PROVISION OF STRENGTHENING ADAPTATION PLANNING PROCESSES AND CAPACITY FOR IMPLEMENTATION OF ADAPTATION ACTIONS IN AGRICULTURAL AND WATER SECTORS IN THE SUDAN (NAP READINESS)

CONSTRUCTING CLIMATE CHANGE VULNERABILITY HOTSPOT MAPS
(SPECIFIED IN LOA)

REPORT ON:

POVERTY DISTRIBUTION & HOTSPOT MAPING

PREPARED FOR FAO- SUDAN

BY

THE FACULTY OF GEOGRAPHICAL AND ENVIRONMENTAL SCIENCES (PROJECT'S TEAM)

UNIVERSITY OF KHARTOUM

JANUARY, 2025

Contents

List of figures and Tables

List of Tables

1. Introduction

Sudan has experienced a significant macroeconomic shock as a result of losing oil revenues since 2011. The consequences included lower economic growth, high rate of foreign exchange- increasing trade deficit emergence of multiple exchange rates. The responses were removal of fuel and wheat subsidies- devaluations of the SDG. Deteriorating conditions have been made worse (economic sanctions - inadequate economic policies). Social safety net has been established to absorb the economic shock. This intervention was weakened by inappropriate targeting tools and measurement. The targeting involves:

1. Geographical targeting

2. Community-based targeting

3. Demographic targeting

4. Self-targeting

Geographic targeting is determining the eligible household by location. It uses to focus the intervention in only some targeted areas in the country. Poverty and household indicators are usually provided by national household surveys. Surveys are not representative beyond the state level. The lower levels of disaggregation are important for policy interventions. Poverty mapping is a process based on the Small Area Estimation (SAE) technique (WB). Poverty mapping aims to estimate the geographic poverty and inequality. Three steps of the process:

- Methods & Data Sources
- Data Processing
- Poverty Mapping

2. Methodology

Generally, the methods depend on combination data from the national surveys and population censuses to build spatially disaggregated poverty maps. Although poverty mapping methods have been used and documented by Bigman and

Deichmann (2000). Choosing of a specific poverty mapping methodology is a critical first step in deriving a poverty map.

The SAE method developed by Elbers, Lanjouw, and Lanjouw (2003) has acquired wide recognition among development practitioners around the world (Mungai, Nguyen, and Pradhan 2018; preferred within the World Bank). This methodology assigns consumption levels to census households based on a consumption model estimated from the household survey.

2.1 Main Sources of Data

Poverty mapping is to be conducted by combining the NHBPS 2014/15 data and 5th Population and Housing Census (2008). The census provides comprehensive information on the population socio demographic and dwelling conditions. Household income and expenditure information were not included. The NHBPS 2014/15 data included information about the expenditure of household at all levels. Since 2009, there have been two poverty surveys, two poverty maps and other poverty assessment studies: Several sources of data have been consulted and some poverty data and information were obtained as presented in Table (1)

Table (1): Poverty data/ information and sources

No.	Source of data/ report	Date of survey	Institute/ Organization
1	NHBS, Poverty Survey	2009	CBS/ Gov.
2	Poverty Assessment in Sudan Mapping Natural Resource Potential Part 1	2012	ICARDA
3	NHBPS	2014	CBS, Gov.
4	Poverty and Inequality in Sudan	2009-2014	WB
5	Mapping Poverty in Sudan	2019	WB
6	Empowering Sudan: Renewable Energy Addressing Poverty& Development	2020	UNDP
7	Rapid assessment of the Impact of the Economic Situation on the Urban Population in Khartoum State	2020	MoSD, UNDP, FAO, WFP and ADB

2.2 Methodology Development

Based on the terms and conditions and the available data as shown in Table (2), combined with Table (1), a scenario for different methods was developed as shown

in Table (2). The team is currently analysing and discussing these methods and the suitable ones will be adopted in order to map poverty.

Table (2): Methods for poverty

No.	Methodology	Notice
1	Ideal national survey	Authenticated
2	They used two resources Multiple Indicators Clusters Survey (MICS) 2000and the Health Survey 2006. The methodology was week because SHHS 2006 is defective.	Not authenticated, not accepted.
3	Ideal national survey	Authenticated
4	It is a study comparing between 2009 NHBS and 2014 NHBPS.	Considered as study, not authenticated
5	It combines data from 2014 NHBP and the 2008 Population and Housing Census data, Ideal Method.	Accepted by the Goveronment
6	They just addressed the poverty as of the conducted surveys	Accepted
7	Fake methodology	Not authenticated, not accepted.

3. Poverty Hotspot analyses

The poverty mapping technique is based on SAE technique developed by the World Bank to derive estimates of geographic poverty and inequality. It combines data from the 2014/15 National Household Budget and Poverty Survey (NHBPS) and the 2008 Population and Housing Census data to build spatially disaggregated poverty maps (WORLD BANK GROUP, 2019). To identify hotspots, areas had to be weighted according to their poverty rate. The Getis-Ord Gi* Statistic function was used to draw a cluster map and identify statistically significant points such as a high-value location among points of the same value, and create poverty hotspot area categories with a Z-score and a P-value associated with each category. To identify areas with high or low values that tend to cluster in a particular area, the following equations were used:

$$G_j^*(d) = \frac{\sum_{j=1}^{n} w_{ij}\,(d)x_j}{\sum_{j=1}^{n} x_j} \qquad (1)\ (\text{Manepalli, U. R, 2011})$$

$$Z(G_j^*) = \frac{G_i^* - E\,(G_i^*)}{\sqrt{VAR\,(G_i^*)}} \qquad (2)\ (Mitra,\ S,\ 2009)$$

Where:

- d = distance threshold
- w ij = weight of target neighbour pair
- x j = severity index at location j

3.1 Poverty Distribution & Hotspot Map in Northern State

According to the National Household Budget and Poverty Survey 2014, the poverty rate in the Northern State ranged between 0.00 - 0.122, (WORLD BANK GROUP,2019). The results in Figure (1A), which shows the distribution of poverty in the Northern State, show that the poverty rate varies from one locality to another within the Northern State. It is noted that some localities show higher poverty rates, while others show lower rates compared to the general rate for the state as a whole. The state is divided, according to the poverty rate, into areas with high poverty rates and others with low poverty rates. There is a gradation in hot and cold spots, where it is noted that the dark red color and the dark blue color indicate the highest degree of poverty and the lowest degree, while the colors branching from dark red and dark blue indicate the second or third level of poverty concentration in the area. As for the yellow color, it indicates the absence of a statistically significant relationship.

 In Figure (A2), which indicates the hot and cold spots of poverty, we notice that the southern localities of the state, especially Ad-Daba, Al-Gold and Dongola, have hot spots due to high poverty rates, with the largest hot spot appearing in Al-Gold, followed by Ad-Daba and then Dongola. Meanwhile, cold spots form in Halfa, Merowe and Al-Burgiq, respectively. This indicates low poverty rates and appears in blue, while red indicates high poverty rates.

Fig 1a: poverty Distribution in Northern State   Fig 1b: poverty Hotspot Map in Northern State

3.2 Poverty Distribution & Hotspot Map in River Nile State

According to the National Household Budget and Poverty Survey 2014, the poverty rate in River Nile State ranged between 0.122 - 0.199, (WORLD BANK GROUP,2019). Looking at Figure (2A) which shows the geographical distribution of poverty in River Nile State, we conclude that the localities that include major cities in the state have high levels of poverty compared to the localities that include moderate or small cities in terms of population. High poverty areas are concentrated in Ad-Damar and Atbara, while moderate poverty areas are concentrated in Shendi, Al-Matama and Berber. Low poverty is concentrated in the north of the state, specifically in Al-Buhaira and Abu Hamad. Figure (2B) shows the hot and cold spots of poverty in River Nile State. The dark red color indicates the hot spots of poverty, while the blue color indicates the cold spots. The hot spots of poverty are concentrated in Atbara and Ad-Damar. Meanwhile, the cold spots of poverty are concentrated in the far north of the state and are confined to Abu Hamad locality and parts of Berber locality. Random gold mining in Abu Hamad and Al-Ubaidiya, north of Berber, has contributed to reducing poverty levels in the region, as mining funds have contributed to the social and economic development of the region, so they appear as cold areas.
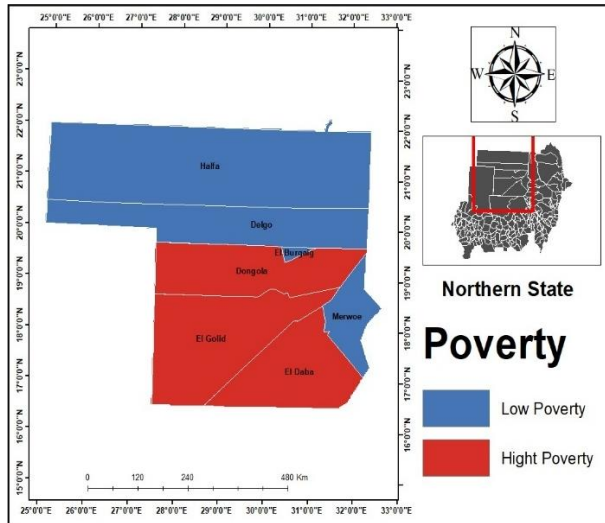
5

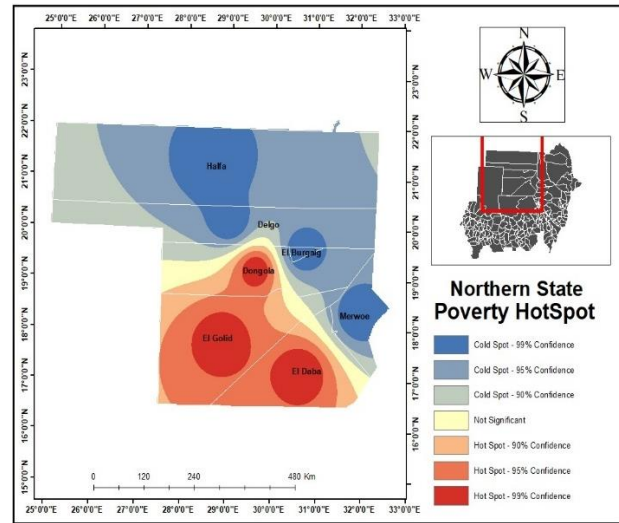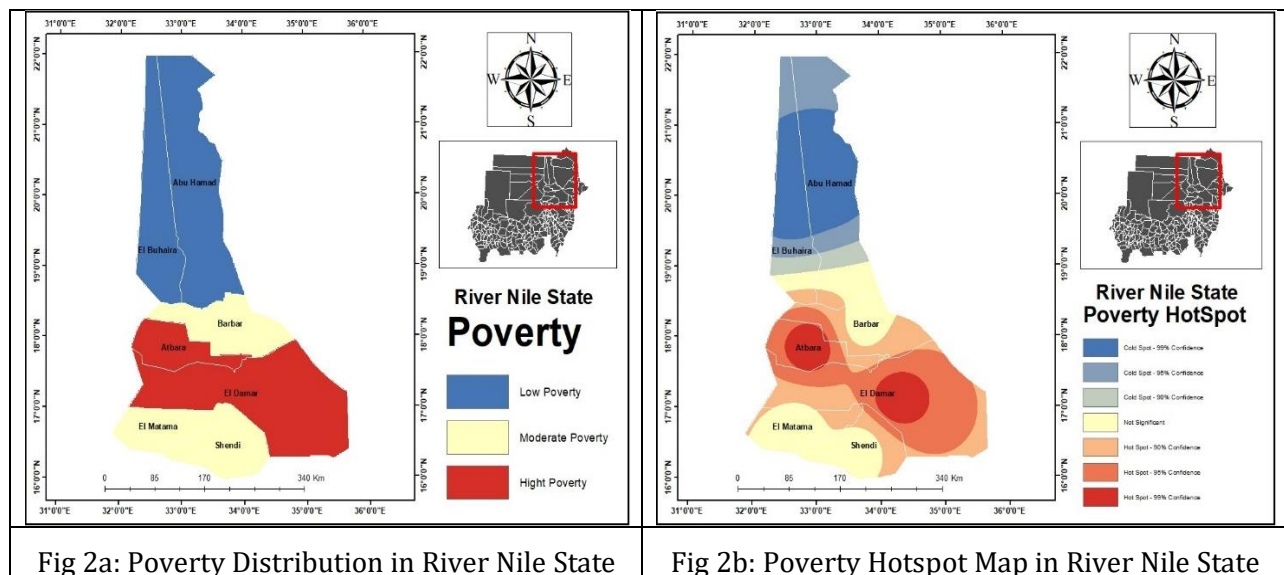| Fig 2a: Poverty Distribution in River Nile State | Fig 2b: Poverty Hotspot Map in River Nile State |

3.3 Poverty Distribution & Hotspot Map in Khartoum State

According to the National Household Budget and Poverty Survey 2014, the poverty rate in Khartoum State ranged between 0.279 - 0.364, (WORLD BANK GROUP,2019). The factors affecting the geographical distribution of poverty in Khartoum State are many, as poverty is concentrated in the peripheral areas of the state, especially the neighborhoods classified as third-class, represented by Umm Badda locality, followed by Karari and Jebel Awliya localities, then East of the Nile. As for the areas of low poverty concentration, they include Khartoum locality, followed by Bahri and Omdurman localities. Figure (3a) shows the geographical distribution of poverty in Khartoum State.

Figure (3b) shows the hot and cold spots of poverty areas in Khartoum State. The dark red color indicates the hot spots of poverty, concentrated in Umm Badda locality. The light red color indicates the warm foci of poverty, concentrated in Karari and Jebel Awliya. It is considered one of the third-class residential areas that hosted a significant percentage of internally displaced persons during the eighties due to drought, desertification, wars and civil conflicts. These areas also received waves of migrants looking for work, education and a decent life. The cold spots of

poverty are concentrated in Khartoum and Khartoum Bahri localities. Khartoum and Khartoum Bahri localities represent the beating heart of the city and include commercial and industrial areas as well as housing for high-income individuals and those working in banking services and cross-border companies.

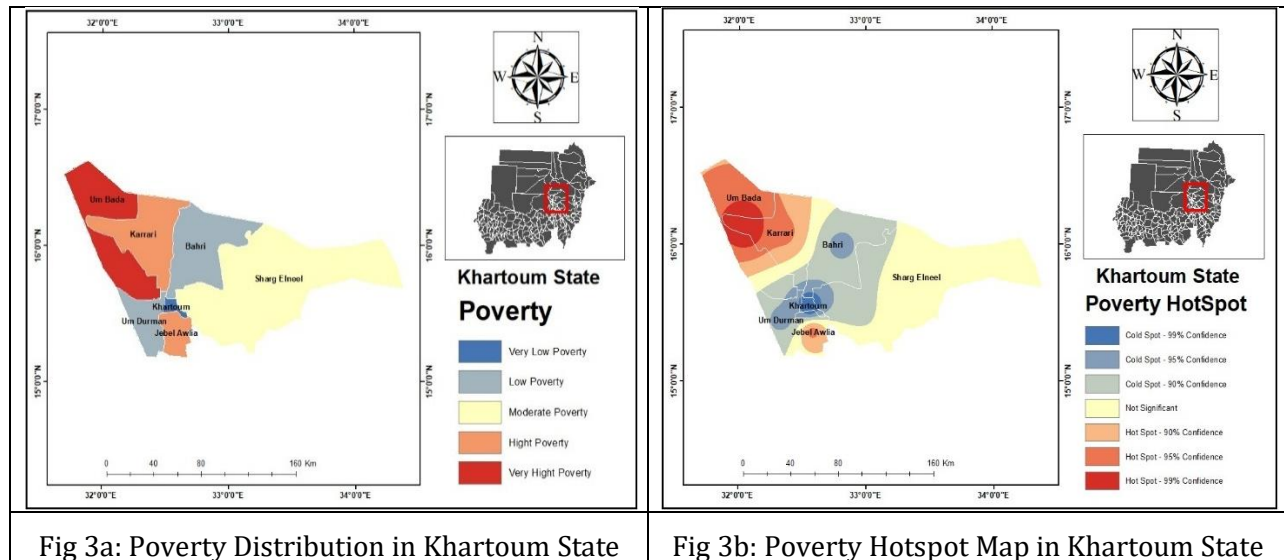| Fig 3a: Poverty Distribution in Khartoum State | Fig 3b: Poverty Hotspot Map in Khartoum State |

3.4 Poverty Distribution & Hotspot Map in Gazera State

According to the National Household Budget and Poverty Survey 2014, the poverty rate in Gazera State ranged between 0.122 - 0.199, (WORLD BANK GROUP,2019). Figure (3A), shows the geographical distribution of poverty in Gazera State, it is noted that there are three types of poverty levels: high, moderate and low poverty areas. Low poverty areas include Wad Madani, Al Kamlin, East Gazera, South Gazera, Al Qurashi and Al Manaqil localities; while moderate poverty areas are limited to Al Hasahisa locality. High poverty areas are limited to Umm Al Qura locality. Gazera State is considered one of the most important agricultural production areas in Sudan and the state's population depends on agriculture and animal husbandry to earn a living, in addition to trading cash crops produced by the Gazera scheme. Therefore, high poverty is concentrated in only one locality out of eight localities, and moderate poverty was also noted in one locality. As for low poverty, it is spread across six localities.

Figure (3B) shows hot and cold poverty hotspots in Gazera State. The red color indicates hot spots, indicating high levels of poverty. This hotspot is located in Umm Al Qura locality, indicating a high level of poverty in the locality compared to other localities. While the blue color covers the other parts of the state, indicating low levels of poverty there. Although poverty levels are low in most localities of Gazera State, they are considered poor when compared to poverty levels in other states of Sudan.

Fig 4a: Poverty Distribution in Gazera	Fig 4b: Poverty Hotspot Map in Gazera
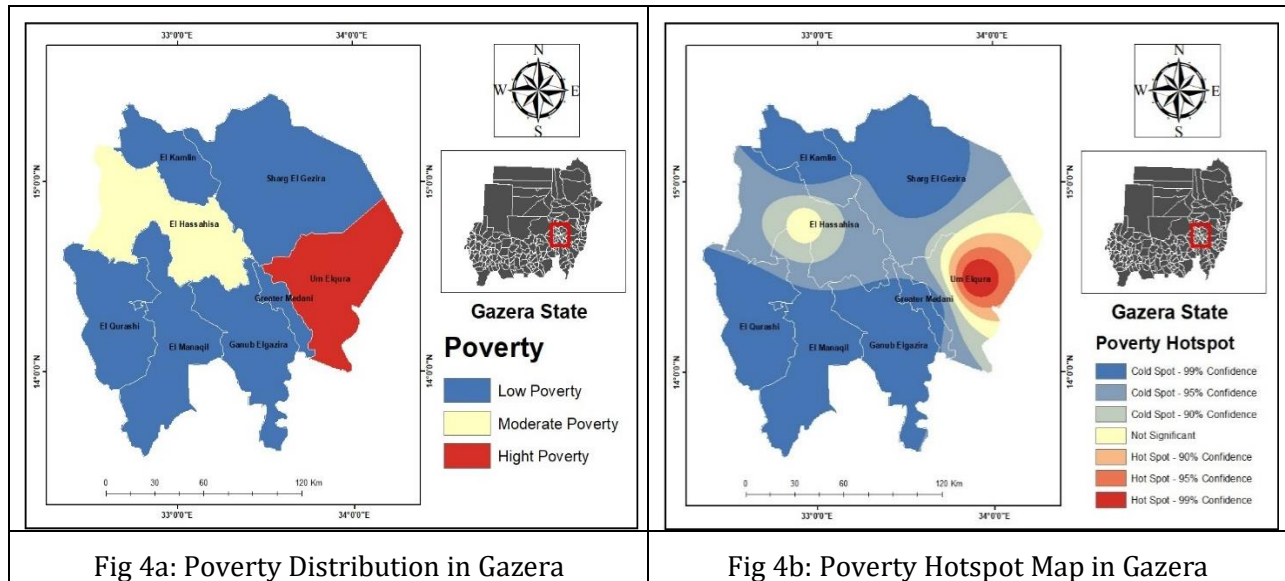
3.5 Poverty Distribution & Hotspot Map in White Nile State

According to the National Household Budget and Poverty Survey 2014, the poverty rate in White Nile State ranged between 0.346 - 0.423, (WORLD BANK GROUP,2019). White Nile State is one of the main agricultural production areas in Sudan; it includes fertile agricultural lands on both sides of the White Nile, as well as rain-fed lands and various agricultural and industrial projects. In addition, the state includes natural pastures and fisheries. All these resources contribute to providing diverse job opportunities. Poverty in White Nile State is classified into four levels: very high, high, moderate and low poverty. Figure (5a) shows the geographical distribution of poverty in the state and the classification of localities according to

poverty level. Tindalti locality, located in the west of the state, represents an area of very high poverty concentration, while Umm Ramta locality, located in the far northwest of the state, represents an area of low poverty. The high poverty area in the state includes the localities of Al Salam, Kosti, Rabak and El Qtaina, while areas of moderate poverty are concentrated in Al Duwaim and El Qataina localities. Figure (5b) shows the hot and cold spots of poverty in White Nile State. The hot spots appear in red color and indicate high levels of poverty, while the cold spots appear in blue color and indicate low levels of poverty. Tindalti locality comes at the forefront of localities with high poverty levels, so there is a hot spot in it, while Umm Ramta locality comes in last place, so the cold spots are confined to low poverty. Far from the centers of hot and cold spots, warm areas are formed and spread in Kosti, Rabak, Es Salam and Guli locality.

| Fig 5a: Poverty Distribution in White Nile State | Fig 5b: Poverty Hotspot Map in White Nile State |
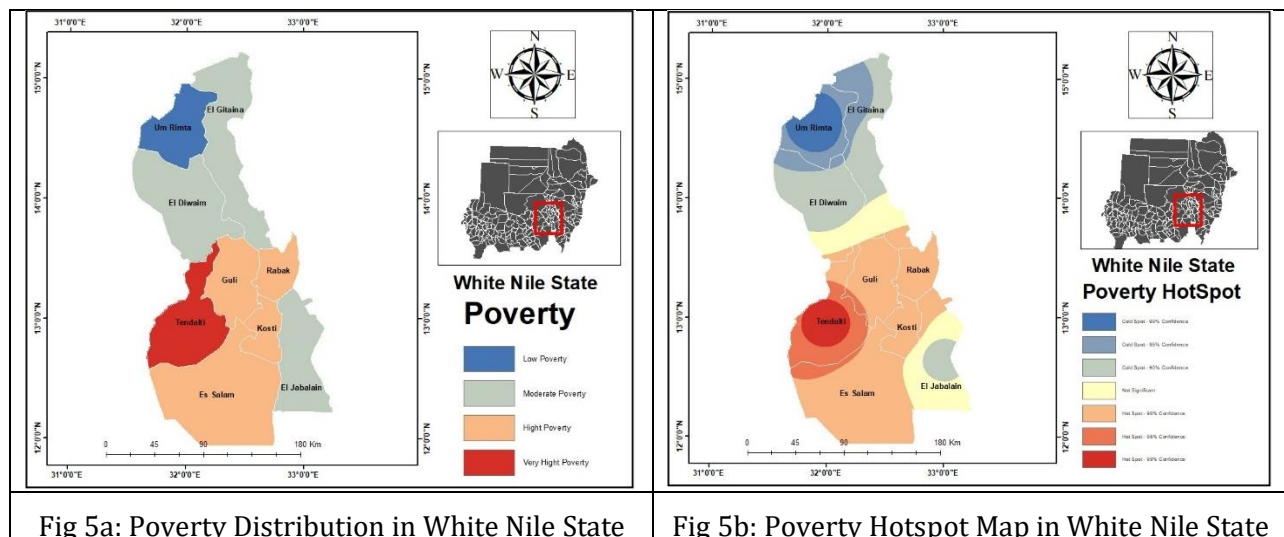
3.6 Poverty Distribution & Hotspot Map in Kassala State

According to the National Household Budget and Poverty Survey 2014, the poverty rate in Kassala State ranged between 0.199 - 0.279, (WORLD BANK GROUP,2019). The state's population depends on irrigated and rain-fed agriculture and animal husbandry for their livelihood. The Gash soil is suitable for growing vegetables and fruits. Poverty is wide spread among Kassala State population. Poverty can be

classified, as shown in Figure (6A), into four levels: low poverty, which is limited to one locality; moderate poverty, which is limited to two localities; high poverty, which is limited to five localities; and very high poverty, which is limited to two localities. Figure (6B) shows the cold and hot spots poverty area in Kassala State; we notice the presence of two hot spots and four warm spots. The hot poverty areas are located in the localities of the northern Delta countryside and Kassala countryside, while the warm poverty areas are located in the rural areas of Hamashkoreib, the rural areas of Khashm al-Qirba, Kassala City and New Halfa. The areas of concentration of hot and warm spots require intervention to alleviate or reduce the severity of poverty. The cold spots of poverty are concentrated in three main areas: rural Aroma, rural Atbara River and rural western Kassala. The areas shown in light color are not statistically significant, i.e. they are not classified.

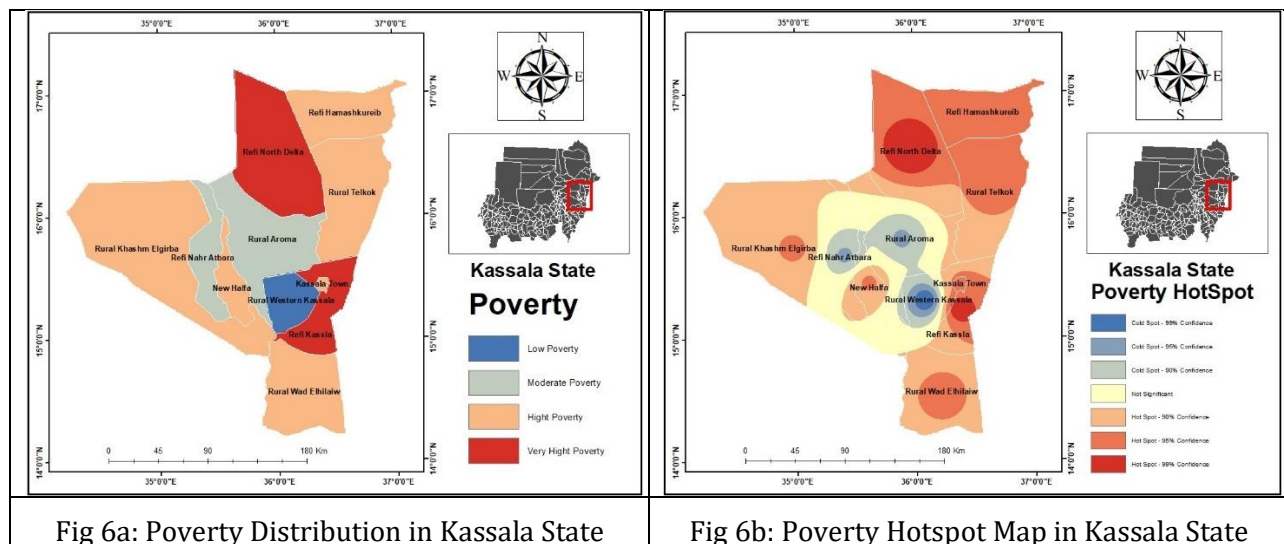| Fig 6a: Poverty Distribution in Kassala State | Fig 6b: Poverty Hotspot Map in Kassala State |

3.7 Poverty Distribution & Hotspot Map in Gedaref state

According to the National Household Budget and Poverty Survey 2014, the poverty rate in Gedaref State ranged between 0.279 - 0.364, (WORLD BANK GROUP,2019). Gedaref State includes the most important large-scale agricultural projects in Sudan, and is one of the most important areas for the production of cereal crops, especially maize and sorghum. In addition, the state produces millet and oilseed crops,

especially sunflowers, peanuts and watermelon seeds. Agriculture is the main source of income in the state, and despite this, poverty is concentrated at very high levels in two localities, and at moderate levels in two localities as well. As for the low poverty areas, they are concentrated in four localities, which are the northern localities of the state. Some localities appear unclassified due to the lack of sufficient data, as shown in Figure (7A).

Figure (7b) shows the hot and cold spots of poverty in Gedaref State. The red color and its gradient colors indicate the hot and warm spots, which are areas of very high and high poverty, while the blue color indicates the cold spots, which are areas of low poverty concentration. The yellow color indicates the absence of a statistically significant relationship. The white color indicates the lack of sufficient data to conduct the analysis. The hot spots are concentrated in two areas: Gedaref City and East Gedaref Locality, which are areas where intervention is required to reduce or eliminate poverty. The cold spots of poverty are concentrated in four areas: Butana in the north, Central Gedaref, El-Fashaga in the east, and El-Fao in the west.

| Fig 7a: Poverty Distribution in Gedaref State | Fig 7b: Poverty Hotspot Map in Gedaref State |

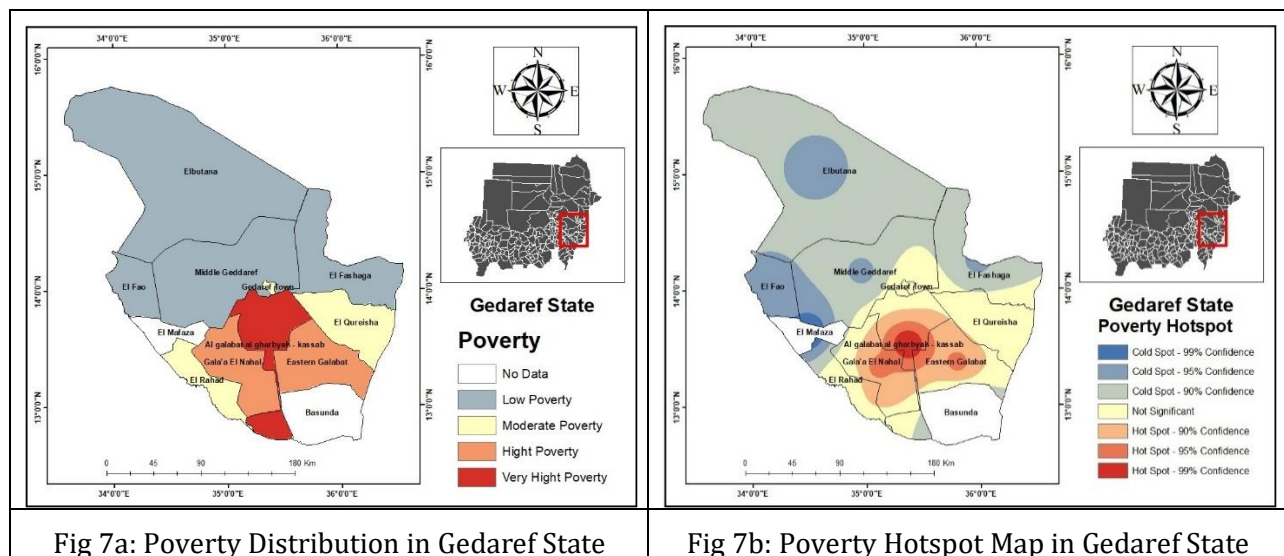## 3.8 Poverty Distribution & Hotspot Map in Red Sea State

According to the National Household Budget and Poverty Survey 2014, the poverty rate in the Red Sea State ranged between 0.423 - 0.514, (WORLD BANK

GROUP,2019). The Red Sea State is located in northeastern Sudan on the Red Sea coast. Fishing and working in the shipping and unloading sector in seaports are a source of income for most of the region's residents. In addition, some people depend on working in the tourism sector, trade and animal husbandry in the western parts far from the sea, as well as growing crops for self-sufficiency and export in the Tokar Delta. Figure (8a) shows the geographical distribution of poverty in the Red Sea State. We notice the presence of five levels of poverty in the state: very high poverty, concentrated in Aqeeq locality; high poverty, concentrated in Sinkat locality; moderate poverty, concentrated in Dardeeb and Haya localities; low poverty, concentrated in Tokar, Suakin, Port Sudan, Al-Qanb, Al-Uleeb, and Halayeb localities; and very low poverty, concentrated in Jabait Al-Maaden locality.

 Figure (8b) shows the cold and hot points of poverty in the Red Sea State. Hot spots are shown in red and are concentrated in the localities of Aqeeq and Sinkat, which are areas that need intervention by decision makers to eliminate or alleviate poverty. Cold spots are shown in blue and are concentrated in the localities of Tokar, Suakin and Jabait al-Maaden. This indicates a decrease in poverty rates.
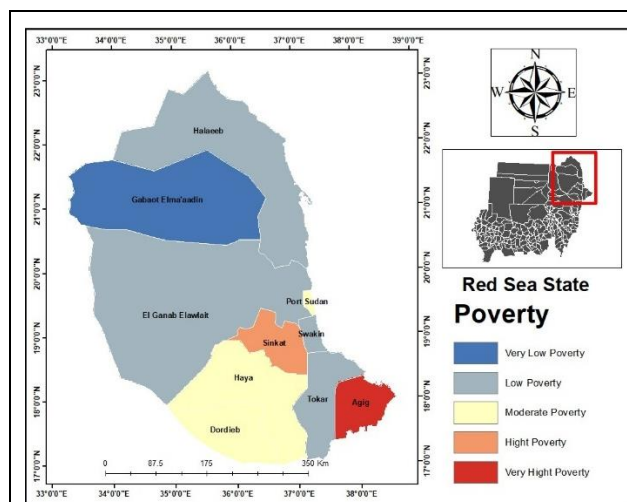

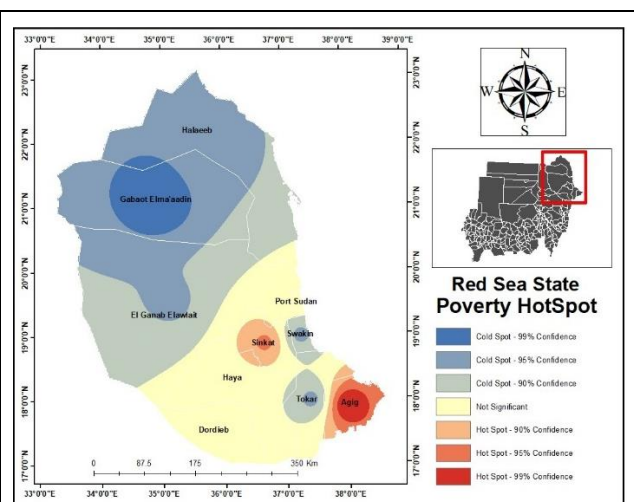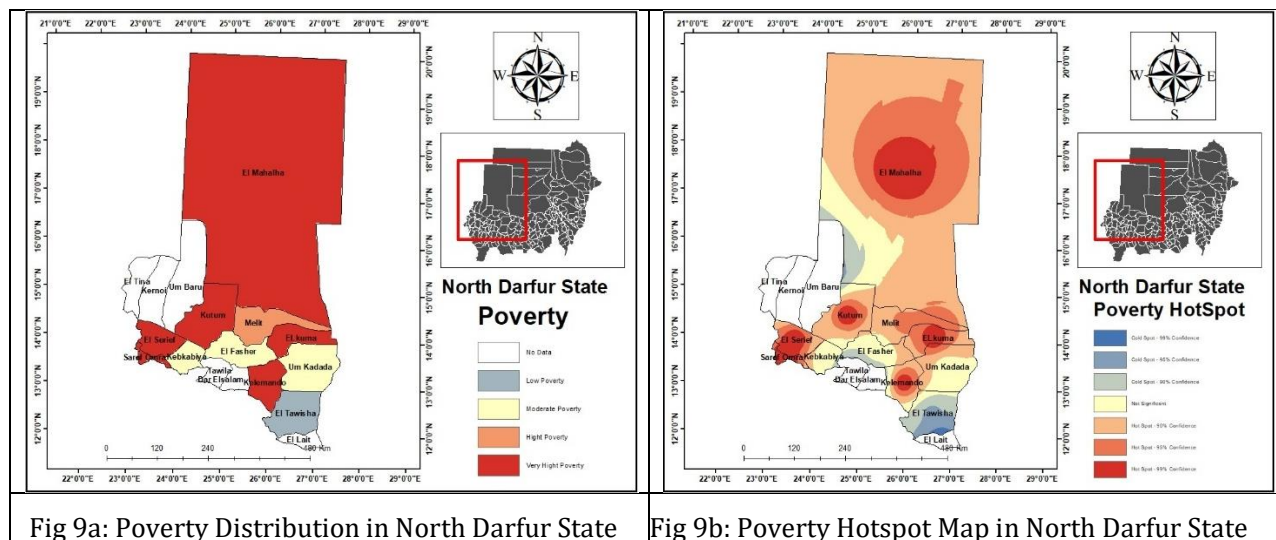
| Fig 8a: Poverty Distribution in Red Sea State | Fig 8b: Poverty Hotspot Map in Red Sea State |

3.9 Poverty Distribution & Hotspot Map in North Darfur State

According to the National Household Budget and Poverty Survey 2014, the poverty rate in North Darfur State ranged between 0.346 - 0.423, (WORLD BANK GROUP,2019). The population of North Darfur State depends on the cultivation of cereal crops and oilseeds. In addition, some of them work in animal herding, especially drought-adapted species such as camels and goats, because most parts of the state are located within dry and semi-dry lands that suffer from recurring droughts that affect livelihoods. Most of the population of the region suffers from poverty. Figure (9a) shows the geographical distribution of poverty in North Darfur State, where it is noted that very high poverty is spread in six localities: Al-Maliha, Kutum, El-Sareif, Saraf Omra, El-Koma and Kalamando. While high poverty is spread in Mellit locality and moderate poverty in El-Fasher, Umm Kadada and Kabkabiya localities. Low poverty is concentrated in El-Tawisha locality. Some localities appear without classification due to lack of data. Figure (9b) shows the hot and cold spots of poverty in North Darfur State. There are five hot spots. The first is located in Al-Maliha locality in the far north of the state, while the second and third are located in El-Koma and Kalamdo localities, respectively. The last two are located in Kutum, El-Sareif and Saraf Omra, respectively. The hot spots indicate high levels of poverty. The cold spots are concentrated in the far south of the state, specifically in the areas of El-Lait and El-Tawisha, which are areas of production of oilseed crops, especially peanuts. The assessment did not include areas where there is insufficient data on poverty levels, so they are shown in white: El-Tina, Umm Baru and Karnoi locality.

| Fig 9a: Poverty Distribution in North Darfur State | Fig 9b: Poverty Hotspot Map in North Darfur State |

3.10 Poverty Distribution & Hotspot Map in South Darfur State

According to the 2014 National Household Budget and Poverty Survey, the poverty rate in South Darfur State ranged between 0.423 - 0.514 (World Bank Group, 2019). The population of South Darfur State depends on trade, agriculture and animal husbandry for their livelihood. Most parts of the state are located within the rich savannah, which has helped in the growth of the livestock sector, especially livestock breeding and trade. Figure (10a) shows the geographical distribution of poverty in South Darfur State. We note the presence of four levels of poverty in the state: Very high poverty areas concentrated in the western parts of the state and include all the localities of Kabom, Rahid El Bardi and Umm Dafuq. High poverty areas, concentrated in the localities of Kass, Ed El Fursan, Es Salam and Katila. Moderate poverty areas, concentrated in the localities of Nitega and Santa. Low poverty areas include the localities of Nyala North, Mershing, Nyala South, Beleil, Tulus, Gereida, Damso, Baram, Santa and Al Radom.

Figure (10b) shows the hot and cold poverty hotspots in South Darfur State. Red color indicates hot spots, areas with high to very high levels of poverty, while blue indicates cold spots, areas with low levels of poverty. Some areas are shown in yellow and are not statistically significant. White color indicates areas where there

14

is insufficient data on poverty levels. The map shows six poverty hot spots, areas with high levels of poverty that require intervention.

Fig 10a: Poverty Distribution in South Darfur State	Fig 10b: Poverty Hotspot Map in South Darfur State
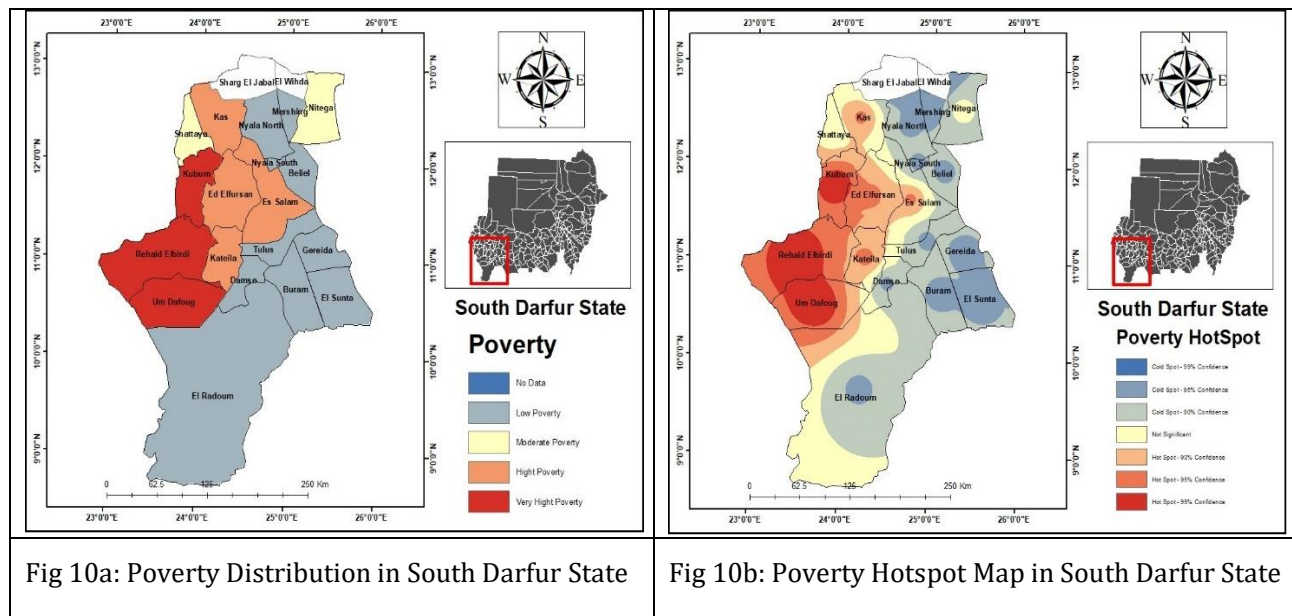
3.11 Poverty Distribution & Hotspot Map in East Darfur State

According to the National Household Budget and Poverty Survey 2014, the poverty rate in East Darfur State ranged between 0.423 - 0.514, (WORLD BANK GROUP,2019). The population of East Darfur State depends on agriculture and animal husbandry, especially cows, sheep, goats and horses for their living. The state is one of the important agricultural production areas in Sudan, where the population produces oilseed crops such as peanuts and watermelons that are grown in the sandy lands of the rain-fed sector. Poverty is a common social phenomenon in the state, where three levels of poverty have been observed as shown in Figure (11A): High poverty, concentrated in the Northwestern parts of the state, specifically in the localities of Shaeria, Yassin, El-Fardous and parts of As-salaya and El-Da'ein. Moderate poverty, concentrated in Abu Jabara and Bahr El-Arab localities. Low poverty, concentrated in Abu Karinka and Adila in the Northeastern part of the locality. Figure (11B) shows the hot and cold spots of poverty in East Darfur State. The red color indicates the hot spots where the poverty level is high, and the blue

color indicates the cold spots, i.e. areas where poverty levels are low among the population. According to Figure (11A), the Northwestern parts of East Darfur State appear in red, which means they are potential areas of poverty concentration, requiring intervention to limit or eliminate the phenomenon. Two cold spots appear in the Northeastern part of the state, representing areas of low poverty.

| Fig 11a: Poverty Distribution in East Darfur State | Fig 11b: Poverty Hotspot Map in East Darfur State |
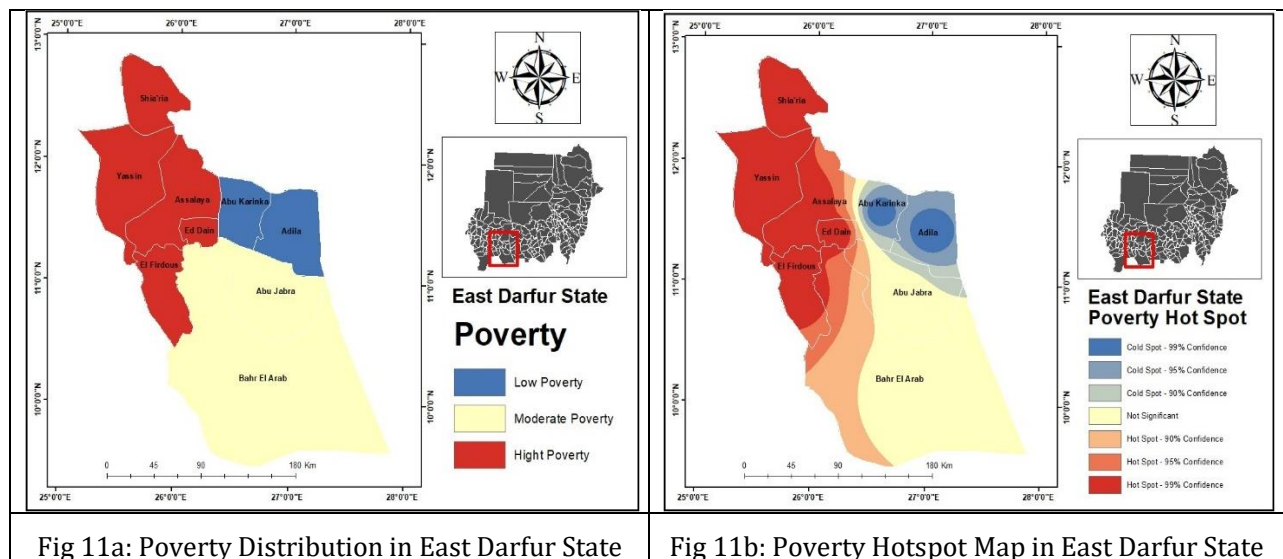
3.12 Poverty Distribution & Hotspot Map in West Darfur State

According to the National Household Budget and Poverty Survey 2014, the poverty rate in West Darfur State ranged between 0.354 - 0.388, (WORLD BANK GROUP,2019). The population of West Darfur State depends on agriculture and animal husbandry for their living. Millet, sorghum and peanuts are grown for self-sufficiency. Hibiscus, legumes, watermelon seeds and sesame are also grown as cash crops that farmers rely on to provide cash to buy basic necessities of life in the region. Some people practice herding alongside agriculture. The traditional agricultural sector, both plant and animal, contributes to securing income for most of the region's population. However, poverty is a prevalent phenomenon in the state, as there are four levels of poverty, as shown in Figure (12A): Very high poverty is found in the localities of Kalbus, Sirba and Bayda. High poverty is

concentrated in Habila and For Baranga localities. Moderate poverty is concentrated in El-Geneina locality. As for Kerinek locality, there is not enough data to classify poverty. Figure (12B) shows the cold and hot spots of poverty in West Darfur State. The red color indicates the hot spots, i.e. areas of high poverty concentration, while the blue color indicates the cold spots, i.e. areas of low poverty concentration. There are three hot spots in the state located in the localities of Kalbus, Bayda and Sirba in the western part of the state, which are areas that require intervention to address or reduce the phenomenon.


Fig 12a: Poverty Distribution in West Darfur State	Fig 12b: Poverty Hotspot Map in West Darfur State
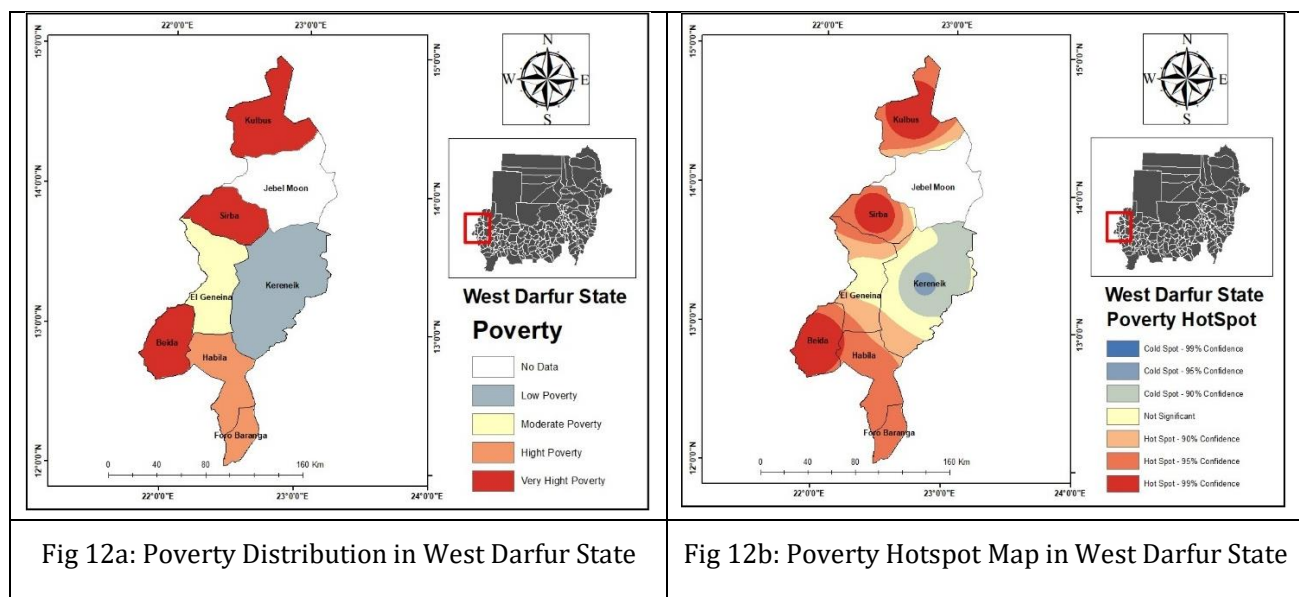
3.13 Poverty Distribution & Hotspot Map in Central Darfur State

According to the National Household Budget and Poverty Survey 2014, the poverty rate in Central Darfur State ranged between 0.361 - 0.368, (WORLD BANK GROUP,2019). The population of Central Darfur State depends on agriculture and herding to make a living. The state is one of the most important fruit-producing areas in Darfur, where the moderate climate similar to the Mediterranean climate has contributed to the diversity of fruit trees. The most important fruits produced in the state are citrus fruits such as oranges, lemons, grapefruit and tangerines as well as mangoes, apples, bananas and others. In addition to fruit production, some

people depend on crop cultivation and animal husbandry. Poverty is a prevalent phenomenon in the state.

From Figure (13A), we notice the prevalence of four levels of poverty: very high poverty, concentrated in Nertiti and Azum localities. High poverty, concentrated in Mukjar and Zalingei localities. Moderate poverty, concentrated in Bandisi and Wadi Saleh localities. Low poverty, concentrated in Umm Dukhun locality. Figure (13b) shows the hot and cold spots of poverty in Central Darfur State. The hot spots are shown in red and indicate areas with high levels of poverty, while the cold spots are shown in blue and represent areas with low levels of poverty. There are two hot spots in the state, in Nertiti and Azum, which require urgent intervention to reduce or eliminate poverty levels. There is a cold spot for poverty in Umm Dukhun locality.

Fig 13a: Poverty Distribution in Central Darfur State	Fig 13b: Poverty Hotspot Map in Central Darfur State
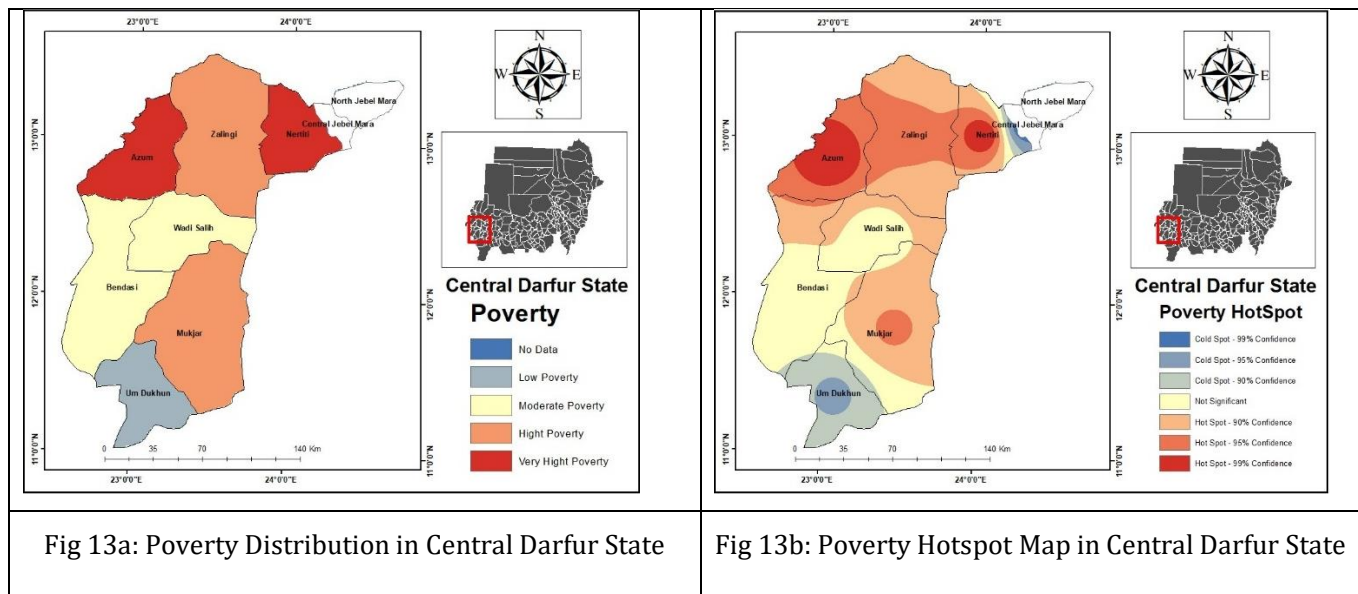
3.14 Poverty Distribution & Hotspot Map in North Kordofan State

According to the National Household Budget and Poverty Survey 2014, the poverty rate in North Kordofan State ranged between 0.346 - 0.423, (WORLD BANK GROUP,2019). The people of North Kordofan State practice agriculture and pastoralism for the purpose of self-sufficiency, in addition to exporting the surplus crop to crop markets inside and outside the state borders, where the revenues from

crops and livestock contribute to alleviating poverty in the region. Figure (14a) shows the geographical distribution of poverty in North Kordofan State, where high poverty is concentrated in one area, which is Sodari locality, while poverty is concentrated at low levels in Jabrat El-Sheikh, Bara, Umm Rawaba and Shikan. While Umm Dam Haj Ahmed and El-Rahad localities appear in white and are unclassified areas due to the lack of data. Figure (14b) shows the hot and cold spots of poverty in West Kordofan State. The hot spots are shown in red and are divided into three degrees and indicate areas of high poverty concentration, while areas of low poverty concentration are shown in blue. It is noted that there is a hot spot in the middle of Sodari locality, which requires intervention from decision makers and work to reduce the severity of poverty or mitigate its effects on society. The areas shown in white have not been studied due to the lack of necessary data. Poverty is a social phenomenon in rural areas in Sudan, and there are a group of factors that contribute to the spread of this phenomenon in the Sudanese countryside, the most important of which are unbalanced development and the lack of job opportunities, climate change and desertification.
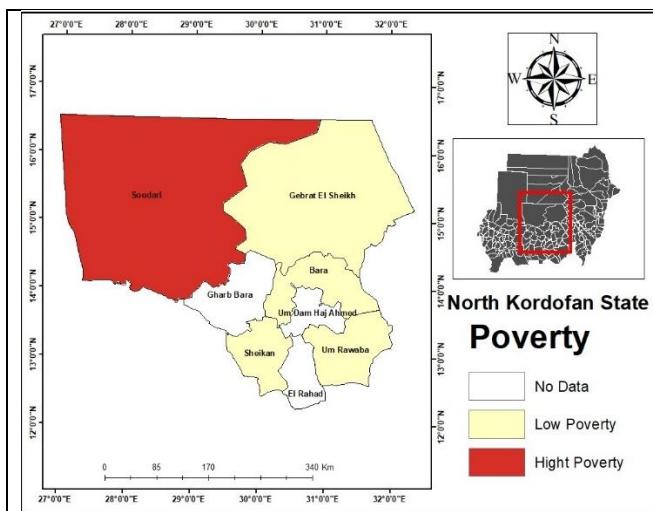

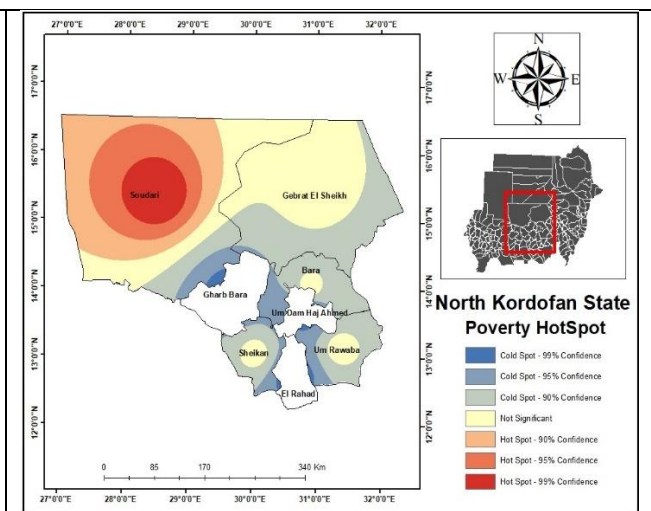| Fig 14a: Poverty Distribution in North Kordofan State | Fig 14b: Poverty Hotspot Map in North Kordofan State |

3.15 Poverty Distribution & Hotspot Map in South Kordofan State

According to the National Household Budget and Poverty Survey 2014, the poverty rate in South Kordofan State ranged between 0.514 - 0.672, (WORLD BANK

GROUP,2019). Poverty is one of the social phenomena prevals in most South Kordofan State. Despite the abundance of natural resources and labor, poverty rates are high, due to unbalanced development and weak agricultural production due to recurring droughts, civil conflicts and wars. All these factors have contributed together to the high rates of poverty, especially in the south of the state, specifically in the localities of Gadir and Al-Liri. Figure (15a) shows the geographical distribution of poverty in South Darfur State. It is noted that there are three levels of poverty: very high poverty in the south, high poverty, which is concentrated in Abu Jibeiha in the east and Talodi in the west, and moderate poverty, which is concentrated in Al-Tadamon Locality. As for the other localities except those shown in white, they are places where low poverty is concentrated. As for the localities shown in white color , they were not included in the analysis due to lack of data. Figure (15b) shows the hot and cold spots of poverty in South Kordofan State. The hot spots appear in red colors and related graded, while the cold spots appear in blue color and related graded. Hot spots are areas with high poverty levels, i.e. areas where people are classified as very poor and are close together. Cold spots are areas where people are classified as less poor than their peers. Hot spots require intervention to reduce or eliminate the phenomenon.
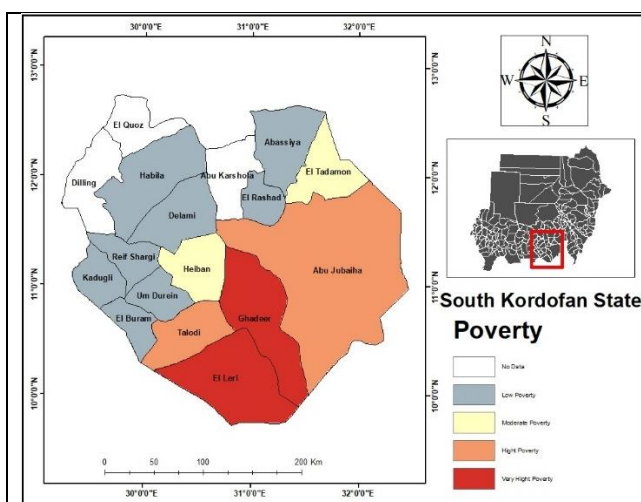

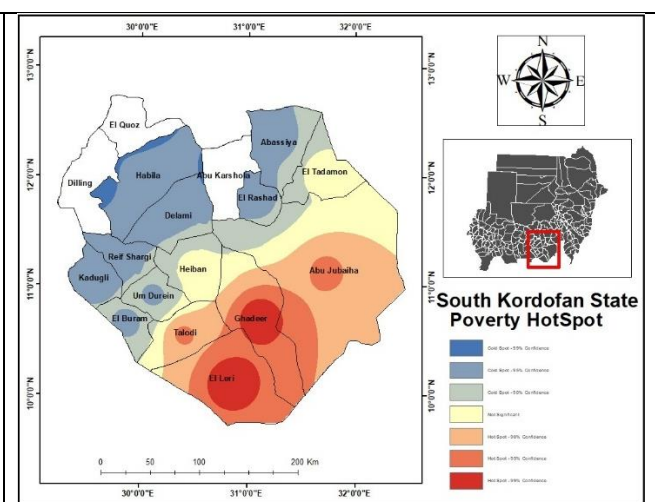| Fig 15a: Poverty Distribution in South Kordofan State | Fig 15b: Poverty Hotspot Map in South Kordofan State |

3.16 Poverty Distribution & Hotspot Map in West Kordofan State

According to the National Household Budget and Poverty Survey 2014, the poverty rate in West Kordofan State ranged between 0.346 - 0.423, (WORLD BANK GROUP,2019). Figure (16A) shows the geographical distribution of poverty in West Kordofan State. The red color indicates high poverty levels, while the yellow color indicates low poverty. Seven localities were classified as areas of high poverty concentration, namely: Abu Zabad, Wad Banda, Babanusa, Es Salam, Lagawa, Kleik and El Meram. On the other hand two localities were classified as areas of low poverty, namely Ghubaish and El Nahud. The areas shown in white color were not classified due to lack of data necessary for the classification. Figure (16b) shows the hot and cold spots of poverty in West Kordofan State.

The red color indicates the hot spots and represents the close areas where poverty rates are high (Abu Zabad, Wed Banda, Babanusa, ES Salam, Lagawi, Kleik and El Meram.). The color grading from red indicates the warm spots, i.e. the poor areas but the poverty level is low compared to the hot spots. The blue color indicates the cold spots and represents the areas where poverty rates are low. The yellow color indicates low poverty. The areas shown on the map in white are not classified due to the lack of sufficient data on poverty levels. The hot spots are the areas that need intervention to reduce the spread of the phenomenon or eliminate it.
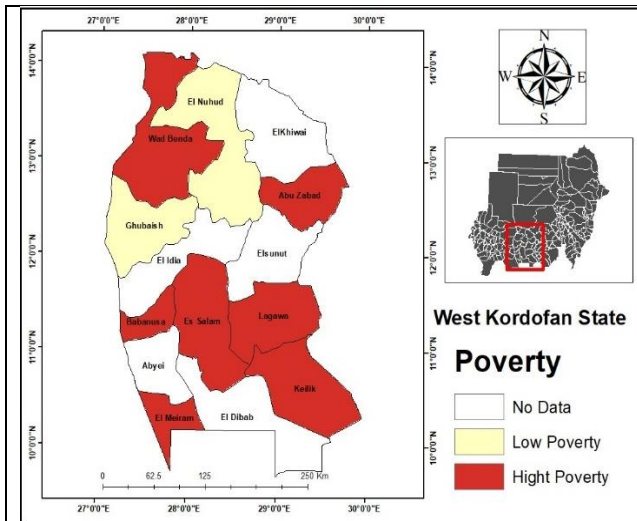
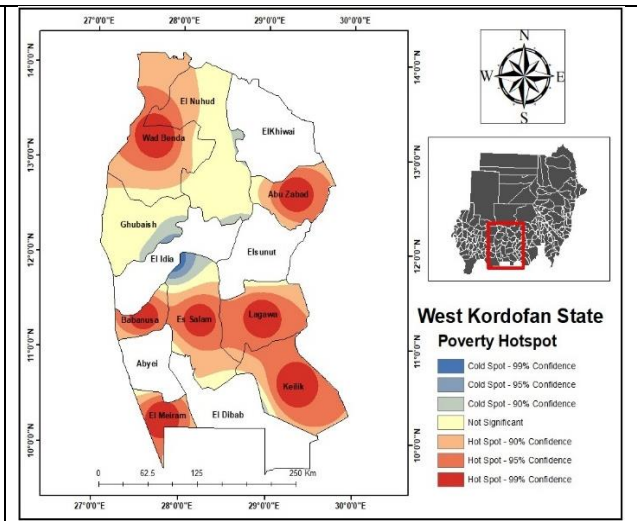| Fig 16a: Poverty Distribution in West Kordofan State | Fig 16b: Poverty Hotspot Map in West Kordofan State |

3.17 Poverty Distribution & Hotspot Map in Sennar State

According to the National Household Budget and Poverty Survey 2014, the poverty rate in Sennar State ranged between 0.199 - 0.279, (WORLD BANK GROUP,2019). Figure (17A) shows the geographical distribution of poverty in Sennar State. The red color indicates high poverty and is concentrated in Sennar Locality. The yellow color indicates moderate poverty and is concentrated in the localities of East Sennar, Singa, Suki and Dinder. While the blue color indicates low poverty and is concentrated in the localities of Ad Dali and Abu Hajar. Sennar State is considered one of the important agricultural production areas in Sudan and has vast agricultural lands in addition to the Sennar Sugar Factory. The population depends on the cultivation of cereal crops, peanuts, bananas and other cash crops for their livelihood. In addition, they raise animals, cows, sheep and goats for the purpose of self-sufficiency in meat, milk and milk products. Despite the availability of natural resources and labor, the region suffers from high poverty rates as a result of unbalanced development. Figure (17b) shows the hot and cold spots of poverty in Sennar State. The red color indicates the hot spots while the blue color indicates the cold spots. The hot spots are the close areas where poverty levels are high, and the cold spots indicate the close areas where poverty levels are low. It is noted that

22

there is one hot spot and one warm spot in Sennar locality, while cold spots appear in ED-Dali and Abu Hajar localities. The areas classified as hot require intervention by the actors to reduce the spread of the phenomenon or eliminate it.

| Fig 17a: Poverty Distribution in Sennar State | Fig 17b: Poverty Hotspot Map in Sennar State |
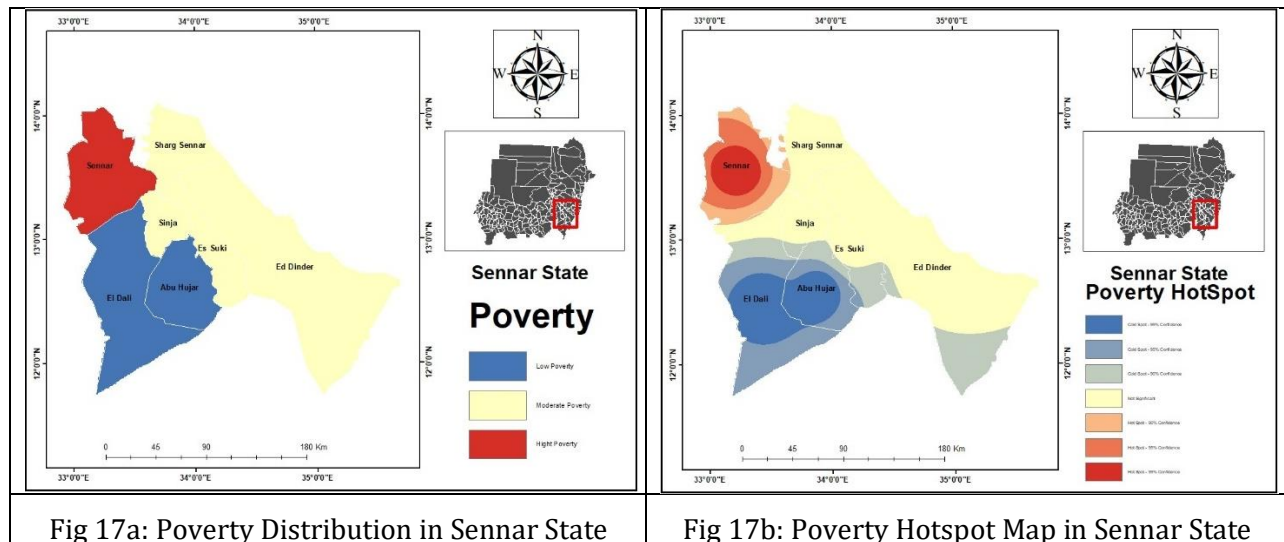
3.18 poverty Distribution & Hotspot Map in Blue Nile State

Based to the National Household Budget and Poverty Survey 2014, the poverty rate in Blue Nile State ranged between 0.279 - 0.364, (WORLD BANK GROUP,2019). Figure (18A) shows the geographical distribution of poverty in Blue Nile State. The red color indicates very high poverty levels, the orange color indicates high poverty, the yellow color indicates moderate poverty and the blue color indicates low poverty. The white color indicates the unavailability of data to assess the poverty level. The localities with poverty levels ranging from high to very high are: Er-Roseires, Ed-Damazin and Bow. The localities that recorded low poverty rates are Et-Tadamon and Qaisan. The locality that recorded moderate poverty levels is El-Kurmuk. Wad El-Mahi locality was not classified due to the unavailability of data. Figure (18B) shows the hot and cold spots of poverty in Blue Nile State. The hot spots appear in red and are concentrated in three localities: Er-Roseires, Ed-Damazin and Bow. The cold spots appear in blue and are concentrated in Et-Tadamon and Qaisan localities. There are a number of factors that contribute to the

spread of poverty in Blue Nile State, the most important of which are: the lack of employment opportunities and unbalanced development.

| Fig 18a: poverty Distribution in Blue Nile State | Fig 18b: poverty Hotspot Map in Blue Nile State |
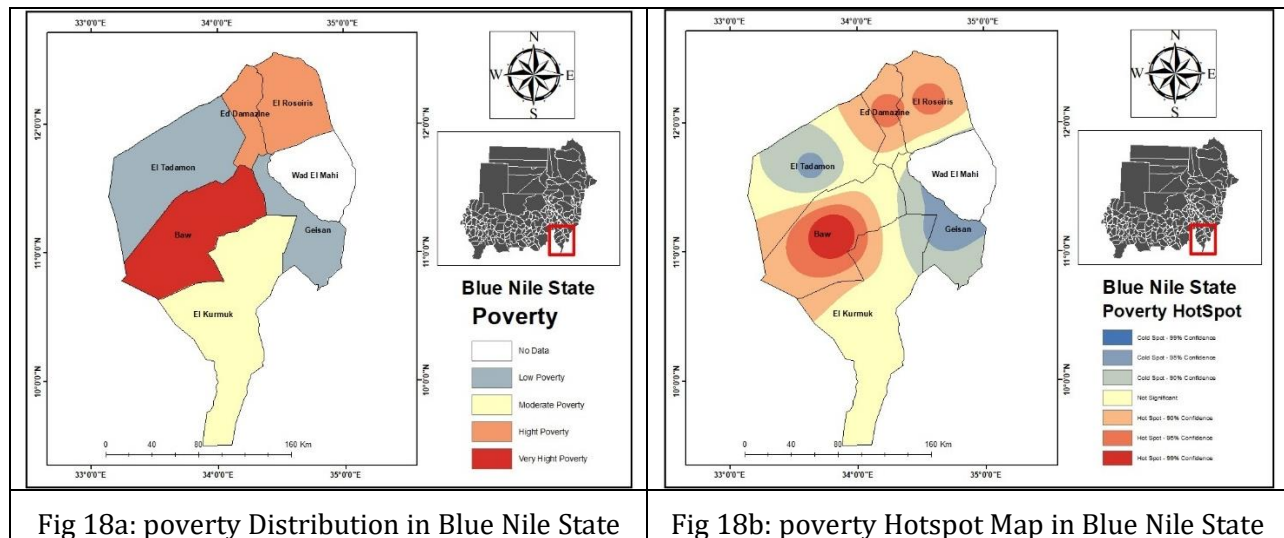
Reference

-   WORLD BANK GROUP, Poverty & Equity, Poverty and Equity Global Practice, Africa Region, August 2019.
-   Bedi, T., A. Coudouel, and K. Simler, eds. 2007. *More Than a Pretty Picture: Using Poverty Maps to Design Better Policies and Interventions*. Washington, DC: World Bank.
-   CBS (Central Bureau of Statistics). 2017. "Sudan: Poverty Profile in 2014 - Main Findings." Khartoum: CBS.
-   CBS (Central Bureau of Statistics). 2009. "Sudan House Hold Baseline Survey- Main Findings." Khartoum: CBS.
-   CBS (Central Bureau of Statistics). 2008. "5th Population and Housing Census- Projections." Khartoum: CBS.
-   Ministry of Finance, 2017. Macroeconomic indicators performance report.
-   Mungai, Rose, Minh Cong Nguyen, and Tejesh Pradhan. 2018. "Poverty and Inequality on the Map in The Gambia: An Application of Small Area Estimation." World Bank: Washington,DC.
-   world Bank 2019. Mapping Poverty in Sudan; Poverty and Equity Global Practice Africa Region.