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SUB-SAHARAN AFRICA IN POWERMETRIC ANALYSIS

Abstract:
This article was written to determine the strength (power) of sub-Saharan Africa and its share in the global balance of power. For this purpose, sub-Saharan Africa was compiled with other world's regions. The methodology of regions division was based on the adopted criteria by the World Bank. The time horizon included in this article is twenty-three years. This period has been examined in three points. The beginning of the research was in 1992, whereas the end was in 2015. Halfway of the research period was set for 2003. The calculated main measures of powermetric come from the first powermetric report published in 2017 in Poland. The general and military power has been used in calculation of the rate concentration.

Keywords*:*
global balance of forces, the model of Sułek, general and military power, concentration index, powermetric

Introduction

One of the most important elements of the international system is power. The overriding interest of each state seems to be its constant development and survival. Increasing the power, positions the political unit among other participants of the global system. This phenomenon can be compared to a living organism. As Professor Mirosław Sułek[2] believes, "just like single people, smaller or larger social groups, they live and function in a world of limited resources, which makes them a subject of competition"[3]. This work presents the

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[2] Mirosław Sułek – Titular Professor, economist, praxeologist, strategic studies analyst. Creator and propagator of powermetric in Poland.
[3] R. Białoskórski, R. Kobryński, M. Sułek, *Potęga 2017. Międzynarodowy układ sił w procesie zmian, Raport Potęgometryczny,* Warszawa 2017, p. 19.

distribution of power in the world in geographical terms. The main analyzed area was the sub-Saharan Africa[4]. The powermetric approach was chosen as a calculation method. The calculated basic measures (general and military power) were used to determine the concentration index. The system of forces was analyzed in dynamic terms. The research period covers twenty-three years therefore the tendencies of changes in investigated sub-Saharan region could be demonstrated. The accuracy of the research was based on the assumption of not analyzing the quality of the formal model and published data. The main purpose of writing this article is to analyze the role of the sub-Saharan Africa in a global power structure.

Sub-Saharan Africa

Africa is a compact continent located mostly in the eastern hemisphere. In terms of size, it is the second biggest in the world, right after Asia. It is positioned almost symmetrically on both sides of the equator. Africa is separated from Europe by the Mediterranean Sea, whereas the Red Sea and the Suez Canal separates it from Asia. A natural factor dividing Africa is the Sahara Desert. Because of that we can distinguish two large sub-regions of North and South Africa.

South Africa is also called Black Africa because of its residents, Negroids and Sub-Saharan due to its location on the south of the Sahara.

As a result of the decolonization, about fifty new countries were formed on the African continent in 1950s. One of the main problems was the ethnic diversity that did not allow the new countries to integrate. The creation of a bond in the new arose community required a long time horizon and development of a coherent idea among African leaders. The economic problems, which did not give chances for the development of social status, were another factor that significantly limited this process. The constitutional mechanism was, to a large extent, a decline after colonial traditions taken over from American, British or French standards. Unfortunately, these systems were not adopted because of a different political culture and that resulted in the assimilation of authoritarian forms. That, combined with the lack of public control over government activities, led to the alienation of power. Legislation was also implemented. As Wiesław Lizak writes, "African states, gaining independence, in most cases adopted constitutions guaranteeing the existence of democratic mechanisms for creating institutions and exercising state power"[5]. This resulted in the emergence of one-party system as well as military attempts

[4] Due to the availability of data, geographical regions were ranked according to the World Bank database. According to this division, North Africa was captured along with the Middle East.

[5] W. Lizak, „*Państwo w Afryce*", [w:] *Państwo w Teorii i praktyce stosunków międzynarodowych,* eds. M. Sułek, J. Symonides, Warszawa 2009, p. 375.

to seize power, authoritarian forms or systems based on socialism. Democratization in Africa is proceeding slowly, and the negotiations of this process remain uncertain. The emerging political thought in the 1990s refers to "democratization, development of civil society and the importance of trade unions in politics, the contemporary role of traditional power, women rights in politics, peaceful co-existence of different cultures"[6].

Sub-regional states of high importance are South Africa and Nigeria. However, they belong to the groups of developing countries which are characteristic for the entire continent. These countries mainly "are characterized by a low and very low level of economic development shown for instance in a small Gross Domestic Product per one inhabitant"[7]. The GDP per person was USD 566.9 in 1992 in comparison to USD 531 in 2003. In 2015, GDP amounted to USD 1655 USD. For comparison, the world average was USD 77832 USD. On a global scale, the population standards of living are at a very low level. This is manifested in malnutrition and limited access to health care. The average population density in sub-Saharan Africa was 43.7 people per square kilometre in 2016, compared to 22.9 in 1992, which is a 90% increase in over twenty years. The dynamics of demographic growth strengthens the mentioned problems. The birth rate in Africa is one of the highest in the world, so is the death rate. The average life expectancy in 2015 was 59.9 years compared to 49.9 years in 1992. By contrast, the average life expectancy in the world in 2015 was 71.9 compared to 65.4 years in 1992[8].

In the further part of the article, powermetric study will be carried out to determine the changes occurring in the South African sub-region countries compared to other regions of the world. The study time has been set from 1992.

Determination of general and military power

The applied research method is a mathematical calculation using the Sułek's model, which allows determining the size of the general and military power. These studies are the main element of science, i.e. powermetric, which is a sub-discipline of geopolitics. It deals, among others, with modelling and measurement of power. Its name "binds power and measurement, and in this sense it is analogous to other – built on this principle of names"[9]. Modelling consists in "mapping the essential features of the studied object (properties,

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[6] K. Trzciński, *Demokratyzacja w Afryce Subsaharyjskiej perspektywa zachodnioafrykańskiej myśli politycznej*, Warszawa 2013, p. 11.

[7] *Stosunki międzynarodowe w Afryce*, red. J. Milewski, L. Lizak, Warszawa 2002, p. 19.

[8] *The World Bank, World Development Indicators*, <http://databank.worldbank.org/data/reports.aspx?source=2&country=SSF> (30.01.2018).

[9] M. Sułek, *O potęgonomii i potęgometrii,* p. 4, <http://geopolityka.net/o-potegonomii-i-potegometrii/> (30.01.2018).

interrelationships, structural or functional parameters) relevant from the point of view of purpose and research"[10]. The main problem of this process remains the degree of similarity between the model and the object being mapped. The measurement in turn organizes, knowledge about the world or "it is a procedure in which, according to specific rules, numerical values – numbers or other symbols – are assigned to empirical (variable) properties"[11].

The importance of the power of the state has become inseparably associated with economic, military and political capabilities as a determinant of the position and power relations in the international system. The state's aspirations can be included in the statement of Raymond Aron, who described the three timeless goals of states, i.e. security, power and glory. The determination of the international position takes place with the help of the formal model of the precursor of power metrometry in Poland, Professor Mirosław Sułek. It is characterized by high transparency, relatively low degree of complexity. General and military power is used for analysis. The term general and military power is used interchangeably in the article. The model takes the following form:

$$P_o = D^{0,652} \times L^{0,217} \times a^{0,109}$$
$$P_w = W^{0,652} \times S^{0,217} \times a^{0,109}$$

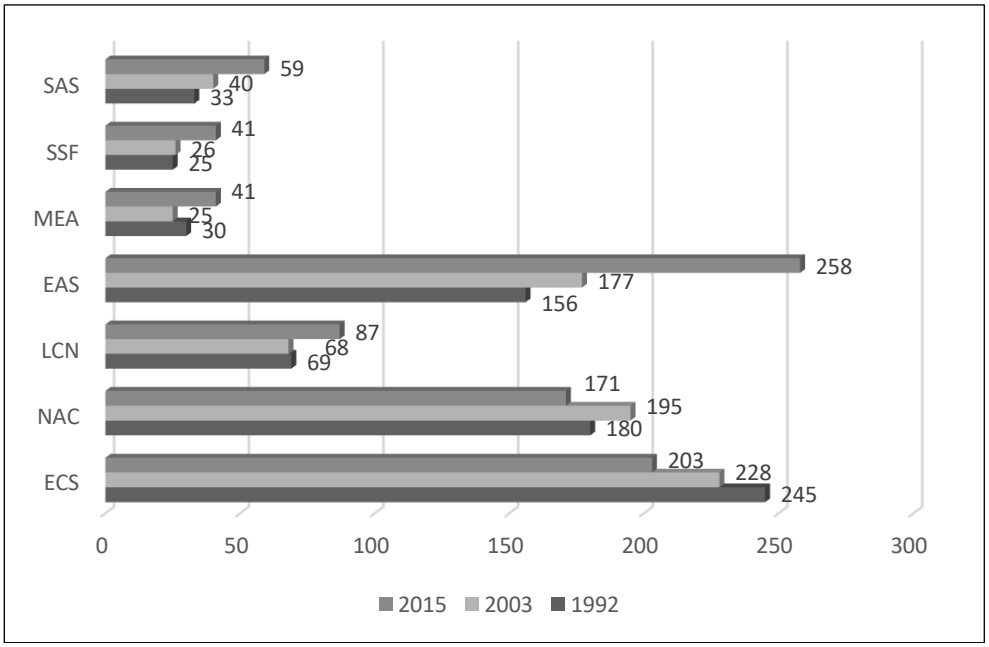
where:
P_o – general power,
P_w – military power,
D – Gross domestic product,
W – military expenditure,
L – population,
S – number of active service soldiers.
a – area of the country,

In order to make a comparative analysis between individual political units, it was assumed that the world's power is equal to 1. The values for states obtained in the course of calculations are therefore a fraction of this value. The obtained results were multiplied by 1000 (world = 1000)[12]. Introduced unit 1 mM (milimir) is a thousandth of the world. Changes in the system of forces, i.e. the sums of increases and decreases are equal to zero. This results from the assumption that "the struggle for power is a zero-sum game, which means that the increase in the power of some countries is accompanied by a decrease in the power of the others"[13].

[10] *Ibidem* p. 3.
[11] *Ibidem.*
[12] For the purposes of this article, it was assumed that the world equals 1.000, thus recognizing that the world is one state.
[13] R. Białoskórski, R. Kobryński, M. Sułek, *Potęga 2017…,* p. 15.

The general power of regions in Africa and the world is shown in chart 1. The results are relative to the world.

Chart 1. Global system of forces based on the general power[14], in the years 2000-2015 (world = 1000) expressed in mM



Source: R. Białoskórski, R. Kobryński, M. Sułek, *Potęga 2017…,* p. 58

The share of Sub-Saharan Africa in the global power distribution is at a comparable level with Middle East & North Africa. The comparison with the rest of the world shows large disproportions in the distribution of general power. Sub-Saharan Africa, however, shows growth over the entire period. In the period 1992-2003 it amounted to only 1 mM. A definite improvement in the general power can be observed in the period 2003-2015, which amounted to 15 mM. The percentage of shares in Sub-Saharan Africa in comparison with the East Asia & Pacific region, which was the best in this ranking, is respectively for individual years – 16.02 %, 2003 – 14.68 %, 2015 – 15.89 %. The growth dynamics of the general region of sub-Saharan Africa was 4 % for the period 1992-2003 and 57.69 % for the period 2003-2015. For comparison, the

[14] The following codes are used in the article for the following regions of the world: ECS - Europe & Central Asia, NAC - North America, LCN - Latin America & Caribbean, EAS - East Asia & Pacific, MEA - Middle East & North Africa, SSF - Sub-Saharan Africa, SAS - South Asia.

dynamics of the East Asia & Pacific region was 13.46 % for the period 1992-2003 and 45.76 % for the period 2003-2015. The table 1 below presents the countries of Sub-Saharan Africa with the highest values of the general power in particular periods.

Tab. 1. Values of Sub-Saharan African countries with the highest general power in 1992, 2003, 2015

	1992		2003		2015	
		[mM]		[mM]	Country	[mM]
	World	1000,000	World	1000,000	World	1000,000
1	South	6,580	South	6,122	Nigeria	9,819
2	Nigeria	2,966	Nigeria	4,000	South	5,882
3	Ethiopia	1,354	Sudan	1,349	Sudan	2,451
4	COD[15]	1,160	Kenya	1,052	Angola	2,409
5	Angola	0,977	COD	0,968	Ethiopia	2,297
6	Sudan	0,936	Tanzania	0,965	Kenya	1,848
7	Kenya	0,910	Angola	0,952	COD	1,641
8	CIV[16]	0,904	Ethiopia	0,934	Tanzania	1,608
9	Tanzania	0,670	CIV	0,872	Ghana	1,071
10	Ghana	0,604	Ghana	0,554	CIV	0,947
	sum	17,061	sum	17,768	sum	29,973

Source: own elaboration based on: R. Białoskórski, R. Kobryński, M. Sułek, *Potęga 2017…,* pp. 42-46.

The countries with the greatest general power in sub-Saharan Africa are South Africa and Nigeria. We can observe an increase in the importance of Nigeria in 2015. We also observe an increase in the general power of other countries. In 1992, four countries exceeded the value of 1 mM. In 2015, there were nine of them. The sum of the general power also increased, which amounted to 29.97 mM in 2015 compared to 17.06 mM in 1992. The table 2 below presents the countries of Sub-Saharan Africa with the highest values of military power in particular periods.

[15] Democratic Republic of the Congo.
[16] Republic of Côte d'Ivoire.

Tab. 2. Values of the countries of Sub-Saharan Africa with the greatest military power in 1992, 2003, 2015

	1992		2003		2015	
		[mM]		[mM]	Country	[mM]
	World	1000,000	World	1000,000	World	1000,000
1	South	3,887	South	3,505	South	3,207
2	Nigeria	2,585	Sudan	1,284	Sudan	3,027
3	Sudan	2,065	Nigeria	1,181	Nigeria	2,193
4	Tanzania	1,284	Ethiopia	0,993	South	2,031
5	COD	0,960	Kenya	0,565	COD	1,474
6	Kenya	0,795	Cameroon	0,564	Kenya	1,022
7	Uganda	0,679	COD	0,554	Ethiopia	0,915
8	Zambia	0,334	Botswana	0,544	CIV	0,901
9	Burkina	0,285	Uganda	0,468	Namibia	0,621
10	Congo,	0,264	CIV	0,446	Zambia	0,574
	sum	13,138	sum	10,104	sum	15,965

Source: own elaboration based on: R. Białoskórski, R. Kobryński, M. Sułek, *Potęga 2017…,* pp. 59-61.

The countries with the greatest military power in sub-Saharan Africa are South Africa, Sudan and Nigeria. In 1992, only four countries exceeded the value of 1 mM. In 2015, there were six countries with a value above 1 mM, and the next two (Ethiopia, CIC) reaching values above 0.9 mM. The total military power of sub-Saharan African countries in 1992 was 13.13, in relation to 15.96 mM in 2015.

Structural measures – concentration and polarization

The distribution of the power of political units at a given moment of time refers to polarization. In other words, we can call it the structure of the system or "distribution of energy and substance in space and time"[17]. It is characterized by stability or lack of it, which leads to peace or war, respectively. Based on the analysis of the actors of the international system (relative power, allied relations, foreign policy), we can determine whether a given structure is stable or not. We can analyse these in two ways. Energomaterial (general and military power) – "as states defined in terms of energy and mass"[18] and structural (concentration / polarization index) – "as states defined in terms of structure,

[17] M Sułek, *Prognozowanie i symulacje międzynarodowe,* Warszawa 2010, p. 164
[18] *Ibidem.*

i.e. distribution of energy and substance in space and time"[19]. The term concentration means the density of energy and matter. We can talk about the lack of concentration in the situation of an even distribution of general and military power among political units. However, the maximum concentration means a non-uniform (extreme) distribution of power. Concentration affects polarization (polarity in the world), which means that a high concentration of power in one country favours unipolarity. Decreasing the concentration is favoured by the formation of multipolarity. This dependence is calculated on the basis of the formula used in the Correlates of War (CON) program:

$$con = \sqrt{\frac{\sum_{i=1}^{i=N} (s_i)^2 - \frac{1}{N}}{1 - \frac{1}{N}}}$$

Signs:
CON – concentration indicator,
s_i – share of the power held by the state in the system (decimal number),
N – the number of countries in the system.

At least two countries are required to calculate the concentration ratio. The values of the index range from 0 to 1. The power is distributed evenly, if it is closer to 0. The closer to the value of 1, the distribution of power will be less even. Table number 3 illustrates the concentration index for two groups of countries with the largest global and military power in the scale of the world.

Tab. 3. Concentration of power for selected groups of countries in 1992, 2003 and 2015

YEAR	GENERAL POWER		MILITARY POWER	
	For 5 countries	For 10 countries	For 5 countries	For 10 countries
1992	0,357	0,287	0,465	0,420
2003	0,366	0,310	0,366	0,383
2015	0,344	0,317	0,413	0,384

Source: Own elaboration based on: R. Białoskórski, R. Kobryński, M. Sułek, *Potęga 2017…,* p. 58.

Based on the calculations contained in table number 5, we can observe the following dependencies characterizing selected countries of the world:

[19] *Ibidem.*

The concentration index is reduced when we take into account a larger number of countries.The concentration of the general power grew over the entire period, while the concentration of military power decreased in 2003 in both groups. For the group of 5 countries there was another increase in 2015, and for the group of 10 countries the value remained at a similar level. The concentration of the general power is smaller than the concentration of military power.

Table number 4 illustrates the concentration index for two groups of Sub-Saharan African countries with the highest values of general and military power.

Tab. 4. Concentration of power for selected countries of sub-Saharan Africa in 1992, 2003 and 2015

YEAR	GENERAL POWER		MILITARY POWER	
	For 5 countries	For 10 countries	For 5 countries	For 10 countries
1992	0,405	0,341	0,240	0,286
2003	0,380	0,323	0,341	0,290
2015	0,323	0,293	0,135	0,192

Source: own calculations based on tables 1 and 2.

Based on the calculations, contained in table number 4, the following dependencies characterizing sub-Saharan Africa can be noticed:

The general indicator of power concentration is reduced if a larger number of countries are included.The concentration of the general power decreased in both groups throughout the research period, while the concentration of military power increased in 2003 and then decreased in 2015. During the research period, the concentration of the general power decreased for 5 and 10 countries. The concentration of military power increased in both groups however there was a significant increase for the 5th group in 2003. The decrease in concentration in 2015 was greater for the group of 5 countries and it was lower than in the group of 10 countries. The concentration of the general power is greater than the concentration of military power.

On the basis of the collected calculations, the differences and similarities in the rate of the concentration indicator between sub-Saharan Africa and the strongest countries in the world are visable:

- Similarities: In both sets, the concentration index decreases when analyzing larger groups of countries.
- Differences: Sub-Saharan Africa has a smaller concentration of military power than the concentration of general power.

That dependence is the opposite regarding the strongest countries in the world. The concentration of military power for the countries of Sub-Saharan

Africa decreased in the whole period in the face of an increase and stabilization for the countries of the world. The greater value of the concentration of the general power for Africa and the smaller concentration of military power in comparison with the countries of the world can be also noticed

Summary

Sub-Saharan Africa is the poorest region in the world. The economic growth of this region remains at the lowest level among the regions examined in the article. However, it is worth noticing, that the emerging upward trends in recent years allow us to hope for improvement. The outgoing economic changes found their mapping in the values of the general power. The dynamics of changes in general power, especially in recent years, was competitive for other regions. The results, which present only the values of power, are unambiguous. Sub-Saharan region is still influenced by the main political actors in the world. The research of military power in this area has not shown the strength such as the one in European countries. However, there is a gradual improvement in this matter. The study of power concentration showed the decrease of these values at the background of the strongest countries in the world. This region was characterized by a smaller concentration of power due to the lack of dominant states in the region.

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