in sub-Saharan Africa in the coming decades. Given that announced policies are by definition not yet fully reflected in legislation or regulation, the prospects and timing for their full realization are based upon our assessment of the relevant political, regulatory, market, infrastructural and financial constraints. This scenario does not focus on achieving any particular outcome: it simply looks forward on the basis of announced policy ambitions in various sectors.

sectors of Africa. The African energy commission (AFREC²) sets out the vision for energy transition in Africa that includes four programmes³:

1. **Energy transition programme.** This programme addresses the system transformation required in the short, medium and long term for the regional energy transition to achieve the goals set out in Agenda 203, the Sustainable Development Goals, and the Paris Agreement. The implementation of this program is defined around seven strategic objectives:
 - a. Building the *energy infrastructure* for economic and social development;
 - b. Development of the renewable energy sector;
 - c. Energy efficiency programs for buildings, industry, and transport;
 - d. Careful consideration of the possible role of national, regional, and inter-continental gas pipelines;
 - e. Development of an integrated African electricity network;
 - f. Decarbonisation of the energy and other sectors;
 - g. Implementation of a systematic, continent-wide approach to *innovation*.
2. **Energy efficiency programme.** With a strategic integrated energy policy approach at the continental level, the programme aims to transform the African energy market to higher efficiency lighting and electrical appliances, resulting in significant reductions in final energy demand and increased electricity access, competitiveness, energy security, and economic development.
3. **Bioenergy programme.** Two-thirds of the countries in Africa depend on biomass for more than 50% of total final energy consumption. The bioenergy programme intends to promote bioenergy resource monitoring, reporting, and sustainability in African countries with greater bioenergy output and consumption.
4. **Oil and gas programme.** Aims to create the African domestic crude oil and petroleum products market by developing the required policies, strategies and promote expansion of refinery production capacity in Africa and associated infrastructure.

With the aim of enhancing transparency and coordination of initiatives and programmes, mapping and monitoring of energy initiatives and programmes in Africa (MMEIPA⁴) provides a platform where energy sector investments are prioritized as a prerequisite for sustainable development. There are six focus areas of the MMEIPA that aim to enable and facilitate the successful implementation of these programmes: mapping and monitoring of energy initiatives and

² The African Energy Commission (AFREC) is a specialised energy agency of African Union with a mandate established by African Heads of States and Governments in 2001, with broad objectives to lead the development of energy policies and programmes, create and continuously update the African Energy Statistics, mobilise technical and financial support for Member States and implement capacity building programmes.

³ <https://au-afrec.org/en/programs>

⁴ MMEIPA is a coordination effort spearheaded by several regional and continental organizations and funded by the European Union. The MMEIPA portal presents an online tool that maps existing energy initiatives and programmes. It is a critical activity for the pan-African coordination effort that aims to increase coherence, efficiency and effectiveness of support provided by development partners. <https://mmeipa.africa-eu-energy-partnership.org/partners>

programmes, assessing and documenting partners contributions to SDGs, measuring and communicating EU/African Union contributions, systematic knowledge exchange and guidance, knowledge facilitation and capacity building, and NDC support to Member States.

4 Key elements of the African energy transition

A transition of the African energy system is key for regional social and economic development. During a workshop with 25 African energy experts in Tanzania (Arusha, May 15-19 2022), organized by Powershift Africa⁵ and Climate Action Network Tanzania, four crucial elements for the African energy transition were identified: i) energy for agriculture, food, and water; ii) renewable energy pathways; iii) energy for industrialization, and iv) household energy and clean cooking. While these elements are sectoral, the expert group acknowledges that there are other cross-cutting issues, including the governance of the energy system, information systems and modelling to assist planning, and capacity mobilization and building, that need to be addressed for a successful transition.

4.1 Energy for agriculture, food, and water

Africa has the fastest growing population in the world, which doubled between 1995-2020 and is expected to nearly double once more by 2050 (United Nations 2019). Together with increasing income, rapid urbanization, and a growing middle class, the demand for food is rapidly increasing, projected to be 55% higher by 2030 relative to 2020 (European Union 2020). Food sovereignty will increasingly be an aim for African states and regional markets, as witnessed during the present conflict in Ukraine that exacerbated food shortage (Ali, Dadush et al. 2022). Africa will need to produce a lot more food to close the gap between the current production and the projected food demand, while harnessing the economic benefits of the largest employment sector in the continent.

Most food is currently produced by smallholder subsistence farmers, who are increasingly marginalized by processes of climate change and variability and the effects of globalization and market shocks (Akram-Lodhi 2015). On average, African farmers have relatively large yield gaps, i.e. the difference between potential and actual crop yield, in the production of cereals and other food crops (Leitner, Pelster et al. 2020). Important reasons are that there is a sizeable amount of untapped irrigation potential (AGRA 2017) and 75% of the smallholder farmers work their lands with hand tools only (Shirley 2020). This has led to very low levels of agricultural productivity.

Agriculture in Africa is the most essential sector to tackle poverty, since three-quarters of working adults in extreme poverty are employed in the sector (Ritchie 2022). Although the form of structural transformations that can best address developmental questions for these farmers are contested

⁵ <https://www.powershiftafrica.org/>

(Akram-Lodhi and Kay 2012), all such pathways should include reducing the yield gap and increasing labor productivity, as well as irrigated agriculture expansion to cope with climate change and variability. However, only a quarter of the rural population in Sub-Saharan Africa currently has access to modern energy, which limits the expansion of irrigated agriculture and mechanization.

Increasing access to modern energy can increase overall productivity of smallholders as it allows improvements in crop processing. Currently, processes like grinding millet, rice, maize, and cassava for gruels and porridges, are often done with a conventional, time-consuming mortar and pestle (Ajala and Gana 2015). In addition to improving productivity of these processes and freeing time for additional on-farm and household productive activities and leisure, using modern energy for these processes would greatly improve efficiency and product quality. As such, access to energy for smallholder households has a multiplier effect on wellbeing because it improves access to water, health, education, and work opportunities, and addresses the gender dimensions of labor-intensive household activity (Fingleton-Smith 2018).

4.2 Renewable energy pathways

Most African nations have the chance to leapfrog to cleaner, flexible, more efficient, and adaptable energy systems. Ensuring universal access to affordable, reliable, and sustainable modern energy and harnessing the power of renewable energy are the two fundamental principles driving the energy transition in Africa (AREI 2015). Given the fact that the electricity mix in South Africa, North Africa and much of West Africa is dominated by fossil fuels and the considerable renewable energy potential of the continent (see also Figure 3), the nationally determined contributions (NDCs), which are the fundamental pieces of the Paris Agreement, have emphasized renewable energy development as climate change mitigation strategy. The Africa Renewable Energy Initiative (AREI) has set an aspirational goal of mobilizing 300GW of new and additional capacity by 2030 to support the strategy (AREI 2015). However, most African countries do not have clear pathways for scaling up their renewable energy system capacities, and where there are policies and strategies, they are fragmented (Ibrahim, Hamam et al. 2021). Therefore, there is an urgent necessity for long-term planning for renewable energy systems that account for the energy service needs as well as local and regional capabilities in Africa. At the same time, this long-term planning should be complemented by short-term strategies that build up incrementally to balance the current needs for universal access and the increasing electricity consumption as income grows.

African energy planners lack reliable decision support tools, such as models, that help explore various pathways for the transition towards an energy system dominated by renewable energy. Already available global models can be used as a basis for establishing stakeholder participation and engagement around the development of renewable energy policies and strategies, but these tools need to be transparent so that they can be challenged and further developed over time to address the unique contexts of African countries. Different community groups should be engaged in the modeling processes of renewable energy pathways, as this will strengthen ownership of the process and local leadership. At the same, the urgency for a strong South-South collaboration in sharing experiences and best practices, and a South-North collaboration for sharing resources and technology transfer was recognized.

4.3 Energy and industrialization

Industrialization was crucial to the economic transformation of developed countries and emerging economies. In high- and medium-income countries, the shift of labor from low value-added to higher value-added sectors led to enhanced labor productivity, raised GDP per capita, improved livelihoods, provided high levels of employment and incomes, and decreased poverty on a national scale (Triki and Said 2021). Today, Africa remains the world's least industrialized region. Therefore, industrialization is at the heart of Africa's development strategies, largely driving economic development and creating safe and decent jobs for rapidly growing young population. Harnessing the full potential of this transformation requires establishing, developing, and modernizing the domestic manufacturing sectors to support industrialization and economic progress.

Energy infrastructure expansion, both in generation, transmission, and distribution, is an urgent priority to drive industrial development in Africa. The availability of abundant energy resources and large quantities of mineral resources provides an opportunity for industrial expansion in much of Africa. However, it is essential to balance between expanding industries for socio-economic development and achieving climate goals. African policymakers emphasize the need and the potential for green growth that safeguards the environment and improves the welfare of communities (Brahmbhatt, Haddaoui et al. 2017).

For all segments of society to participate in and benefit from the industrialization, industrial growth in Africa must be both inclusive and sustainable. Hence, renewable energy plays a crucial role in the industrial development of Africa, not only for harnessing the renewable energy potentials for industrial energy needs, but also through the development of strategies for establishing renewable energy technology value chains in African countries. The latter allows African ownership of the clean energy transition. Such strategies may involve progressive approaches, where one can begin with manufacturing and assembly of renewable energy components and move towards increasingly sophisticated production of equipment. There is also a prospect of green hydrogen production that can be used to power low-carbon heavy-industries in Africa.

A low-to-zero carbon energy development strategy should, therefore, go beyond merely technology imports and be integrated in industrialization programs. This transition requires a strong collaboration with industrialized nations, not just through financial support but also in capacity mobilization and building to develop a thriving sustainable manufacturing industry.

4.4 Household energy and clean cooking

Despite the fact that a number of nations have made major strides in recent years to increase access to electricity, the number of people without access in Africa in 2021 reached 600 million, 10 million more than the number of people lacking access in 2010 (see Figure 2). Between 2010 and 2021, the number of people without access to clean cooking even increased from 800 million to 970 million, an increase of more than 2% annually between 2010 and 2021 (IEA 2022). The logistic and financial hurdles exacerbated by the pandemic have slowed down the rate of progress in electricity access in the region, resulting in a net increase in population without access to electricity. The progress towards universal access to clean and modern cooking technology has always been challenging and lagged behind the progress made in electricity access, and the pandemic made the trend worse.

In the past, the clean cooking sector has often been often disconnected from other energy access programs and projects. Clean cooking has important links to energy, health, environment, climate and gender, but it is rarely prioritised by any sectoral institution. As a result, many energy interventions did not integrate clean cooking into their planning and design. There is a need to rethink the household energy demand (including clean and modern cooking) and its role in a broader, more holistic, energy access framework.

Though there are numerous possibilities, addressing household energy demands must be context-sensitive, consistent with a commitment to combating climate change, compatible with resources available in the region, and should take a balanced approach to maturity and affordability of modern energy technologies. The energy transition should be owned and led by the local community and it should reflect the needs and capabilities of the same community. There is need for more research to understand household energy needs for residential end-use services as well as for productive uses of energy that differ by region and communities. Such knowledge will enable the development of efficient and Indigenous technologies acquired through understanding and adapting of already existing local knowledge, culture, and technologies.

The cost of acquiring clean and modern cooking technologies has been the hurdle in the energy transition; households need financing options for high upfront cost of devices, local manufacturers need capital for scaling up manufacturing to meet demand, and distributors need finance to get the product where it is needed. Given the low and unstable income of the rural poor, innovative financing models are required to support the transition and manage the risk. There is also the need for co-creation of modern cooking technologies to increase ownership and uptake; community engagement in the design, testing and manufacture of the stove to ensure suitability and sustainability, and raising public awareness to the benefits of clean and modern cooking technologies.

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