

Review

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Review

# Enhancing Understanding through Data Visualization: What Can Available Data Reveal about Access to Energy in Displacement Contexts on the African Continent?

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**Abstract:** The extent of access to energy of displaced populations in settlements and camps in Africa is largely unknown, given 94% of displaced persons without access to electricity and 81% with a reliance on biomass for cooking. A multitude of contextual factors, such as the location and the characteristics of housing, the legal status, the socio-cultural background and the availability of humanitarian and public services impact the living conditions and the needed energy services. Limitations in accessing energy services have direct, multilayered, and far-reaching implications, including impacts on health, nutrition, education, protection, and livelihood. The objective of this article is to contribute to a more comprehensive overview of the current state of energy access in displacement contexts on the African continent by identifying and utilizing existing data. After a screening of the vast and various available information, setting up of a database, consolidating the gathered data as well as assessing the quality through a quality assessment method, the currently available information is visualized and discussed. Considerable differences in the access to electricity for displaced persons across the countries are found. For both electricity and clean cooking, the availability for displaced persons ranges from nearly no access at all up to an access rate of 100%. More strikingly, the results also show that besides South Africa, and the selected countries in the Maghreb region, the access to both clean cooking and electricity for displaced persons is very limited. At the same time, the fragmentary quality of the data allows neither solid theoretical conclusions nor planning of effective practical implementation measures. Novel conceptual frameworks and indicators are needed that can be applied across studies for the purpose of comparability and consistency. As a consequence, future research has the potential to generate a more comprehensive understanding of what is currently happening in the contexts and in a next step to examine how energy is interwoven in the lives of displaced people to derive a set of more detailed context-sensitive energy indicators. It is essential that the concerned persons, the displaced persons themselves are included in the research in a meaningful way.

**Keywords:** access to energy; displacement contexts; humanitarian settings; data assessment; data visualization; electricity; cooking

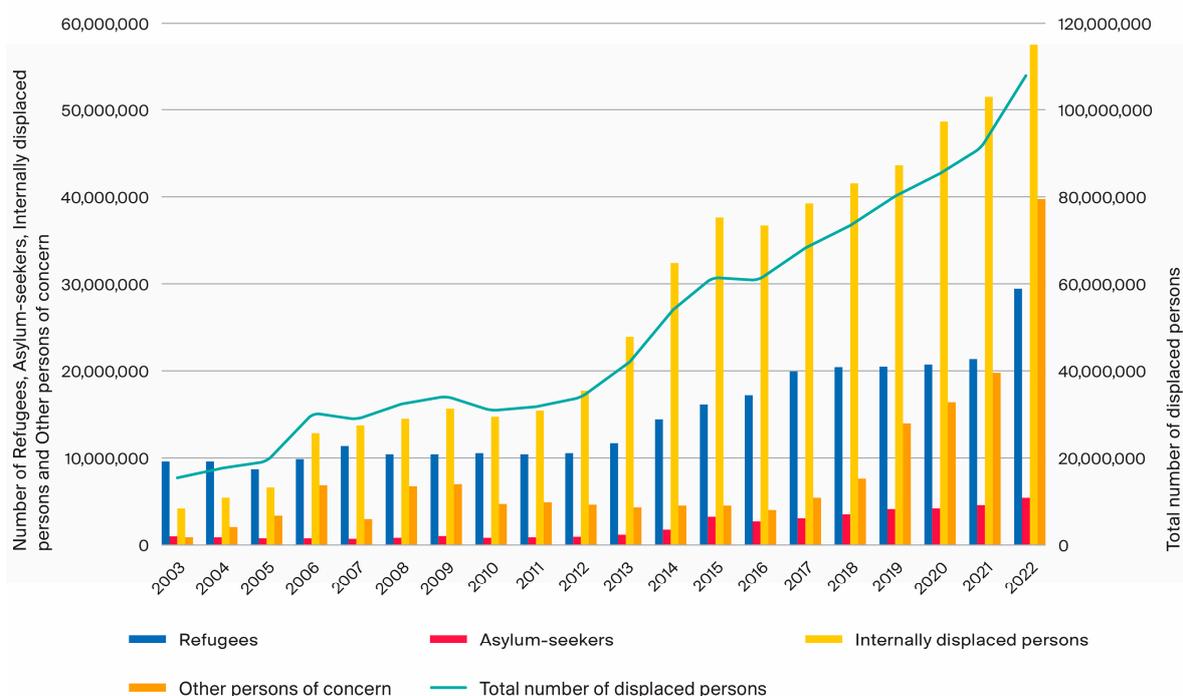
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## 1. Introduction

### 1.1. The Context of Displacement and Access to Energy

Global crises such as climate change, conflict and natural disasters have resulted in a growing number of persons who were forced to leave their home. UNHCR, the UN refugee agency, estimated that in 2024 there will be 130.8 million displaced persons in the world [1]. Displaced persons are “persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, either across an international border or within a State [...]” [2]. The term

displaced persons includes but is not limited to refugees, asylum seekers and internally displaced persons (IDPs), for which relevant definitions can be found elsewhere [2–4]. Displacement has implications not only for displaced persons themselves, but also for those hosting them, which are often referred to as the host country and host community. With 134 countries currently accommodating displaced persons [5], active engagement with the displacement context is a global matter and it is a matter that is growing in scale. As is shown in Figure 1, in the last decade the number of displaced persons has continuously increased.



**Figure 1.** Evolution of the number of refugees, asylum-seekers, IDPs and other persons of concern. Own compilation based on data from UNHCR [1].

While cumulative global statistics are relevant to highlight the increasing relevance of the subject matter, it is essential to acknowledge that the lived experiences of displaced persons vary greatly between different host countries and contexts. A multitude of contextual factors, such as the location and the characteristics of housing (settlement, camp-like, urban, rural, etc.) [6], the legal status of displaced persons [7], the socio-cultural background and the availability of humanitarian and public services have a major impact on the conditions of living. In our study we focus on displaced persons residing in settlements and camps. While in the humanitarian space there is no universally agreed upon definition for the term *settlement*, we recognize that the terms *settlement* and *camp* are in many cases used to describe settings with different attributes (e.g., [4,6,8–11]) and we agree that the differentiation adds a valuable dimension to the discourse.

One key factor determining the conditions of living is access to energy [12]. In humanitarian settings different energy needs coexist. First, energy is needed to enable the operation of humanitarian actors, such as electricity in the offices of humanitarian organization and fuel for transportation [6,12]. Second, displaced persons have a wide range of energy needs that are embedded in basic areas of life [13], characterized by energy needs on a household level, such as for electricity and cooking, energy needs for income generating activities or businesses and energy needs on the community level, such as streetlights and the operation of public facilities such as schools and hospitals [13]. In this article, we focus on energy needs of displaced persons on an individual, household and community level as opposed to generalized energy needs that are associated with humanitarian operations.

The critical importance of the availability of clean, reliable, and affordable energy services for a qualitative life is reflected in Target 7.1 of the Sustainable Development Goals (SDGs) [14], which now explicitly includes displaced persons [15]. Nevertheless, despite this critical importance, there are fundamental shortcomings in the majority of displacement contexts. The Global Platform for Action, a working group hosted by the United Nations Institute for Training and Research (UNITAR), estimated that in 2022, 94 percent of displaced persons living in settlements and camps did not have access to electricity, and 81 percent of displaced persons living in settlements and camps relied on biomass for cooking [16]. The limitations in accessing energy services have direct, multilayered, and far-reaching implications, including impacts on health, nutrition, education, protection, and livelihood [6,17–19]. For example, food security is directly linked to a reliable fuel source [17], the use of firewood for cooking is linked to health risks [20] - especially respiratory and eye diseases [7] - and the lack of lighting in public spaces is associated with conflicts, and sexual and gender-based violence [21,22].

Besides the direct impact on wellbeing of displaced persons, there is a multitude of downstream impacts associated with the limitations in access to energy. A significant challenge is the high dependency on biomass for cooking leading to environmental degradation [6]. In some locations this has caused camps being cleared of vegetation in a radius of several kilometers [23]. The resulting scarcity of resources in turn can fuel conflicts, the consequences of which are especially severe for vulnerable members of the respective communities [23].

Therefore, international development organisations emphasize and recent publications [16], [24] underline, that the affected African settlements have the lowest levels of access to energy in displacement settings and this is, where the most progress is needed to be made. While we acknowledge that research of energy access in displacement settings is critical in all regions of the globe, for pragmatic reasons, this study focuses on the African continent to handle the various information sources and the vast array of data. Also, the majority of the displacement settings in African countries are not connected to an electricity grid whereas grid connection can frequently be found in other parts of the world that have large numbers of displaced persons, specifically in West and South Asia [16]. Furthermore, the African continent is by far hosting the most displaced persons [1], which underpins the decision to focus our research on this continent.

While global energy access indicators regarding electricity and clean cooking are relevant to showcase the overall scale of the challenge, it is important to note that access to energy is not a binary condition – grid connected vs. not, cooking with firewood vs. not - but appears on a spectrum [25]. The Multi-Tier Framework (MTF) of energy access introduced a multidimensional framework that allocates energy access conditions to different tiers, in which Tier 0 constitutes no access at all and Tier 5 constitutes the highest level of access [25]. In addition, it is significant that access to energy in itself is not a value in isolation, but rather a precondition to satisfy multiple energy service needs [26].

A further essential consideration regarding access to energy is the diversity of energy demand [18]. The contextual diversity of displacement settings is mirrored by the contextual diversity of the energy demands, the challenges that are associated with limitations in energy conditions and preferences of displaced persons. In the case of cooking, the associated challenges may be influenced by “culture, geography, season, fuel type, local practices and general awareness” [27]. Consequently, energy needs are not only determined by the descriptive characteristics of a settlement, but also by individual circumstances and individual preferences. The growing recognition and the increased emphasis of the diversity of energy needs (e.g. [18,27–29]) is not addressable by the predominantly technology-focused and top-down energy interventions in settlements and camps.

### *1.2. The Levels of Data and the Current State of Affairs*

In contrast to other sectors of the humanitarian response system, such as waster, health and shelter, the provision of energy services is not operationalized by established institutional actors [17,18,30] and energy has historically not been a priority in humanitarian response [19]. Mirroring the increased recognition of the central importance of access to energy on a global level, efforts to further this challenge in displacement settings have increased in the last decade. Thomas et al. [19]

provided an overview of the most relevant institutional initiatives, including the UNCHR's commitment in 2019 to enable Tier 2 electricity access by 2030 to all refugees as part of the so called Clean Energy Challenge. The increased recognition of the essential importance of energy in humanitarian settings is also reflected in the growing number of scientific publications [24]. However, the overall scientific engagement with the subject remains limited. Rosenberg-Jansen [24] identified a total of 115 relevant scientific documents in a literature review in 2022. The limitations in scientific publications accompany limitations in available data. For a small number of host countries case studies were conducted and published in scientific journals that allow basic insights into the contextual conditions of energy access in selected settlements and camps [17,31–37], while case studies documented in grey literature provide additional selective insights [24].

Both in the research and in the humanitarian response field, the critical role of data has repeatedly been highlighted [31,38–40]. In a consolidating report on the state of energy access in displacement settings, the GPA highlighted the need for evidence and data to inform systemic change as one of their key messages [16], which picks up on the Working Area *Data, Evidence, Monitoring and Reporting* (Working Area V) that the GPA had outlined in the Framework for Action in 2018 [40]. Establishing a realistic and comprehensive overview of the energy access situation is key to inform action on multiple levels. It is essential for policy making to foster integration of displaced persons in national energy access plans [41], for humanitarian assistance to inform planning and daily operation and for research to further novel concepts and approaches [24] and for donors to establish relevant funding programs. Therefore, accurate and detailed data is significant to establish a comprehensive understanding of the diversity of energy-related lived realities of displaced persons, which is a precondition for relevant action and intervention on all levels.

Several initiatives have contributed to further the systematic collection and sharing of data. One of the first initiatives to systematically assess the multifaceted role of energy in displacement settings was the Moving Energy Initiative, introduced in 2015 by a consortium of organizations and hosted by Chatham House [42]. In 2017 UNHCR initiated the Integrated Refugee and Forcibly Displaced Energy Information System, which monitors the progress of improved access to energy [43]. In 2018 the GPA was founded, which has taken up coordination activities, highlighted pathways to efficiently improve energy access and has published contextual insights as part of the READS program [44]. The Humanitarian Data Exchange platform, which is hosted by OCHA, includes data sets on energy access in settlements and camps [45].

Despite these recent efforts to improve the information base on energy access in displacement settings, the insights, and the data on energy access in settlements and camps remains dispersed and fragmented. Numerous scientific articles state the lack [16,39,46] and the poor quality [24,39,47] of available data, which is rarely harmonized across the levels from individual over communal to regional and international spheres and therefore insights differ, and comparisons are barely justifiable. While one source might describe the individual level in a country while another one might do so too but uses different definitions of the type and the units of data, what hinders integration and joint usage. Because of the general lack of data and the lack of cohesion, the state of energy access in settlements and camps in large parts are unknown. This is a fundamental limitation as a comprehensive information basis constitutes a basic building block to further energy access in displacement settings from a policy, research and implementation perspective.

The objective of this article is to contribute to a more comprehensive understanding of the current state of energy access in displacement settings by identifying and utilizing existing data. After a screening of the vast and various available information, setting up of a database, consolidating the gathered data as well as assessing the quality through a quality assessment method, the currently available information is visualised and discussed. As far as the overview allows, conclusions are drawn, as well as current content and structure to the initial and pressing issue of improving access to energy for displaced persons are mirrored. Two research questions are addressed:

- (1) What insights can be gained from the available data on access to energy in displacement contexts in several countries of the African continent?
- (2) What are the limitations?

## (3) What are the differences between multiple countries?

The character of the issue at hand and the fragmented state of the current affairs motivates to map and investigate differences between multiple countries and therefore include transnational data sets. The claim of limited data availability is tested. While available data from case studies are excluded given their small percentage share of total available data as well as their more extended differences in the type and composition of numbers, the identification of relevant data for the description of the state of energy access in displacement settings inevitably raises the question of assessing the quality of the data that we identify. We therefore include a systematic quality assessment in our study and tailor a data quality assessment procedure to the needs of our study.

The number of displaced persons varies considerably by country [48] and so does the available information about the related displacement setting. Countries with a smaller population of displaced persons show little to no available data on energy access [24]. This fact directs this research to countries with available data and thereby to those with more than 20,000 displaced persons, resulting in 30 African countries result, jointly accounting for 99.8% of displaced persons across all African countries [48]. The countries of this study are listed in Table 1.

**Table 1.** List of countries with more than 200,000 displaced persons in January 2024 [48], countries considered in this study.

<b>Countries</b>	<b>Number of displaced persons</b>
Algeria	102,753
Angola	55,981
Burkina Faso	1,917,317
Burundi	99,251
Cameroon	1,473,294
Central African Republic	527,348
Chad	1,080,557
Congo	97,074
Cote d'Ivoire	937,027
Democratic Republic of the Congo	6,063,761
Djibouti	30,197
Egypt	358,523
Ethiopia	4,208,422
Kenya	1,078,815
Libya	206,330
Malawi	56,560
Mali	441,449
Mauritania	106,370
Mozambique	1,060,234
Niger	716,412
Nigeria	3,379,779
Rwanda	149,218
Somalia	3,002,276
South Africa	150,912
South Sudan	2,167,672
Sudan	4,685,356
Tanzania	247,196
Uganda	4,144,589
Zambia	81,090
Zimbabwe	23,063

## 2. Materials and Methods

A desk research exercise for data acquisition and consolidation was conducted to map the energy situation in displacement contexts. Online databases, project reports, scientific publications as well as web resources of implementing organizations were reviewed for available data.

### 2.1. Screening for Materials and Information

The mapping focuses on the general energy situation at the settlement and at the country level including indicators of the enabling environment. The part on the enabling environment examines how supportive the local regulatory and policy framework for energy standard improvements is, while the energy situation focuses on the local possibilities for electricity and cooking. Applicable sources were consulted and available data was extracted in order to understand:

- The share of renewables in the electricity mix
- The extent of access to electricity
- The amount of displaced persons that is connected to the electricity grid
- The national electricity prices and the estimations in displacement settings
- The amount of displaced persons using biomass for cooking.
- The possibilities for type of cooking and lighting and the dominant types
- The level of maturity of the policy framework for access to cooking and electricity as well as for renewable energies

The data acquisition and consolidation related to country-wide and settlement specificities where data was available and possible to distinguish accordingly.

### 2.2. Development and Application of a Data Quality Assessment

A data quality assessment (DQA) is a procedure to grasp data by its intention, view it in its composition and assess intention and composition based on previously established quality criteria. The DQA differentiates the data amongst data sources and assesses through a scoring system. The resulting scores stand for the quality rating of the concerned data and give an overall statement on its meaningfulness and significance.

The part within the DQA which considers the data composition corresponds to the quality dimensions which consist of several indicators with a scoring range for the evaluation. The indicators are used to determine the extent to which a dataset is able to meet the related quality dimension.

Depending on the field of application and focus of the DQA, the quality dimensions are variable. Various DQA frameworks were developed for different matters [49]. For example, the World Health Organization (WHO) has published a detailed approach on how to review and improve the quality of health-facility data [50]. Other sources describe methodologies and guidelines for DQA [51,52,52] or give an overview of existing frameworks [49]. While the existing methodologies can be used as guideline for the data analysis, none of the existing frameworks meets the needs of the current study. For this reason, a novel DQA framework based on existing methods and guidelines was developed. This DQA framework included the definition of a comprehensive set of quality indicators and the definition of the respective scoring system, quality dimensions and indicators.

#### *Country level*

The analysis on the country level is subdivided into two categories. First, a general overview of energy access of the considered countries by visualizing the access to electricity and clean cooking in rural and urban areas and by evaluating the current regulations and policies related to energy access. This information is relevant to this study to examine how the technological progress and the political environment of a country influence the access to energy for displaced persons. Second, a specific overview by analyzing the access to different types of energy forms for displaced populations. Looking at energy access for displaced persons on a country level, it is possible to analyze differences between host countries.

#### *Camp and settlement level*

For this analysis, the focus is on access to electricity and clean cooking in refugee camps. Comparisons within a country but also transnational comparisons will be included in the evaluation. This evaluation is particularly relevant as it gives more detailed information on the different lived realities for displaced persons from one camp to another and from one country to another.

### 2.2.1. Quality Dimensions and Indicators

The measurement tool to indicate the quality of data within a DQA are data quality dimensions. Each of the dimension consists of several indicators, which represent the evaluation criteria for the DQA. The indicators are used to determine the extent to which a dataset is able to respond to the requirements of a quality dimension.

For the purpose of this study, an own DQA framework that fits the requirements for this study was created. The methodology behind the framework is based on a work by Cameron [53]. After a thorough review of the existing quality dimensions, the following five dimensions are considered as the most relevant for data on energy access in displacements settings and included in the DQA:

#### A. Timeliness

Timeliness is defined as the extent to which the age of data is appropriate for the task at hand [52] and obviously plays an essential role, as the situation for displaced persons may change rapidly [39]. The indicator used to determine the timeliness of each dataset is the number of years elapsed since the data was collected. If a dataset was based on several sources, the source with the oldest data was used as reference.

#### B. Completeness

Completeness represents the most prominent dimension for DQA as described elsewhere [49] and is defined as the degree to which all relevant data is included in a data collection [52]. Data on energy access in displacement settings often show a lack of completeness since a lot of organizations only collect information that is relevant for their own purpose and activities [39]. The evaluation criterion for completeness is the number of countries considered in the specific dataset compared to the number of countries considered in this analysis. Therefore, the evaluation of completeness only refers to the specific purpose of this study and does not evaluate the completeness of the data with regards to the initial purpose for which it was initially collected for. Some data sources do not have the same selection of countries for each indicator. For example, the data for electricity access is available for more countries than the data on clean cooking. In that case, the indicator with lowest number of countries is considered in this work as reference.

#### C. Accuracy

Another challenge depicts the accuracy of data. The limited sources of quantitative data [39,46] often lead to simplified methodologies and undetailed analysis of the access energy situation [54] causing a low level of accuracy. Accuracy is the degree to which statistical data measures what it was intended to measure [53]. In contrast to other DQA frameworks, where accuracy is mostly evaluated through statistical analysis [49], in the scope of this study, the accuracy of data is determined by the following indicators:

- Availability of additional information: Additional information can give further explanation to the dataset and thus makes it possible to determine its accuracy.
- Accuracy of the methodology: Depending on the used methods for the data collection and analysis, the accuracy will decrease or increase. For example, a detailed field survey will lead to a higher accuracy than a dataset based on a simplified model.
- Real-world data or synthetic data: Real-world data is more accurate than synthetic data that is based on assumptions and approximative information, e.g. as the outcome of models and simulations.

#### D. Coherence

In accordance with Cameron [53] coherence is defined as the degree to which data can be combined with other information within an analytical framework. This work includes the combination of datasets from different sources so that the coherence of the used data becomes an

essential parameter not only for the data quality but also for the quality of our analysis. In order to evaluate the coherence of data, we use the following indicators:

- Use of common methods: The utilization of known methods facilitates the analysis of data and reduces the risk of incoherencies.
- Incoherence within the dataset or with other sources: If possible, the dataset will be cross-checked with other sources for the detection of incoherent data.

#### E. Interpretability

Some data are published without additional information or explanations of the methodology which causes a broad spectrum of possible interpretations. For a detailed analysis, it is however crucial to be able to interpret any data correctly. The quality dimension of interpretability is defined as the degree to which additional information is necessary to interpret and utilize the data correctly [53].

Here, the first indicator is the availability of additional information. In particular, a detailed description of the methodology is necessary to interpret data. The second indicator that is considered is the suitability of the sources and used methods. This indicator allows to evaluate if the data is based on appropriate sources and methods that have the capacity for the analysis at hand.

### 2.2.2. Evaluation and the Scoring System

In order to evaluate and compare different datasets, a scoring system based on previously described methodology [53] is used. Each dataset is analyzed by assessing its ability to fulfil the conditions set by the indicators. This allows to give a score ranging from zero to two for each dimension, with zero being the lowest possible value and two the highest possible value to reach.

Table 2 shows the indicators of each dimension with the respective scoring system. A maximum score of two points can be reached for each dimension resulting in a total maximum score of ten points for the DQA.

**Table 2.** Evaluation matrix.

Dimension	Indicator	Points		
Timeliness	Number of years elapsed since the data was collected/created.	More than four years or the number of years cannot be calculated	0	
		Between two and four years	1	
		One year	2	
Completeness	Does the data include countries considered in our analysis?	No	0	
		Yes	Coverage error is greater than 20 %	0
		Coverage error is between 10 and 20 %	1	
		Coverage error is less than 10 %	2	
Accuracy	Does the reporting source give additional information (e.g. metadata, description of the collection and analysis of data) that help to determine the accuracy of the dataset?	No	0	
		Yes	The data is based on a methodology that leads to inaccurate results (e.g. models with insufficient information, assumptions).	0
		The dataset is based on an appropriate methodology that leads to synthetic data (e.g. models with sufficient information).	1	
		The dataset is based on an appropriate methodology that leads to real-world data (e.g. detailed surveys).	2	
Coherence	Does the dataset use a common methodology that allows to compare and use the data with	No	0	
		Yes	The dataset is incoherent.	1
		The dataset is coherent.	2	

	datasets from other sources?		
Interpretability	Is a detailed description of the methodology and relevant background information (objective of the analysis, used sources and contributors) available?	No	0
		Yes	1
			2

### 2.2.3. Data Search, Visualization and Interpretation

Energy access data on country level is included in the Energy Progress Report [55]. It depicts the situation in displacement contexts in the datasets of the Moving Energy Initiative (MEI) [56], the Humanitarian Energy Data Platform [54] and the database on the Refugee Settlements Energy Access (RSEA) [57] published by the European Commission.

Since displaced persons are rarely considered in the development of national energy policies [58], the analysis of the regulations and policies on energy access can only be done on the country level and in turn, this regulatory and policy environment includes displacement contexts too. Accordingly, the regulatory indicators for sustainable energy (RISE) [59] do not specifically account for the displacement context but nevertheless provide valuable guidance and insights into the enabling environment. Table 3 summarizes the available sources and distinguishes by the data categories of level, information and kind of indicator.

**Table 3.** Selected sources for the visualization of current data on energy access in displacement settings.

Level	Information	Indicator	Source
Country	General	Energy access in rural and urban areas	[55]
		Regulations and policies for energy access	[59]
	Specific to the displacement context	Electricity access for displaced persons	
		Access to clean cooking for displaced persons	[56]
		Access to lighting for displaced persons	
Camp or Settlement	Specific to the displacement context	Number of projects	[54]
		Camp population	[54,56,57]
		Electricity access for displaced persons	[54]
		Access to clean cooking for displaced persons	[54,56]
		Access to lighting for displaced persons	[56]
		Livelihood	[54]

## 3. Results

### 3.1. Data Quality Assessment

The results of the DQA show a considerable range in terms of quality and composition of the data. The UNHCR database [60] for displaced persons received the highest score with 10 points, while the dataset of the Moving Energy Initiative [56] and the Humanitarian Energy Data Platform [54] share the lowest score with three points each. The latter two represent two sources with information specifically on access to energy in displacement contexts. The remaining sources were given a score of seven or more points and this creates a significant gap between the data for the host country contexts contrary to the displacement context. The current analysis brings out that this is caused by the scores for the dimensions "timeliness", "completeness" and "accuracy". The data from the sources [54,56] scored 0 and 1 points respectively, and the sources [55,57,59] reach 3 points for the aforementioned three dimensions. The information is gathered in Table 4.

**Table 4.** Results of the DQA per source and dimension.

Source	Score per dimension					Total score
	Timeliness	Completeness	Accuracy	Coherence	Interpretability	
ESMAP [55]	1	2	1	2	2	8
GPA [54]	0	0	1	1	1	3
EU [57]	1	0	2	2	2	7
UNHCR [48]	2	2	2	2	2	10
World Bank [59]	1	1	1	2	2	7
UN OCHA [56]	0	0	0	1	2	3

A detailed description of the results of the DQA can be found in the Appendix A.

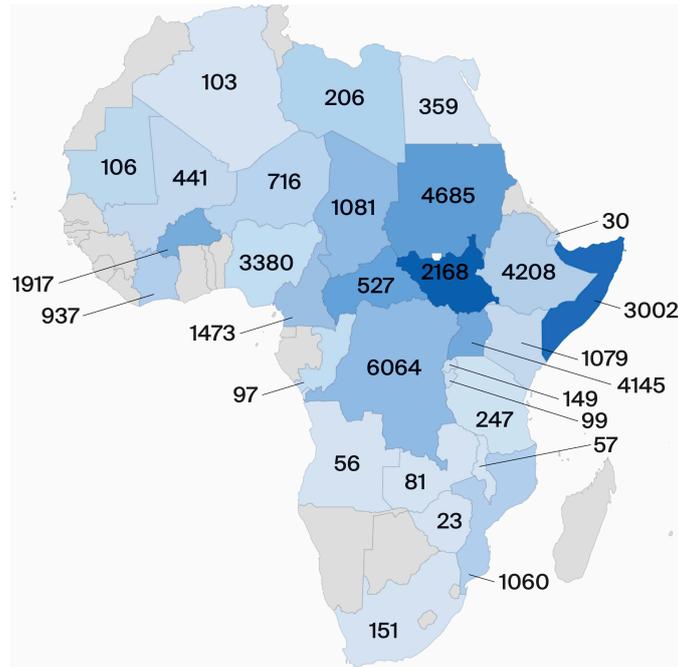
### 3.2. Visualisations

#### 3.2.1. Displaced Populations

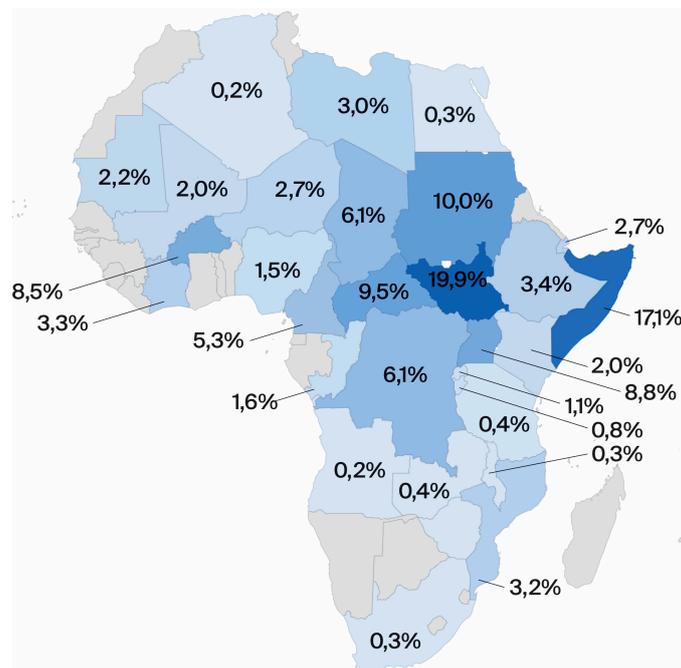
The visualizations in this section are based on the data sets from [48] and [61] they capture the 30 countries of this study

The Democratic Republic of Congo (DRC) with 6.1 million displaced persons emerges as the country with the highest number followed by Sudan with 4.7 million, while Ethiopia and Uganda host 4.2 million each. Together, these four countries host nearly half of the total number of displaced persons of all selected countries (49.4%). The countries with the smallest displaced populations are Zimbabwe with 23,063, Djibouti with 30,197 and Angola with 55,891 displaced persons. Figure 2 illustrates these facts by the total number of displaced persons in each of the countries. Large regional differences can be noted between East Africa, particularly in and around the horn of Africa, as the region with the highest number of displaced persons, compared to Western, North and South Africa in descending order. Djibouti is the single country hosting less than one million displaced persons. The Maghreb region and Southern African countries show smaller numbers, apart from Mozambique. In Western Africa, considerable differences are notable with the two extremes of Mauritania and Nigeria representing 106,000 and 3.4 million displaced persons respectively.

Figure 3 puts the data of Figure 2 in another perspective by showing the percentage of displaced persons compared to the total population of the host country. It can be observed that the share of displaced persons is highest in South Sudan with 19,9% followed by Somalia with 17,1% and Sudan with 10,0%. A particularly high share of displaced persons compared to the total population of the host country is discernible in the countries of the Eastern Sahel region as well as their bordering countries to the south. In this region, only Ethiopia shows a value less than 5%. Looking at the Western, Northern and Southern region of Africa, a different picture emerges as the percentages are relatively low with only Cameroon and Burkina Faso having a share of more than 5%. Overall, the shares in the selected countries differ considerably and they range from 0,1% in Zimbabwe to South Sudan, where every fifth individual is a displaced person.



**Figure 2.** Number of displaced persons by country in third quarter of 2023, in thousands. Own compilation based on data in [48], accessed in January 2024.



**Figure 3.** Share of displaced persons in the total population of the host country. Own compilation based on data in [48], [61], accessed in January 2024.

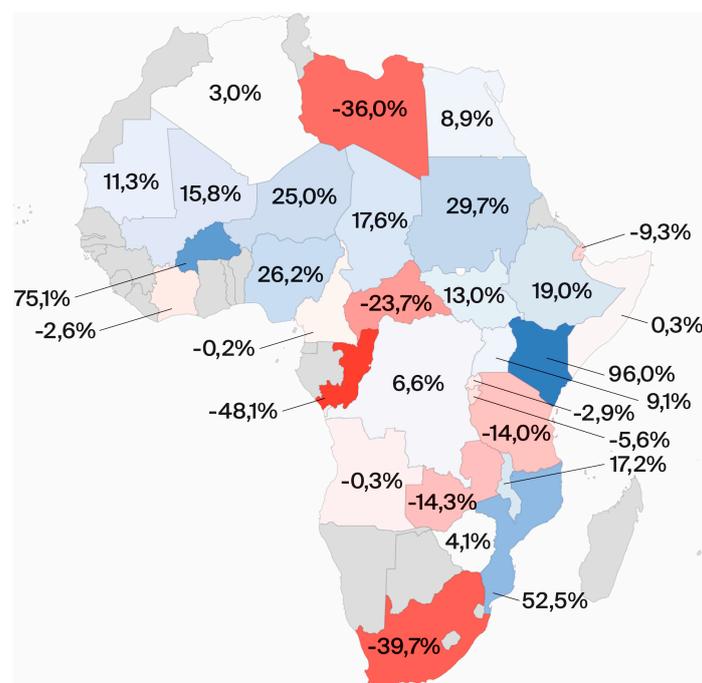
Similar to the previous analyses, an examination of the country-specific shares for the years from 2020 to 2022 reveal twelve countries experiencing a decrease and nineteen witnessing an increase. DRC registered the most significant reduction, as the number of displaced persons reduced by nearly half with a decrease of 48.1%, followed by a reduction in South Africa of 39.7% and Libya by 36%. In contrast, Kenya nearly doubled its number of displaced persons with a rise of 96%, followed by Burkina Faso and Mozambique who show a notable increase of 75.1% and 52.5%. A closer look at the

Sahel region reveals a substantial rise in each country with the lowest percentage change noted in Mauritania of 11.3%. Please refer to Figure 4 for insights across all 30 countries.

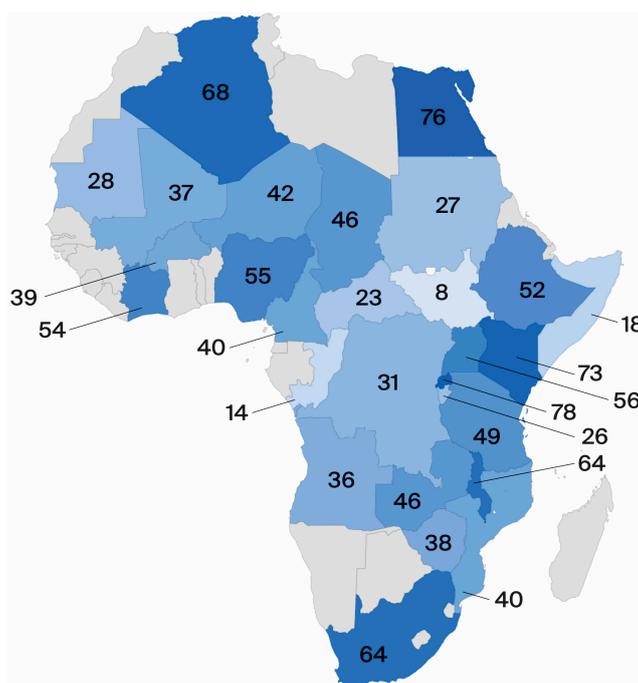
### 3.2.2. Regulatory and Policies – the Enabling Environment of the Country

This subchapter deals with the data of the Regulatory Indicators for Sustainable Energy (RISE) evaluation [59] and points out the state of regulations and policies regarding access to energy in the countries. The RISE score encompasses the multi-dimensional aspects of policies and regulations and allows to compare national policy and regulatory frameworks for sustainable energy implementations. It assesses countries' policy and regulatory support for each of the four pillars of sustainable energy - access to electricity, access to clean cooking (for 54 access-deficit countries), energy efficiency, and renewable energy. The RISE dataset does not include the countries of Libya and Djibouti in general and it does not provide for data on electricity access and clean cooking for Algeria and Egypt.

Figure 5 presents these scores which encompass multi-dimensional aspects of policies and regulations supporting access to energy activities with 0 being the lowest and 100 the highest performance. RISE scores reflect a snapshot of a country's policies and regulations in the energy sector, organized by the three pillars of sustainable energy: Energy Access, Energy Efficiency, and Renewable Energy. The overall scores are spread widely with South Sudan recording the lowest score of 8 whereas Rwanda emerges as the country with the highest score of 78. Regional patterns unveil relatively high values in the Maghreb region pointing out Algeria with 68 and Egypt with 76, South Africa with 64 and East Africa with countries such as Ethiopia, Kenya, Uganda, Rwanda, and Malawi with overall scores above 50. Conversely, the Sahel region reports mainly low overall scores, with only Nigeria surpassing a score of 50. It can further be noted that a limited number of countries report very low or very high scores as there is only one country with a score below 10 and three countries which achieved scores above 70.



**Figure 4.** Changes in the share of displaced persons in the total population of the host country and for the period of 2020 to 2022. Own compilation based on data in [48], [61], accessed in January 2024.

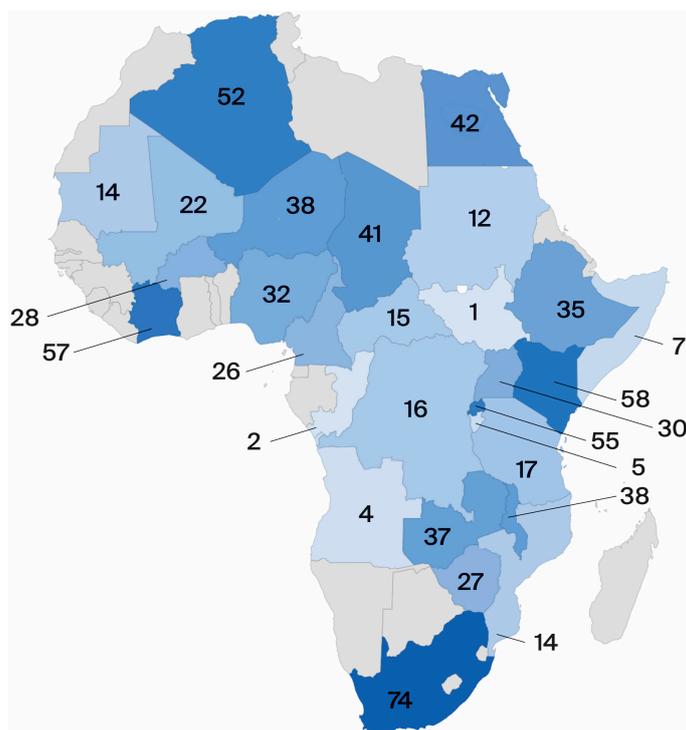


**Figure 5.** RISE overall score on the country regulatory and policy environment in 2021. Own compilation based on data in [59], accessed in January 2024.

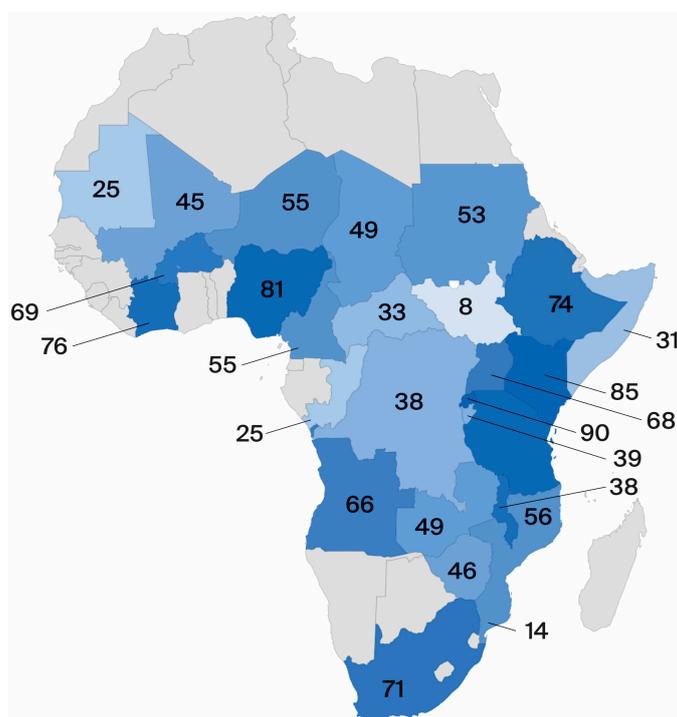
Figure 5 shows the RISE overall scores while the following figures provide more detailed insights by looking into the various thematic pillars and associated scores of the RISE evaluation. Figure 6 illustrates the scoring in the pillar renewable energy in which Rwanda emerges as the country with the highest score of 91, followed by Egypt and South Africa with 85. Identically to the order of countries in the overall scores in Figure 5, South Sudan reports the lowest score of 8 while Burundi and Congo are the two other countries with scores below 20 in Figure 6. Regional patterns become apparent, with Southern Africa showcasing predominantly high scores, apart from Angola with 42. In Western Africa, low scores prevail since no country in the region surpasses a score of 50, except for Nigeria with a score of 65. Some countries show considerable differences compared to the overall score such as South Africa with 85 whereas its overall score is 64.

The pillars electricity access and clean cooking are presented in Figures 7 and 8, and as mentioned previously they do not provide for scores for the countries of northern Africa, specifically Egypt and Algeria, which were however considered for the renewable energy pillar.

The analysis of electricity access regulations and policies results in the highest average score among all considered RISE pillars as average score of the selected countries is 56. Figure 7 reveals that Rwanda stands out with the highest score of 90, whereas South Sudan reports the lowest score at 8. Most countries in East Africa demonstrate high scores with values of at least 68 for Kenya, Ethiopia, Tanzania and Uganda. However, discrepancies are also visible in this region as Somalia with 31 and Burundi with 39 received comparably low scores. Noteworthy variations emerge within Western Africa, where Nigeria and Côte d'Ivoire exhibit scores above 60, whereas Mauritania and Mali show lower scores of 25 and 45, respectively.



**Figure 6.** RISE score for the pillar renewable energy in 2021. Own compilation based on data in [59], accessed in January 2024.



**Figure 7.** RISE score for the pillar electricity access in 2021. Own compilation based on data in [59], accessed in January 2024.

Clean cooking scores in Figure 8 are visibly lower, with an average score of 37, compared to the average score of 48 for renewable energy in Figure 6 and of 56 for electricity access in Figure 7. Nevertheless, several countries in East Africa exhibit high numbers with a minimum of 50 in Tanzania and Kenya showcasing the highest score at 83. As shown in Figure 8, only Somalia stands out as an exception with a notably lower score of 10. Conversely, the Eastern Sahel region and their

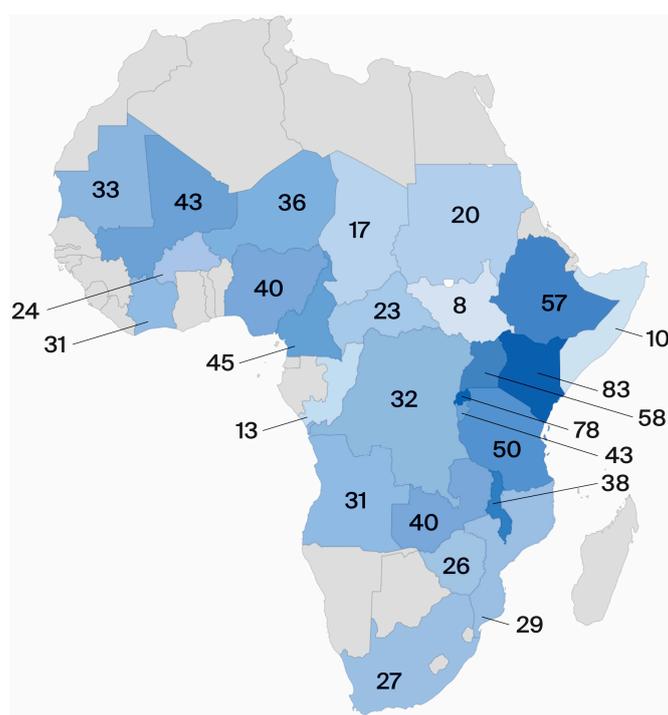
bordering countries to the south report low values with Chad of 17, Sudan of 20, the Central African Republic of 23 and South Sudan of 8. Southern Africa also reveals lower clean cooking scores, with South Africa at 27, Zimbabwe at 26, and Mozambique at 29. Particularly in the case of South Africa, this low score is surprising as the country exhibited high scores for the other pillars.

### 3.2.3. Access to Electricity

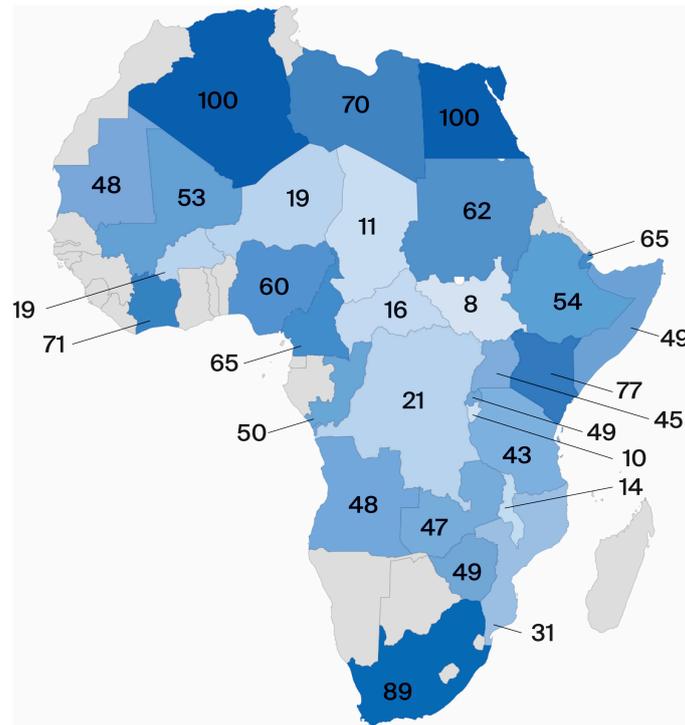
#### *Host country population*

For the visualizations of the electricity access on the country level, the data of the Energy Progress Report [55] was used. While this dataset covers all selected countries in its evaluation of the electricity access for the total population and the urban population, it does not include data for Angola, Burkina Faso, Libya and Mauritania when analyzing access to energy in rural areas.

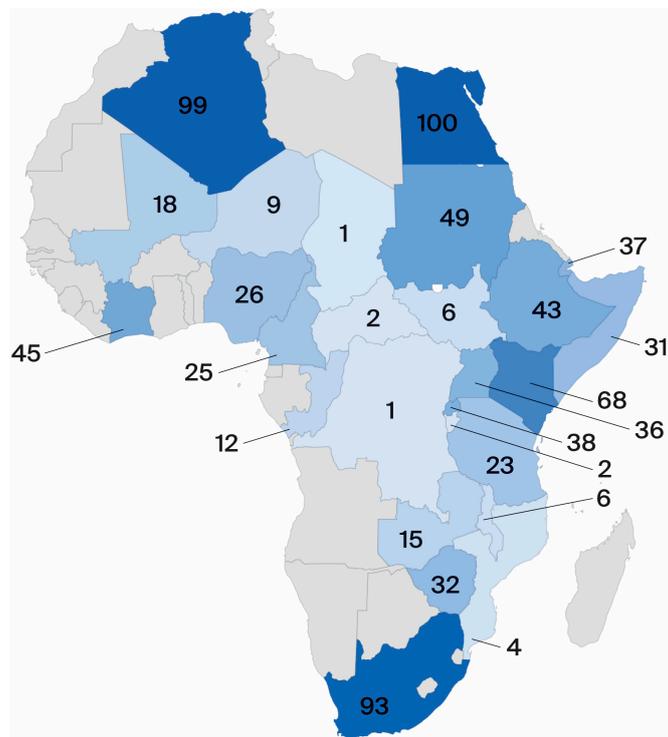
Assessing the share of the total population with access to electricity reveals substantial disparities among the selected countries. Figure 9 illustrates these differences regarding electricity access and ranging from 8% in South Sudan to 100% in Algeria and Egypt. In contrast to the Maghreb region and South Africa where the access rate is at least 70%, the countries in Central Africa represent the lowest percentages that do not surpass 20%. These differences are even more visible when we look at the access to electricity in rural areas. As illustrated in Figure 11, only three countries have a rural electrification rate above 90%, namely Algeria, Egypt and South Africa. Furthermore, the previously mentioned disparity between the selected countries is now even further stretched as only 1% of the rural population of the Chad and the DRC have access to electricity. Another notable pattern emerges as eight countries exhibit rural electrification rates below 10%.



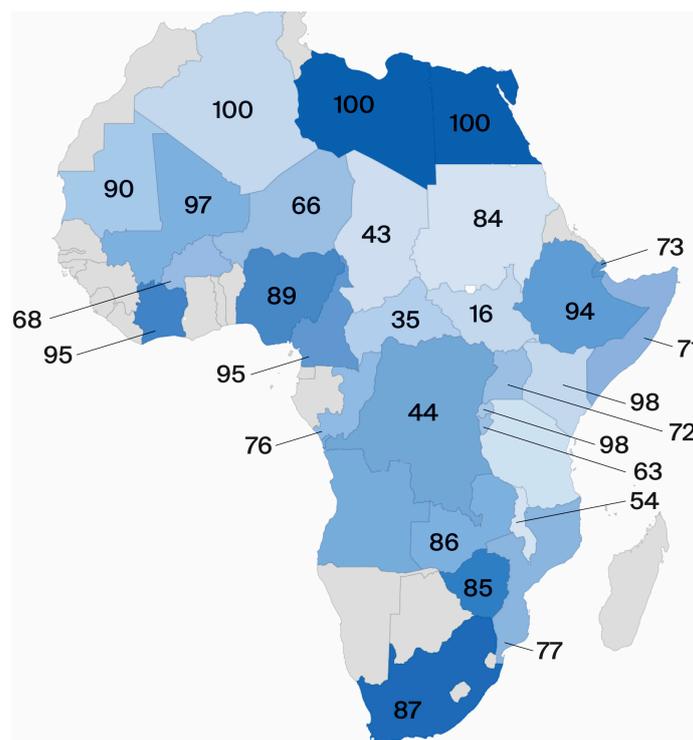
**Figure 8.** RISE score for the pillar clean cooking in 2021. Own compilation based on data in [59], accessed in January 2024.



**Figure 9.** Share of the total population in the country with access to electricity in 2021, in percent. Own compilation based on data in [55], accessed in January 2024.



**Figure 10.** Share of the rural population in the country with access to electricity in 2021, in percent. Own compilation based on data in [55], accessed in January 2024.



**Figure 11.** Share of population in the country with access to electricity in the urban area in 2021, in percent. Own compilation based on data in [55], accessed in January 2024.

In contrast to the low access to electricity in rural areas, the urban electrification in most countries is well advanced as 13 out of the 30 countries have access rates higher than 90%. This can be further confirmed by the fact that only the four countries of the Central African Republic (CAR), the DRC, Chad and South Sudan have an urban electrification rate below 50%.

#### *Displacement population*

The data for the visualization in Figure 12 stems from the moving energy initiative [56] and covers all concerned countries of this study. The analysis of the access to the electricity grid for displaced persons reflects both similarities and divergences among the selected countries. While the highest shares of displaced persons with electricity grid access are observed in Egypt with 100%, Libya with 98% and South Africa with 85%, Sudan, Tanzania with both 2% and Malawi with 0% exhibit very low rates. The data reveals a prevailing trend of relatively low access in most countries, with 14 nations recording less than 30% grid connectivity for displaced persons. When we compare the results to Figure 9 on the share of the total population with access to electricity, we see a correlation that countries with a high share of the population with access to electricity also demonstrate a high share of displaced persons with grid access. This correlation is notably evident in Egypt with 100% in both cases, South Africa with 85% and 89%, Côte d'Ivoire with 67% and 71%, Nigeria with 65% and 60%, and Ethiopia with 50% and 54%. However, some countries, e.g. Algeria with 10% and 100% or Kenya with 10% and 77%, challenge this correlation. A look at the DQA further emphasizes the need for validation by more accurate and detailed analyses.

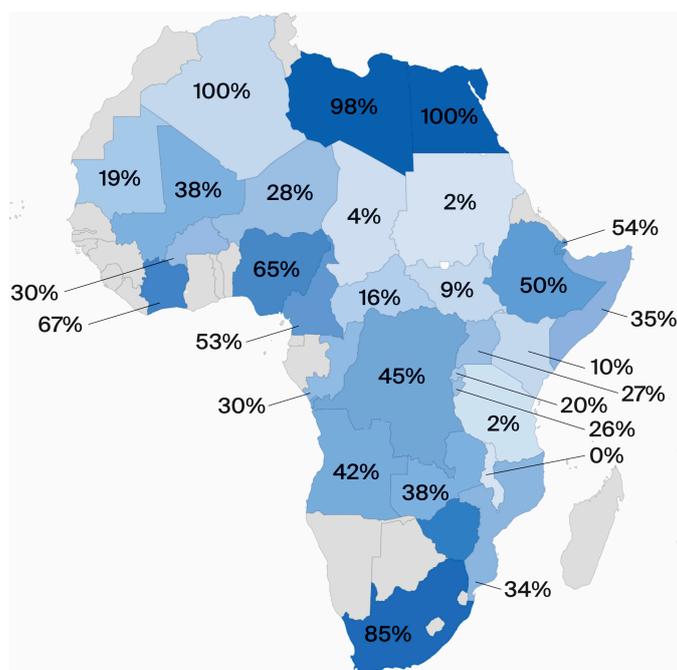
#### *Camp and settlement level*

The Humanitarian Energy Data Platform [54] is referred to for the electricity access on a displacement camp or settlement level. This source encompasses a total of 74 camps, situated across 16 out of the 30 selected countries. As illustrated in Figures 13 and 14, there is a significant disparity in electricity access with a substantial majority of the camps and settlements of 70% that lack any form of access to electricity. In turn, 26% of the camps and settlements report partial access to electricity and a mere 4% have full access to electricity.

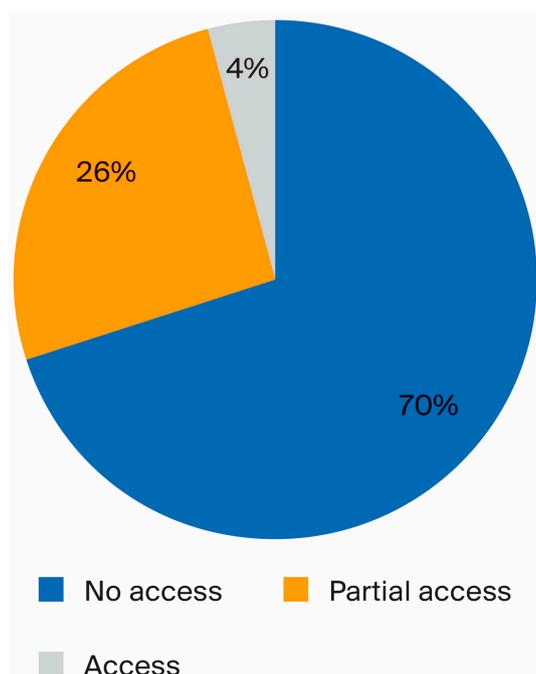
Looking at the same dataset but from a country perspective, the previous findings of considerable disparity can be further emphasized. Merely three camps that are located in Algeria, Congo and Sudan report full access to electricity whereas a complete lack of electricity access is

revealed in all considered camps situated in Djibouti, Democratic Republic of Congo (DRC), Ethiopia, Rwanda, South Sudan and Tanzania.

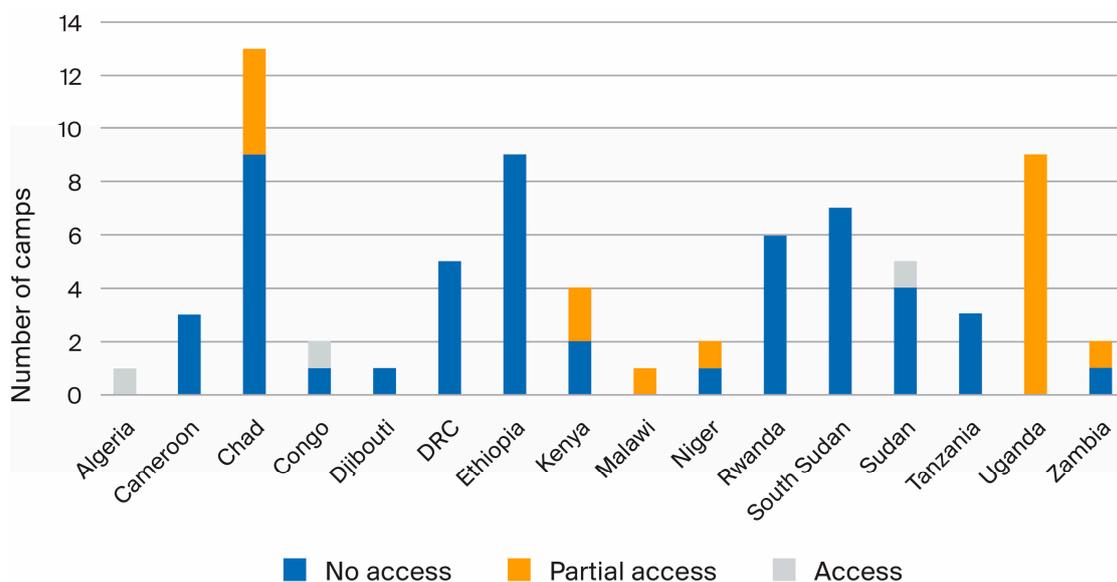
It is crucial to point out that there is data available for the camps and settlements included into this study, however for various camps and settlements no data is available. A review of the data in [56,57] provides evidence on the fact that there exist approximately 219 camps and settlements and for two thirds of those no data is available. This share varies from country to country. For instance, in Sudan the combined sources indicate 62 different camps while data on the camp situation is only available for five camps.



**Figure 12.** Share of displaced persons with access to the national grid in 2018, in percent. Own compilation based on data in [56], accessed in January 2024.



**Figure 13.** Percentage of camps and settlements in which residents have access to electricity in 2022, in percent. Own compilation based on data in [54], accessed in January 2024.



**Figure 14.** Number of camps and access to electricity across countries. Own compilation based on data in [54], accessed in January 2024.

### 3.2.4. Access to Cooking

#### *Country population*

Data in the Energy Progress Report [55] cover all considered countries, except for Libya, and we make use of those to provide visual insights into the cooking situations. Figure 15 reveals considerable differences regarding the access to clean cooking across the selected countries. Similar to the trends observed for the electricity access in Figure 9, countries within the Maghreb and South Africa exhibit high percentages of clean cooking access, with Algeria and Egypt achieving full coverage at 100%. Additionally, Angola, Sudan and Mauritania show a notable alignment between percentages of access to clean cooking and electricity. However, a considerable change in this pattern is visible in all the other regions, where the access to clean cooking lags significantly behind electricity access rates. This discrepancy is most prominent in East Africa, where electricity access levels were reaching at least 40%, all countries, except for Kenya and Sudan, report clean cooking access percentages of less than 10%.

The investigations into access to clean cooking in rural areas underscore the low development stage as Figure 16 showcases universally low values for the selected countries. Among the sampled countries, only the four countries Algeria, Egypt, Sudan, and South Africa report rural clean cooking access rates exceeding 50%. In contrast, 24 out of the 29 selected countries exhibit rural clean cooking access rates below 10%, signifying a widespread deficiency in rural areas. Moreover, 10 countries within the dataset report an absence of any clean cooking access in rural regions.

Similar to the total and rural population rates to clean cooking access, the examination of clean cooking access in urban areas reveals distinct patterns, with notable differences across regions. Urban areas in the Maghreb and South Africa again showcase high rates of access to clean cooking with at least 96%. The countries in the Sahel region display comparatively much higher rates for clean cooking access in urban environments. Specifically, only Mali reports a clean cooking access rate below 10% in this region. In contrast, five out of the seven Sahel countries considered in this analysis Mauritania, Burkina Faso, Nigeria, Chad, and Sudan exhibit clean cooking access rates above 30%, with Mauritania and Sudan surpassing 70%.

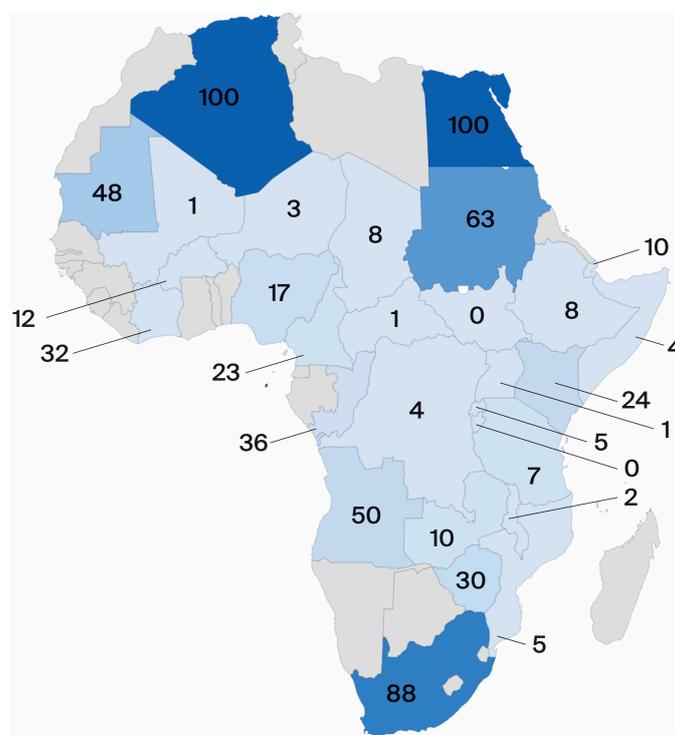
#### *Displacement population*

As illustrated in Figure 18, the use of biomass exhibits differences across the considered countries with Algeria showing the highest share of non-biomass usage with 99%, whereas South Sudan and Malawi do not have any displaced persons using a cooking fuel that differs from biomass. Overall, significant differences between countries persist, with the Sahel region notably presenting lower values, as all countries except Nigeria have a non-biomass usage rate below 25% for displaced populations. Furthermore, it can be noted that Maghreb and South Africa stand out with high shares of displaced persons not using biomass, with percentages above 90% and hence mirroring the host countries clean cooking access rates. Countries such as South Sudan, Uganda, the Central African Republic (CAR), Chad, and Mozambique exhibit relatively small shares of displaced persons not using biomass, also aligning with tendencies observed in the clean cooking access rate of their respective host populations.

#### *Camp and settlement level*

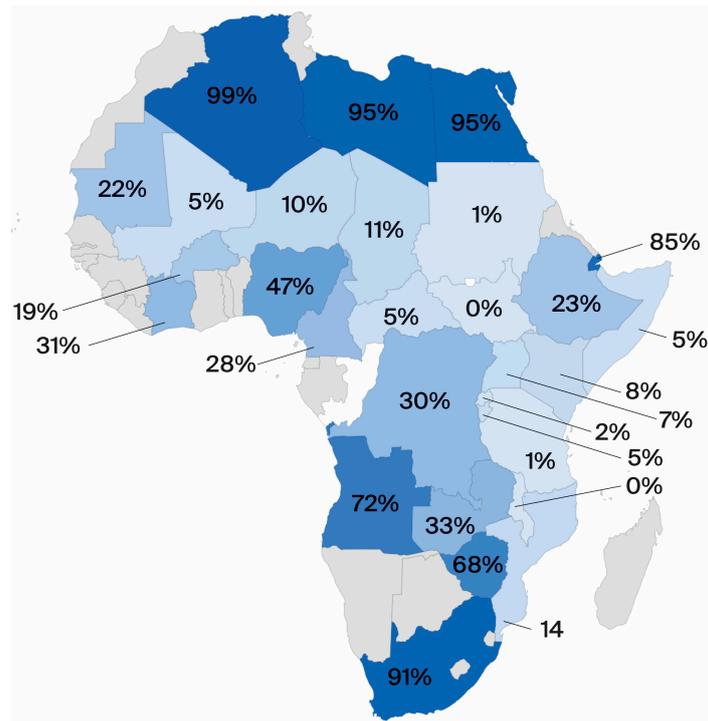
The data sources [54,56] were used for the analysis of the access to cooking in displacement contexts. The two sources cover 146 camps in 20 out of the 30 selected countries. According to Figure 19, firewood emerges as the predominant source of cooking fuel in refugee camps, constituting the majority at 61%. Approximately a third of the considered camps adopt a combination of firewood and fossil fuels leading to 22% for firewood or LPG, 13% for firewood, charcoal, gas or fuel. However, only 4% do not depend on firewood and employ alternative cooking fuels such as gas, biomass or briquettes.

A country-level examination of the type of cooking fuel used within refugee camps reveals that firewood emerges as an exclusive cooking fuel in several countries. Notably, the refugee camps in Cameroon, the Central African Republic (CAR), Djibouti, the Democratic Republic of Congo (DRC), and Somalia depend solely on firewood for their cooking needs. There are however examples of countries with a relatively diverse use of cooking fuel. For example, Chad, Ethiopia, and Rwanda have at least four different types of cooking fuels used in refugee camps. The entire array of information can be seen in Figure 21.

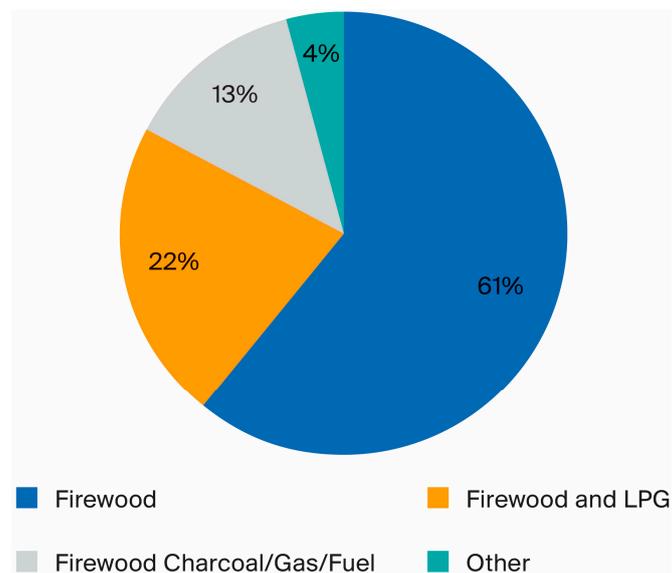


**Figure 15.** Clean cooking access rate of the total population in the countries in 2021, in percent. Own compilation based on data in [55], accessed in January 2024.

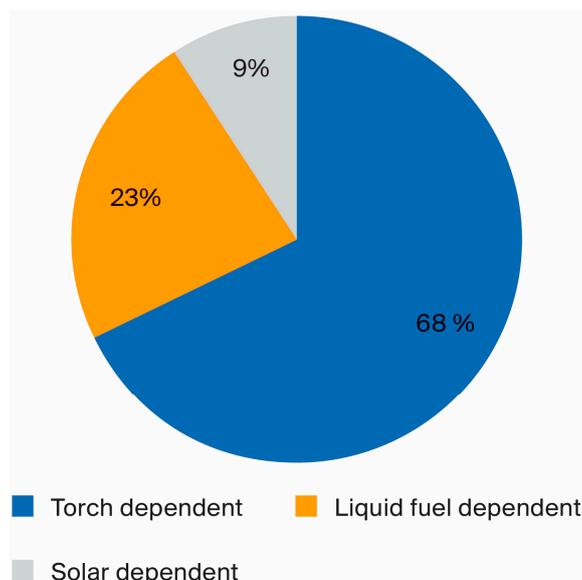




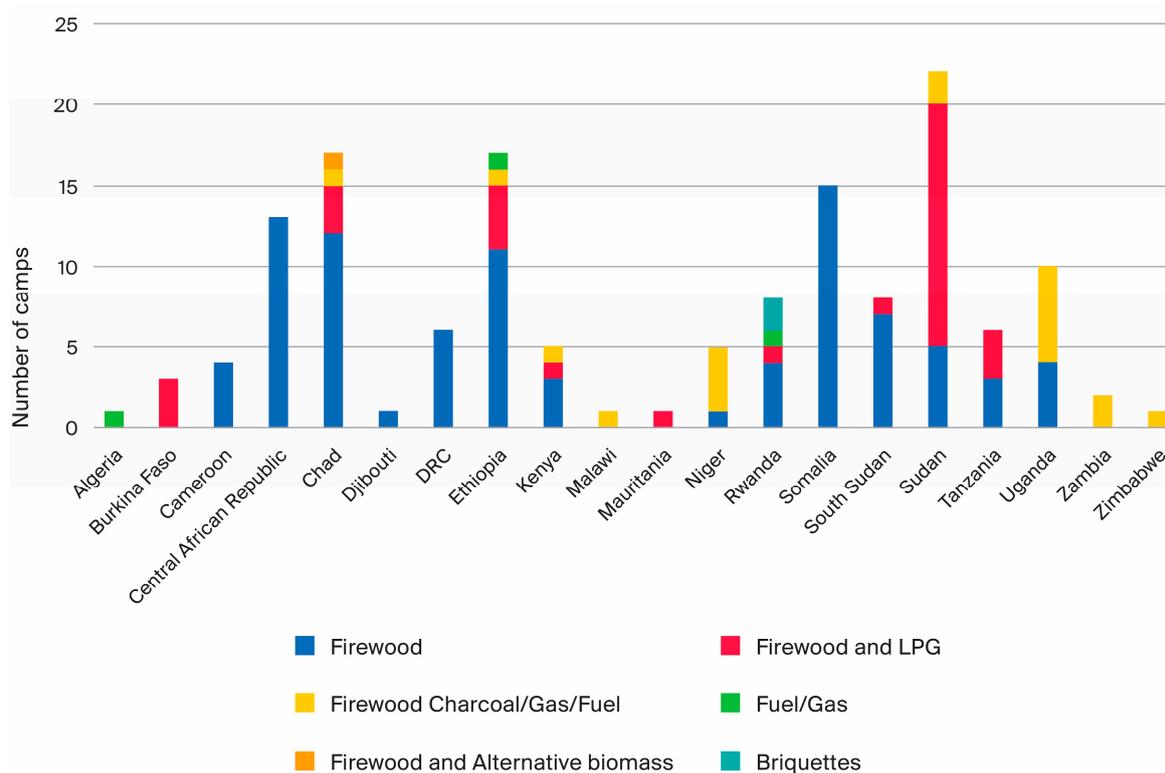
**Figure 18.** Share of displaced persons in the countries that are not using biomass for cooking, in percent. Own compilation based on data in [56], accessed in January 2024.



**Figure 19.** Type of cooking fuel in displacement camps and settlements for considered countries, in percent. Own compilation based on data in [54,56], accessed in January 2024.



**Figure 20.** Type of lighting in displacement camps and settlements for considered countries, in percent. Own compilation based on data in [54,56], accessed in January 2024.



**Figure 21.** Type of cooking fuel in displacement camps and settlements by country. Own compilation based on data in [54,56], accessed in January 2024.

#### *Lighting access at the camp and settlement level*

This paragraph describes the status quo of the access to lighting in the camp and settlement levels since it is part of the above shown cooking access data. Figure 20 is based on data from the moving energy initiative [56] which covers a total of 115 camps from 18 out of the 30 considered countries. Figure 20 illustrates the dominant case of torch usage for lighting purposes across camps and settlements. More than two thirds are torch dependent whereas only 23% use liquid fuel as

source for lighting. Looking towards the use of renewable energy, we note that less than 10 % of the considered camps and settlements rely on solar dependent lighting.

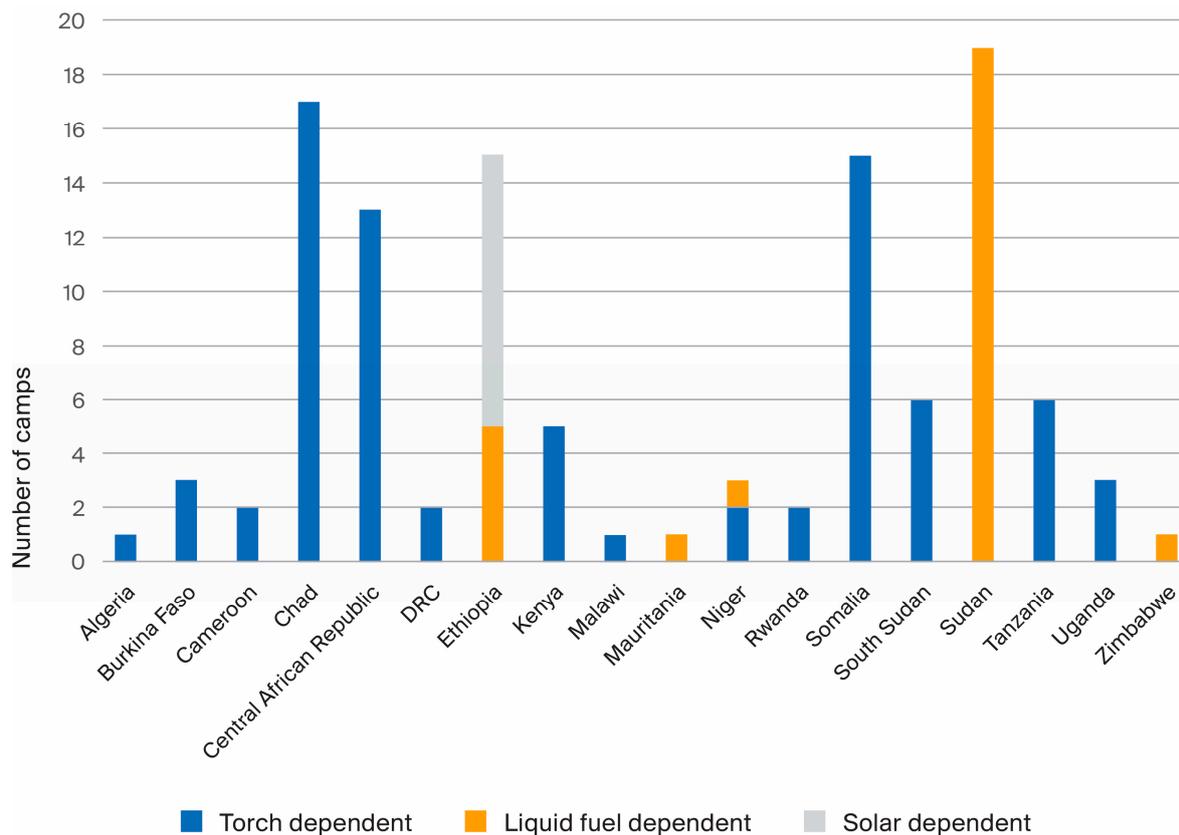
An examination of the data from country-level perspective further indicates substantial disparities across the countries. 13 out of 18 countries only have torches as source of lighting in their refugee camps. The graph also reveals that Sudan is the only case within the dataset, which has camps that purely depend on liquid fuel and Ethiopia stands out as the only country among the considered nations with camps utilizing solar energy as a lighting source.

### 3.2.5. Livelihood Possibility - Right to Work and to Move in and Out of the Camp/Settlement

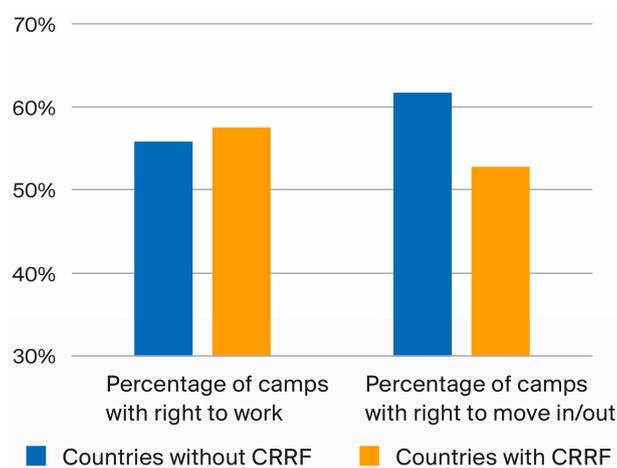
The right to work as well as the possibility to move in and out of the camp or settlement are prerequisites and indicators for livelihood generating activities. Accordingly, and as it was available in the data sources, we include Figure 23 which points out the percentages across countries for having the right to work and freedom of movement as well as linked to the country having signed the Comprehensive Refugee Response Framework (CRRF). The objective of the CRRF is to coordinate programming between refugees and host communities, to share best practices and develop shared analyses, to discuss policy issues with a view to agreeing on common positions as a basis for dialogue with the respective government and further stakeholders, among others. The right to work exists in 55% to 57% of camps and settlements of the considered countries with only a slight variation depending on the country being a signatory to the CRRF. The freedom to move varies between 53% and 62% for countries having joined the CRRF versus not.

### 3.2.6. Project Activities on Access to Energy in Displacement Contexts

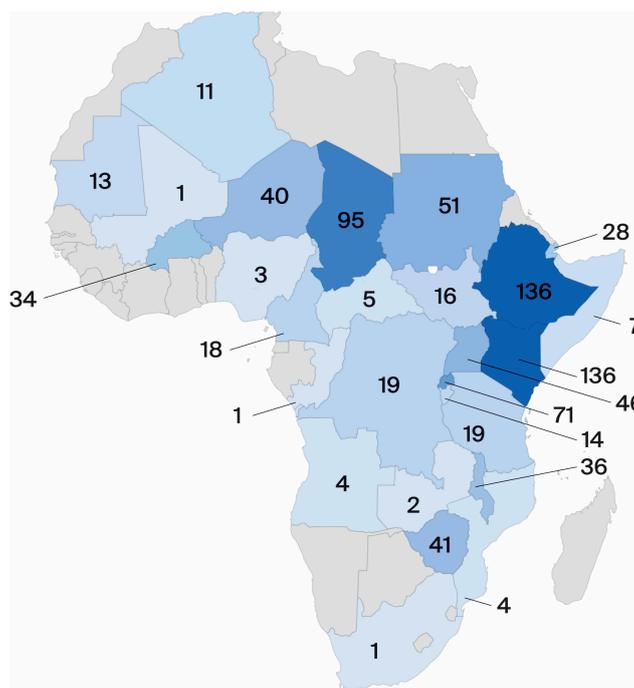
Figure 24 visualizes data from the Humanitarian Energy Data Platform which covers 27 out of the 30 countries selected, not considering Algeria, Egypt and the CAR. The number of projects on energy access in displacement contexts differs considerably across countries. East Sahel and East Africa, notably Ethiopia and Kenya with 136 projects each, represent the regions with the highest number of energy-related projects, whereas all the other considered countries show numbers below 20 except for Burkina Faso, Niger and Zimbabwe. This difference becomes even more visible when we look at the four countries with the highest number of projects. Ethiopia, Kenya, Chad, and Sudan collectively account for nearly half of all the projects with 49% of the 27 countries. Consequently, there are several countries which exhibit a very limited number with South Africa, Congo and Mali representing the lowest values at only one project each. Overall, it can be noted that the number of projects per country remains quite modest, with nine countries having fewer than 10 projects.



**Figure 22.** Type of lighting in displacement camps and settlements by country. Own compilation based on data in [56], accessed in January 2024.



**Figure 23.** Right to work and right to move in/out of camps and settlements, as well as percentage of countries that are signatories of the Comprehensive Refugee Response Framework (CRRF) across countries, in percent. Own compilation based on data in [56], accessed in January 2024.



**Figure 24.** Number of energy-related projects in the displacement context per country in 2021. Own compilations based on data in [54], accessed in January 2024.

## 4. Discussion

### 4.1. Available Data on Energy Access in Displacement Contexts

Research on and practical implementations of energy access in displacement contexts is still in its early stages. While a number of researchers and practitioners have tried to gain more clarity on the situation of energy access and contribute to the understanding of local, regional and country circumstances, there is the need for conceptual studies, novel approaches, progressive policy making and financing to systematically advance this field and improve the lived realities of large population on different levels [16,24]. Data and evidence are essential as a foundation for efficient and meaningful decision taking and progress that then is possible to be applied practically. The data search of this study revealed that while being scattered, relevant data exists that allows for the formulation of a generalized information base on the state of art. Overall, the number of transnational data sets that comply with minimum quality standards and that were categorized as relevant for this study is small. Six relevant sources were identified that allowed to formulate eleven indicators with six of them on the country, and five on the camp and settlement level. All presented data is quantitative data, which was prepared, visualized, and explained. Further, a DQA was tailored and applied to assess the quality of the information achieved. The DQA revealed significant shortcomings on energy access in displacement contexts, a finding that coincides with statements from multiple publications from recent years [13,16,24]. The overall low-quality scores in the DQA are related to several reasons.

First, the data is often incomplete. For example, the data on clean cooking access published by [54] includes 53% of the countries of this study. The shortcomings of data becomes also visible when looking at the number of camps and settlements that were considered in the dataset of [54]. For the overview on access to electricity, the source provided information on 74 camps and settlements across 16 countries. Looking at the camps and settlements found in [56] and [57], it can be seen that there are at least 216 camps in the 16 countries mentioned. This means, that at least 66% of the existing camps are not included in the dataset of [54]. On the one hand, this allowed to research, visualize and discuss more details about the situation in parts, but it left out a larger number of locations and it

raises the question as to whether and how this can be applied to estimate the overall picture of the situation in these countries.

The second reason for the low-quality score depends on the category of timeliness. Some of the data considered in this study is 3 to 10 years old and potentially does not take into account latest changes. The energy infrastructure and the environment change over a longer period of time slowly and the data seems to still have high relevance for these purposes, however the number of displaced persons fluctuates in shorter time intervals. The MEI data originate from 2010 [32] and provide useful indication, but it is essential to generate up-to-date knowledge to estimate the current situation.

The third reason explaining the limitations in the quality of the data is its accuracy. There is a considerable lack of field data at the individual and at the community level in the form of survey and interviews with displaced persons. The models employed to produce the information are often oversimplified leading to inaccurate results. An example showing this issues is the study performed by MEI [56]. Although some of the data is derived from interviews, which is for example the case in [54], an extensive survey in order to improve data accuracy, as it was sought in the development of the Energy Progress Report [55], is yet to be realized in a similar manner.

A fourth problem uncovered by the DQA concerns the category coherence. The analysis of the data of MEI [56] and the Humanitarian Energy Data Platform [54] showed inconsistencies, i.e. among the data on clean cooking. The two sources published data on clean cooking in several camps and settlements while 45 of those appear in both datasets. Nevertheless, only in five out of 45 cases do both agree on the type of fuel used for cooking. This could be due to the different years of publication, although it would suggest only minor discrepancies. The inconsistency in 40 cases is difficult to reconstruct.

The limited data quality poses challenges since reliable and informed decision making requires consistent and needs-based data. The currently available information on energy access in displacement contexts provide valuable insights but at the same time offers merely estimates and indications that do not suffices as guidance for further development and expansion of the sector, but rather serve as a broad overview. Further research is needed that is based on overarching criteria to enable comparability across settings and the evaluation of individual contextual situations. In addition, existing data collection designs, which are mainly top-down and high-level rather than needs-based, individual and community-oriented, should be complemented to include the influences of energy solutions on the perceived life realities of displaced persons.

#### *4.2. Data Insights from a Country Perspective*

##### *Policies and regulations*

The evaluation of RISE has shown that there are considerable differences in terms of current regulation and policy environment for the integration of electricity access and clean cooking between the selected countries. For electricity access, the scores range from as low as 8 in the case of South Sudan to 90 in Rwanda.. The data of RISE further revealed that most of the selected countries had relatively low scores, particularly for the pillar clean cooking, raising the question of how these results might translate into access to clean cooking for displaced persons. As the objective of RISE is to demonstrate the extent to which a countries regulatory framework contributes to achieving Sustainable Development Goal 7 [59], the assumption could be made that displaced persons who live in countries with a relatively high score might have better chances to obtain electricity and clean cooking access than displaced persons hosted by countries with low scores. With the currently available data, it is however impossible to prove this assumption. In fact, a high correlation between the RISE scores and the electrification rate or clean cooking access for displaced persons was not found.

##### *Electricity*

Similarly, there were many disparities found in electricity access for the general population of the countries. Particularly in rural areas, access to electricity varied widely, ranging from full access (e.g. Egypt) to nearly no access to electricity (e.g. 1 % in Chad), raising the question of how those percentages may also have an influence on the electricity access for displaced persons in the

respective countries. A look at the results of the study performed by MEI [56] reveals some insights. On the one hand, there are countries that show similar values regarding electricity access for both, the total population and displaced persons (e.g. Chad for low access or South Africa for high access). However, there are also countries such as Algeria, where the electrification rate is generally at 100% but only 10% of the displaced persons have electricity access. With the considered data in this study, a significant correlation between the general electrification rate of a country and the electricity access for displaced persons could not be made. Nevertheless, even though the data cannot be regarded as the result from a thorough data design and generation exercise, there are indications the situation in the host country has a considerable impact on the availability of electricity for displaced persons.

#### *Clean cooking*

While both, the Energy Progress Report [55] and MEI data [56] show a similar picture for the availability of clean cooking options, also no correlation could be established between clean cooking access for the total population and for displaced persons. For example, the amount of the population of Sudan that has clean cooking solutions at hand is at 61% but only 1% of the displaced persons in Sudan benefit from access to clean cooking devices. However, the shockingly low shares in clean cooking access for the majority of the countries, in particular in rural areas, emphasizes that the access to clean cooking represents not only a challenge for displaced persons but also for the general population.

Compared to the electrification rate, the results of the MEI study on access to clean cooking demonstrate an even more pronounced disparity between the selected countries. The proportion of population in the Maghreb region and South Africa that have access to clean cooking is very high - at least 90%, while 12 of the remaining 26 countries have an access rate of less than 10%. The data therefore clearly indicates that the differences in the living conditions of displaced people become even more apparent when access to clean cooking is analyzed.

### *4.3. Data Insights from a Camp Perspective*

#### *Electricity*

The analysis from the camp perspective emphasizes the conclusions drawn in the previous section. Particularly, the low electrification rate becomes visible with the data from [54] as more than two thirds of the 74 considered camps do not have any access to electricity. This finding underpins the statements found in other scientific articles [58,62]. The camp perspective also reveals that the lived realities do not only differ between countries but also within a country. 7 out of the considered 16 countries in the data of [54] show camps with different accesses to electricity.

A detailed representation of the lived experiences can however not be made due to several reasons. First, the database for this analysis [54] differentiated between three categories of access – access, partial access, and no access. The source does not specify what “partial access” exactly means though. For a detailed representation of the electricity access for displaced persons, for example with the World Bank Multi-Tier Framework [25], further and more detailed information is required. The second reason is the fact that this study only focusses on refugee camps, leaving out IDPs, asylum seekers and other people of concern. Conclusions made from data on refugees living in camps cannot be transferred and used for an accurate view of energy access for all displaced persons.

#### *Clean cooking*

From the camp perspective, the most visible finding is the high dependency on firewood. With 96%, the vast majority of the considered camps in the dataset of [54] are either completely or partially dependent on firewood, emphasizing the previously discussed low development state in clean cooking access. The camp perspective also illustrates considerable differences between and within the countries. While five out of the 20 selected countries only host firewood dependent camps, three countries have at least four different types of cooking fuels used in their respective camps, indicating that clean cooking access differs also considerably within the same country.

#### 4.4. Limitations and Considerations of the Available Data

In the previous subsections of this article, we discussed insights that available data reveals about the state of energy access in displacement contexts. This study confirms that already today an information basis exists that goes beyond the global cumulative indicators for energy access. It is evident that the relevant transnational data identified is limited in its scope. Nevertheless, the data gives some important indications that may be utilized to efficiently progress towards universal access to clean energy in displacement settings.

Although the scope of data is limited and our quality assessment has revealed fundamental shortcomings, it is essential that stakeholders use all available data to improve the relevance of decision-making, especially considering the urgent need and urgency highlighted in this study. However, the overall lack of data and evidence also risks overestimating the informational value of the evidence. The existing data contains fundamental simplifications and assumptions that need to be critically reflected upon for each application of the data. A comprehensive understanding of the degree of uncertainty is essential.

Another risk associated with the utilization of the data is the oversimplification of the subject matter. The presented data is predominantly quantitative. While the data enables a high-level evaluation of the state of energy access and may inform the overall scope of the challenges at hand, it does not provide a sense of context. The inability to describe the relevant local contexts of settlements and camps contains the risks of neglecting the context in decision making. This is in stark contrast to the growing body of scientific literature calling for an acknowledgement of the fundamental implications of the diversity in contexts (e.g., [18,28,29,63]). In simple terms, this suggests that the less contextual insights are required, the more relevant the existing data is. The data may therefore be more relevant to inform high-level policy decisions than to support the design of energy programs or interventions on settlement and camp level.

Activities that necessitate a comprehensive contextual understanding of energy-related lived realities require a more thorough information base than what is available to enable meaningful decision making. For example, knowledge of the dominant type of cooking fuel in a settlement or a camp may give the impression that the relevance of higher-tier cooking intervention can be assessed for a settlement or camp. However, assessing the relevance of energy intervention necessitates much more detail understanding of the context. In the case of cooking this understanding may include on a household level e.g., individual cooking preferences [27], energy priorities [19], aspirational energy needs [6], and the household's income [21], on a settlement or camp level the availability of alternative cooking fuels [19] and the type of environment (emergency vs. protracted situation) [24]. In addition, the type of fuel alone is also insufficient to determine the tier of energy access of displaced persons. The stated indicators are only exemplary for the energy-related lived realities of displaced persons and more insights are needed to inform systemic change processes.

The need for more updated, more comprehensive, and granular data is apparent. It is up to international organizations and the scientific community to facilitate processes to further develop approaches to systematically collect, share, and evaluate data. Novel conceptual frameworks and indicators are needed to capture the state of access to energy in displacement contexts. Future research holds promise to enhance the field if it first focuses on a more comprehensive understanding of how energy is intertwined with the lives of displaced people before deriving a set of energy indicators. It is important that IDPs are meaningfully included in the research.

## 5. Conclusions

The results of our study have shown remarkable differences in the access to electricity for displaced persons across countries on the African continent. For both electricity and clean cooking, the availability for displaced persons ranges from nearly no access at all up to an access rate of 100%. More strikingly, the results also show that besides South Africa, and the selected countries in the Maghreb region, the access to both clean cooking and electricity for displaced persons is considerably low. Particularly in the case of clean cooking, the very low shares have become apparent. From a

country perspective, it can be concluded that the access to energy for displaced persons does not only depend greatly on the energy situation in the host country but is still at a very low level in general.

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## Appendix A

Countries in this study	Number of displaced persons
Algeria	102753
Angola	55981
Burkina Faso	1917317
Burundi	99251
Cameroon	1473294
Central African Republic	527348
Chad	1080557
Congo	97074
Cote d'Ivoire	937027
Democratic Republic of the Congo	6063761
Djibouti	30197
Egypt	358523
Ethiopia	4208422
Kenya	1078815
Libya	206330
Malawi	56560
Mali	441449
Mauritania	106370
Mozambique	1060234
Niger	716412
Nigeria	3379779
Rwanda	149218
Somalia	3002276
South Africa	150912
South Sudan	2167672
Sudan	4685356
Tanzania	247196
Uganda	4144589
Zambia	81090
Zimbabwe	23063

<b>Countries without data or a displaced population below 20000, and not in this study</b>	<b>Number of displaced persons</b>
Equatorial Guinea	no data
Mauritius	no data
Sao Tome and Principe	no data
Seychelles	no data
Cape Verde	115
Sierra Leone	324
Benin	2639
Gabon	280
Gambia	3883
Ghana	11048
Guinea	2252
Guinea-Bissau	54
Liberia	1441
Namibia	7268
Senegal	12062
Togo	9876
Tunisia	8929
Botswana	900
Comoros	17
Eritrea	136
Lesotho	545
Madagascar	245
Eswatini	2161
Morocco	18066
<b>Sum</b>	<b>74973</b>
<b>Total number of displaced persons in Africa</b>	<b>36059666</b>
<b>Share of excluded countries</b>	<b>0,2%</b>

Data Quality Assessment – evaluation of the considered sources

<b>Tracking SDG 7 – The Energy Progress Report</b>		
<b>Dimension</b>	<b>Assessment</b>	<b>Score</b>
Timeliness	The latest publication of the Energy Progress Report is from 2022 and represents the results for the year 2021.	1
Completeness	29 from the 30 countries that have been selected for our work have also been considered in the Energy Progress Report.	2
Accuracy	The Energy Progress Report is based on the collection of census and survey data. However, the data sources lack of information for some regions and some surveys are not updated regularly. The missing data is therefore estimated by using modelling tools (for example the nonparametric modelling).	1
Coherence	The methodology used for the creation of the data is common. The data collection is done by desk research while several modelling tools are used to fill the missing data for the creation of the dataset. The report is updated on a regular basis, allowing the resulting dataset to be compared to other sources.	2
Interpretability	The reporting source gives access to a detailed description of the methodology as well as further background information on the work. The additional information allows to interpret and use the data correctly.	2
<b>Total score</b>		<b>8</b>

<b>Humanitarian Energy Data Platform</b>		
<b>Dimension</b>	<b>Assessment</b>	<b>Score</b>
Timeliness	The source only mentions when the dataset was published (2020). It is not possible to calculate the number of years elapsed since the data was collected.	0
Completeness	The country coverage varies depending on the considered subject. For instance, the section "Country Market Analysis" covers 21 countries whereas the section "National Energy Data" covers 51 countries. The minimum coverage corresponds to 16 out of 30 countries that are considered in our analysis.	0
Accuracy	The dataset was created by using different sources with different levels of accuracy and methodologies (data survey and models). The reporting source states that the work does not represent a complete picture of the humanitarian energy situation but rather an overview of factors that influence the current trends of the humanitarian energy environment.	1
Coherence	The dataset is based on common methods (e.g. surveys, interviews). A comparison with sources however shows that the data is incoherent. Any interpretation deriving from the analysis of the data and any use with other sources should be done with the knowledge that the dataset is not coherent.	1
Interpretability	A description of the methodology is available. The objective of the analysis as well as the used sources and contributors are mentioned. However, the link to the data is missing which makes it difficult to find the exact data source.	1
<b>Total score</b>		<b>3</b>

<b>Refugee Settlements Electricity Access (RSEA)</b>		
<b>Dimension</b>	<b>Assessment</b>	<b>Score</b>
Timeliness	The dataset was published in 2021 and shows data collected in 2020.	1
Completeness	The analysis includes 21 out of the 30 countries considered in our analysis.	0
Accuracy	The dataset is based on data from existing literature (academic articles, white papers) as well as field research (surveys, interviews). The collected data was cross-referenced for consistency.	2
Coherence	The dataset was created by using common methods including desk research, field data collection and interviews with stakeholders. The reporting source has published a paper which explains the work and its purpose in detail. We have not found any incoherence in the data and therefore conclude that this source can be used in combination with other sources.	2
Interpretability	The work is described in detail in a research paper allowing a clear view on the used methodology. The purpose as well as the limitations of the work are explained so that the data can be interpreted correctly.	2
<b>Total score</b>		<b>7</b>

<b>UNHCR refugee data finder</b>		
<b>Dimension</b>	<b>Assessment</b>	<b>Score</b>
Timeliness	The data was published in 2023 and shows the results of the analysis for the year 2022. The dataset is updated every six months.	2
Completeness	All the countries selected for our analysis are covered by the dataset.	2
Accuracy	The work is based on different data sources which all represent real world data, including population censuses, surveys and administrative records. Statistical frameworks specifically developed for the analysis of forcibly displaced persons are used to complement the data analysis.	2

Coherence	The source uses methodologies that are common for a population count (statistical analysis based on population censuses, surveys, administrative data records, etc.). There has not been found any incoherence during our analysis of the data.	2
Interpretability	A detailed description of the used methodology is available and allows to interpret and use the data correctly. The source also gives access to further documents with detailed descriptions of the analysis that lead to the creation of the dataset.	2
<b>Total score</b>		<b>10</b>

### Regulatory Indicators for Sustainable Energy (RISE)

Dimension	Assessment	Score
Timeliness	The dataset was published in 2022 and represents the results for the year 2021.	1
Completeness	The source does not have the same country coverage for each section. The minimum coverage is 26 out of 30 countries considered in our analysis.	1
Accuracy	The dataset is based on desk research and field data (surveys). The reporting sources gives access to the used data sources and additional information related to the analysis. It should be noted that the results are not representing any real-world data but rather a score which is based on the specific framework that was developed for this analysis (RISE framework). A certain subjectiveness should therefore be attributed to the work which also influences its accuracy.	1
Coherence	The used methodology is explained in detail. Any incoherence in the dataset was not found.	2
Interpretability	The reporting source gives access to the methodology and further information that allows a clear understanding of what the dataset can be used for. The sources that were used for the creation of the dataset are also shared on the web page of the reporting source.	2
<b>Total score</b>		<b>7</b>

### Moving Energy Initiative

Dimension	Assessment	Score
Timeliness	The information was obtained from different sources with the oldest dating back to 2014.	0
Completeness	The source does not have the same country coverage for each section. The lowest coverage is 18 out of 30 countries considered in our analysis.	0
Accuracy	A scientific article was published which describes the methodology of the work in detail. It is stated that the dataset is based on a simple model which does not lead to accurate results.	0
Coherence	The dataset was created with common methods and can be used with other datasets if it is understood that the data represents more an indication than a detailed picture. The dataset shows some incoherencies (e.g. description for type of cooking fuel, see section 2 GPA UNITAR).	1
Interpretability	A detailed description of the methodology used in this work is presented in the scientific article. It is clear what the work is intended to show and how the data should be interpreted.	2
<b>Total score</b>		<b>3</b>

### References

1. *Global Appeal 2024*; UNHCR, 2024;
2. *Glossary on Migration*; IOM;

3. EMN Asylum and Migration Glossary Available online: [https://home-affairs.ec.europa.eu/networks/european-migration-network-emn/emn-asylum-and-migration-glossary\\_en](https://home-affairs.ec.europa.eu/networks/european-migration-network-emn/emn-asylum-and-migration-glossary_en) (accessed on 22 August 2023).
4. UNHCR Master Glossary of Terms | UNHCR Available online: <https://www.unhcr.org/glossary> (accessed on 22 August 2023).
5. *Global Appeal 2023*; UNHCR, 2023;
6. Matthey-Junod, A. Leaving No Aspect of Sustainability behind: A Framework for Designing Sustainable Energy Interventions Applied to Refugee Camps. *Social Science* **2022**.
7. Bisaga, I.; To, L.S. Funding and Delivery Models for Modern Energy Cooking Services in Displacement Settings: A Review. *Energies* **2021**, *14*, 4176, doi:10.3390/en14144176.
8. Jacobsen, K. *The Forgotten Solution: Local Integration for Refugees in Developing Countries*; UN High Commissioner for Refugees (UNHCR), 2001; p. 43.
9. Brause, U. Analysis of Empowerment of Refugee Women in Camps and Settlements. *The Journal Internal Displacement* **2013**.
10. Moore, B. Refugee Settlements and Sustainable Planning. **2017**.
11. Damme, W.V. How Liberian and Sierra Leonean Refugees Settled in the Forest Region of Guinea (1990-96). *Journal of Refugee Studies* **1999**, *12*, 36–53, doi:10.1093/jrs/12.1.36.
12. Thomas, P.J.M.; Rosenberg-Jansen, S.; Jenks, A. Moving beyond Informal Action: Sustainable Energy and the Humanitarian Response System. *Int J Humanitarian Action* **2021**, *6*, 21, doi:10.1186/s41018-021-00102-x.
13. Rosenberg-Jansen, S. The Secret Life of Energy in Refugee Camps: Invisible Objects, Technologies, and Energy Systems in Humanitarianism. *Journal of Refugee Studies* **2022**, *35*, 1270–1291, doi:10.1093/jrs/feac026.
14. Home | Sustainable Development Available online: <https://sdgs.un.org/> (accessed on 21 March 2024).
15. *Accelerating SDG7 Achievement: Policy Briefs in Support of the First SDG7 Review at the UN High-Level Political Forum*; United Nations, 2018;
16. Dr Sarah Rosenberg-Jansen and Dr Hajar Al-Kaddo.; Contributing authors: Joelle Hangi, Thomas Fohgrub, Elif Demir, Owen; Grafham, Eva Mach, Luc Severi, Mark Gibson, Mattia Vianello, Laura Clarke.; Cathleen Seeger, Aimee Jenks, Lama Gharaibeh, Cecilia Ragazzi, Iwona; Bisaga, Jonathan Archimi, Philip Sandwell, Stephen Gitonga, David Kinzuzi.; Arielle Ben-Hur, Vahid Jahangiri, Surabhi Rajagopal, Ziad Ayad, and Sadiq; Zafrullah. *The State of the Humanitarian Energy Sector: Challenges, Progress and Issues in 2022*; UNITAR Publishing; Geneva, Switzerland, 2022;
17. Barbieri, J.; Leonforte, F.; Colombo, E. Towards an Holistic Approach to Energy Access in Humanitarian Settings: The SET4food Project from Technology Transfer to Knowledge Sharing. *Int J Humanitarian Action* **2018**, *3*, 11, doi:10.1186/s41018-018-0038-3.
18. Rosenberg-Jansen, S. Inclusive Energy Solutions in Refugee Camps. *Nature Energy* **2019**, *4*.
19. Thomas, P.J.M.; Sandwell, P.; Williamson, S.J.; Harper, P.W. A PESTLE Analysis of Solar Home Systems in Refugee Camps in Rwanda. *Renewable and Sustainable Energy Reviews* **2021**, *143*, 110872, doi:10.1016/j.rser.2021.110872.
20. Robinson, B.L.; Halford, A.; Gaura, E. From Theory to Practice: A Review of Co-Design Methods for Humanitarian Energy Ecosystems. *Energy Research & Social Science* **2022**, *89*, 102545, doi:10.1016/j.erss.2022.102545.
21. Baldi, D.; Moner-Girona, M.; Fumagalli, E.; Fahl, F. Planning Sustainable Electricity Solutions for Refugee Settlements in Sub-Saharan Africa. *Nat Energy* **2022**, *7*, 369–379, doi:10.1038/s41560-022-01006-9.
22. *How Night-Time Street Lighting Affects Refugee Communities*; UNHCR, 2017;
23. Renewables for Refugee Settlements: Sustainable Energy Access in Humanitarian Situations.
24. Rosenberg-Jansen, S. The Emerging World of Humanitarian Energy: A Conceptual Research Review. *Energy Research & Social Science* **2022**, *92*, 102779, doi:10.1016/j.erss.2022.102779.
25. Bhatia, M., A., N. *Beyond Connections: Energy Access Redefined*; Energy Sector Management Assistance Program (ESMAP): Washington, D.C., 2015;
26. Pelz, S.; Pachauri, S.; Groh, S. A Critical Review of Modern Approaches for Multidimensional Energy Poverty Measurement. *WIREs Energy & Environment* **2018**, *7*, e304, doi:10.1002/wene.304.
27. Abdelnour, S.; Pemberton-Pigott, C.; Deichmann, D. Clean Cooking Interventions: Towards User-Centred Contexts of Use Design. *Energy Research & Social Science* **2020**, *70*, 101758, doi:10.1016/j.erss.2020.101758.
28. Neves, D.; Baptista, P.; Pires, J.M. Sustainable and Inclusive Energy Solutions in Refugee Camps: Developing a Modelling Approach for Energy Demand and Alternative Renewable Power Supply. *Journal of Cleaner Production* **2021**, *298*, 126745, doi:10.1016/j.jclepro.2021.126745.
29. Robinson, B.L.; Clifford, M.J.; Jewitt, S. TIME to Change: Rethinking Humanitarian Energy Access. *Energy Research & Social Science* **2022**, *86*, 102453, doi:10.1016/j.erss.2021.102453.
30. Bellanca, R. Sustainable Energy Provision Among Displaced Populations: Policy and Practice. *Policy and Practice*.

31. Baranda Alonso, J.; Sandwell, P.; Nelson, J. The Potential for Solar-Diesel Hybrid Mini-Grids in Refugee Camps: A Case Study of Nyabiheke Camp, Rwanda. *Sustainable Energy Technologies and Assessments* **2021**, *44*, 101095, doi:10.1016/j.seta.2021.101095.
32. Lehne, J.; Blyth, W.; Lahn, G.; Bazilian, M.; Grafham, O. Energy Services for Refugees and Displaced People. *Energy Strategy Reviews* **2016**, *13–14*, 134–146, doi:10.1016/j.esr.2016.08.008.
33. Fuentes, M.; Vivar, M.; Hosein, H.; Aguilera, J.; Muñoz-Cerón, E. Lessons Learned from the Field Analysis of PV Installations in the Saharawi Refugee Camps after 10 Years of Operation. *Renewable and Sustainable Energy Reviews* **2018**, *93*, 100–109, doi:10.1016/j.rser.2018.05.019.
34. Van Hove, E.; Johnson, N.G. Refugee Settlements in Transition: Energy Access and Development Challenges in Northern Uganda. *Energy Research & Social Science* **2021**, *78*, 102103, doi:10.1016/j.erss.2021.102103.
35. Maalim, S.A.; Adwek, G.; Arowo, M. Shared Energy Parks as a Solution to Energy Challenges for Dadaab Refugee Camps in Kenya. *Scientific African* **2021**, *13*, e00901, doi:10.1016/j.sciaf.2021.e00901.
36. Thomas, P.J.M.; Williamson, S.J.; Harper, P.W. The Diffusion of Solar Home Systems in Rwandan Refugee Camps. *Energy for Sustainable Development* **2021**, *63*, 119–132, doi:10.1016/j.esd.2021.05.003.
37. Rafa, N.; To, T.T.V.; Gupta, M.; Uddin, S.M.N. The Pursuit of Energy in Refugee Contexts: Discrimination, Displacement, and Humanitarian Energy Access for the Rohingya Refugees Displaced to Bangladesh. *Energy Research & Social Science* **2022**, *83*, 102334, doi:10.1016/j.erss.2021.102334.
38. Owen Grafham *Energy Access and Forced Migration*; 2020;
39. Grafham, O.; Sandwell, P. Harness Better Data to Improve Provision of Humanitarian Energy. *Nat Energy* **2019**, *4*, 993–996, doi:10.1038/s41560-019-0518-8.
40. *The Global Plan of Action for Sustainable Energy Solutions in Situations of Displacement: Framework for Action*; UNITAR, 2019;
41. Frercksen, N. Inclusion of Displaced Persons in National Systems.
42. Yaron Cohen, L.P. *Innovative Financing for Humanitarian Energy Interventions*; Chatham House, 2019;
43. UNHCR Energy Information System Available online: <https://eis.unhcr.org/home> (accessed on 22 March 2024).
44. READS Programme | Global Platform for Action Available online: <https://www.humanitarianenergy.org/thematic-working-areas/reads-programme/> (accessed on 22 March 2024).
45. Humanitarian Data Exchange Available online: <https://data.humdata.org/> (accessed on 22 March 2024).
46. Rosenberg-Jansen, D.S. Critical Concepts and Research Needs in Humanitarian Energy. **2021**.
47. Halford, A.; Gaura, E.; Bhargava, K.; Verba, N.; Brusey, J.; Nixon, J. Off the Boil? The Challenges of Monitoring Cooking Behaviour in Refugee Settlements. *Energy Research & Social Science* **2022**, *90*, 102603, doi:10.1016/j.erss.2022.102603.
48. UNHCR Refugee Data Finder 2023.
49. Cichy, C.; Rass, S. An Overview of Data Quality Frameworks. *IEEE Access* **2019**, *7*, 24634–24648, doi:10.1109/ACCESS.2019.2899751.
50. World Health Organization *Data Quality Review: Module 1: Framework and Metrics*; World Health Organization: Geneva, 2017; ISBN 978-92-4-151272-5.
51. Mumbere, O.; Kopi, L. *How to Conduct a Data Quality Assessment (DQA): An Aif Memoir for a COR/AOR*; USAID, 2012;
52. Batini, C.; Cappiello, C.; Francalanci, C.; Maurino, A. Methodologies for Data Quality Assessment and Improvement. *ACM Comput. Surv.* **2009**, *41*, 1–52, doi:10.1145/1541880.1541883.
53. Cameron, Laurie *Methodology for Evaluating Data Quality*. Working Paper WP-07-02. **2005**.
54. Introduction to Humanitarian Energy Data Platform 1.0 | Global Platform for Action Available online: <https://www.humanitarianenergy.org/news/latest/introduction-to-humanitarian-energy-data-platform-1.0> (accessed on 23 March 2024).
55. Tracking SDG 7 | Progress Towards Sustainable Energy Available online: <https://trackingsdg7.esmap.org/> (accessed on 23 March 2024).
56. Moving Energy Initiative - Humanitarian Data Exchange Available online: <https://data.humdata.org/organization/moving-energy-initiative> (accessed on 23 March 2024).
57. Joint Research Centre Data Catalogue - Refugee Settlements Electricity Access (RSEA) - European Commission Available online: <https://data.jrc.ec.europa.eu/dataset/4261bf3c-7e8e-4b16-925b-68cfd4eade37> (accessed on 23 March 2024).
58. Grafham, O.; Lahn, G.; Haselip, J. *Scaling Sustainable Energy Services for Displaced People and Their Hosts: How Policy and Governance Make a Difference*; Royal Institute of International Affairs, 2022;
59. RISE Available online: <https://rise.esmap.org/> (accessed on 23 March 2024).
60. UNHCR Refugee Data Finder Available online: <https://www.unhcr.org/refugee-statistics/> (accessed on 22 March 2024).

61. World Population Prospects - Population Division - United Nations Available online: <https://population.un.org/wpp/> (accessed on 23 March 2024).
62. Gunning, R. The Current State of Sustainable Energy Provision for Displaced Populations: An Analysis.
63. Rosenberg-Jansen 1, S.; Barlow, M.; Peisch, S.; Ponnann, N.; Rathi 2, P. *Sustainable Humanitarian Energy Services: Inclusive Participation, Lessons Learnt, and Paths Forward*; Practical Action Publishing Ltd: The Schumacher Centre, Bourton on Dunsmore, Rugby, Warwickshire CV23 9QZ, UK, 2018; ISBN 978-1-85339-982-4.

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