

## **FILLING IN THE BLANK SPACES: THE MAPPING OF BRITISH AFRICA, 1800 TO 1960**

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### **INTRODUCTION**

Britain's involvement with Africa spanning the period from the end of the Napoleonic Wars in the 1780s to the beginning of the era of decolonisation in 1960 was marked by four dominant episodes, or actions:

- Participation in the African slave trade, and in the trade with India;
- the exploration of Africa's big river systems by British explorers;
- the political partition of Africa, 1870 to 1918, and
- the implementation of colonial rule after World War I.

The cartography undertaken in and by a country during a specific period usually mirrors the most influential political and economical ideas and policies of that period. Given this, it is logical to expect that the cartography of Africa by Britain from 1780 to 1960 would have been a reflection of the above-mentioned actions.

### **THE CARTOGRAPHY OF COMMERCE (THE SLAVE TRADE AND THE TRADE WITH INDIA)**

After 1600 Britain was highly active in the transatlantic slave trade. Trading posts and forts were erected on the coast of West Africa at Sierra Leone, the Gambia, the Gold Coast (present-day Ghana) and Nigeria, and slaves were sold by local chieftains to slave agents. Few Europeans penetrated the interior of the continent and the mapping which was done was primarily of the coastal area.

The same situation applied to South Africa which was an important British possession on the route to India since 1795. The detachment of Royal Engineers at the Cape of Good Hope was not required to map the interior of the colony, but only had to carry out fortifications and coastal surveys and compile such plans and maps as were necessary for the defense of the settlement<sup>1</sup>.

Another set of maps which owe their existence to the British presence at the Cape, are the maps of the Eastern Frontier of the Cape Colony. In 1790 the Dutch proclaimed the Great Fish River as the eastern boundary of the Colony. The various Xhosa tribes moving westwards in search of grazing did not uphold this boundary and nine frontier wars raged from 1779 until 1878. To safeguard the white frontier farmers, British troops were sent to the Eastern Cape and Royal Engineers commissioned to provide in the need for maps<sup>2</sup>.

### **THE CARTOGRAPHY OF EXPLORATION AND DISCOVERY**

Would-be explorers interested in the interior of the Dark Continent realized from early on that Africa's big river systems were the key to the geography of the continent. The first British organisation to pursue this idea was the Association for Promoting the Discovery of the Interior Parts of Africa which was founded in London in June 1788. The Association chose the exploration of the Niger River in West Africa as its first object. After two failed attempts, Mungo Park's finding that the Niger flowed eastwards instead of westwards settled a major issue of African geography. In 1831 the Association was absorbed into the Geographical Society of London (later renamed the Royal Geographical Society) which pursued the discovery of the source of the Nile by Burton and Speke (1857-1858), and later on by Speke and Grant (1863), as the greatest geographical cause of the 19th century. The Royal Geographical Society (RGS) also supported Livingstone's exploration of the Zambezi River (1851-1856) in southeast Africa, and Stanley's exploration of the upper reaches of the Congo (1874-1877).

The travellers mentioned above were classical explorers who made daily observations of latitude and longitude which they jotted down in journals and occasionally plotted on maps. The technical quality of their manuscript maps was of a variable quality and much depended on the technical skills of the traveller and how meticulous the observations were done. Explorers who travelled under the auspices of the RGS could depend on survey teaching the organization provided in a pocket-size manual entitled *Hints for Travellers*, available in successive and enlarged editions since 1854<sup>3</sup>. The manuscript maps produced by the explorers were usually taken or sent to England to be lithographed for publication in their narratives.

The publications of explorers were seized upon by 19th century map and atlas publishers in Britain and abroad who were eager to update their depiction of the interior of Africa. Throughout the 19th century,

exploration and map compilation of remote and newly discovered areas remained a source of enormous public interest. Atlas production became an lucrative commercial venture and important British cartographic undertakings were established such as those of the Arrowsmiths, James Wyld, John Carey, Blackwood, John Bartholomew, W. & A.K. Johnston, etc.

Not all British explorers' maps were published by commercial publishing houses in travel narratives or in atlases. Another major outlet for the publications of explorers' accounts and maps was the *Journal (or Proceedings)* of the *Royal Geographical Society*. The RGS employed skilled cartographic draughtsman such as John Arrowsmith to compile the accompanying maps and between 1830 and 1880 the *Journal* published 35 original maps of parts of Africa<sup>4</sup>.

A different type of map maker in the 19th century was the missionary who went into Africa to spread the Gospel. Evangelical revival movements in Scotland and England in the late 18th and early 19th centuries led to the establishment of influential missionary societies<sup>5</sup> which established mission stations on the Guinea coast, in South Africa and around Zanzibar in East Africa. The incumbents who in many instances became explorers and pioneers of trade and empire, greatly contributed to the cartographical knowledge of the continent.

### **THE CARTOGRAPHY OF IMPERIALISM**

Although the term "imperialism" does not necessarily imply colonisation, the latter often was the result of the implementation of imperialist policies. By 1800 the map of Africa was politically still empty with none of the European powers particularly interested in the continent. By 1900 this situation had changed radically due to three main factors, Commerce, Civilization and Christianity, also jocularly referred to as the 'blessed trinity' or "three Cs"<sup>6</sup>. With regard to commerce, the Industrial Revolution had created a huge demand for both raw materials and markets which politicians hoped could be satisfied by overseas dependencies. Africa offered a lucrative opportunity for investment where cheap and exotic raw materials, an untapped market and limited competition would garner a substantial trade surplus. At the same time the Age of Enlightenment had given rise to a new world view validated by science rather than by religion and tradition, and a desire for human affairs to be guided by rationality rather than faith or superstition. In Britain this manifested in a surge of interest in geographical exploration; an increasing preoccupation with the suppression and elimination of the African slave trade, and the idea that the indigenous peoples of Africa and Asia should be "civilized" by introducing them to European material and social culture and Christianity<sup>7</sup>.

#### ***The "Scramble for Africa"***

In Europe the above inducements led to fierce political rivalry amongst nation states to secure a foothold in Africa. This process, generally referred to as the "scramble for Africa", lasted from approximately 1870 until the end of World War I. The completion of the Suez canal in 1859 made it vitally important for Britain to control this strategic gateway to India and in 1882 Egypt became a de facto colony of Britain. In Southern Africa, British influence pushed steadily northwards with the annexation of Natal in 1848, Basutoland in 1868, Griqualand-West in 1874 and the Transvaal in 1877. The Gambia, Sierra Leone, Nigeria and the Gold Coast (Ghana) officially became British protectorates in 1889, 1889, 1901, and 1902 respectively, and in 1890 prolonged trading sessions in East Africa led to the proclamation of a British protectorate over the future Kenya. The Uganda territory was incorporated into this protectorate in 1902. Central Africa had been of interest to Britain since the area was first explored by Livingstone in the 1850s, and Britain declared the British Central African Protectorate, including present-day Zimbabwe and Zambia, in 1891. The Sudan was effectively administered as a British colony since 1899, and in Southern Africa the discovery of the world's richest gold deposits indirectly led to the Boer War of 1899-1902. In South Africa the British imperialist Cecil John Rhodes had been pursuing his ideal of creating on the map of Africa a continuous "red line" denoting British possessions from the Cape to Cairo by obtaining mining concessions from the indigenous peoples. In 1885 Rhodes' political manoeuvres resulted in Bechuanaland being declared a British possession, and in the late 1890s Rhodes' British South Africa Company gained control over the entire area between the Limpopo River and Lake Tanganyika.

#### ***Boundary mapping***

The partitioning of Africa implied that international frontiers had to be delimited and demarcated. From 1889 until 1913 Britain was involved in 39 boundary commissions in Africa which covered a distance of approximately 10 000 miles<sup>8</sup>. The British commissioners were usually officers drawn from the Corps of Royal Engineers and their cartography can be considered the first organized mapping of the continent. Apart from illustrating the treaty concerned, the work of the boundary commissions also provided the War Office with a framework into which existing topographical information could be

fitted. The latter was mostly of a variable quality whereas the boundary surveys and maps were executed with considerable care.

The maps produced were usually of two types, namely a general map of one or two sheets for treaty purposes at some small scale such as 1 : 250 000 or even 1 : 1 000 000, and a set of maps of sections of the boundary on a larger scale. British commissions usually surveyed a zone stretching for at least 10 miles in depth on their side of the boundary line<sup>9</sup>. In a paper read at the 1928 Empire Conference of Survey Officers, Winterbotham reported on more than 50 different War Office map sets which were produced by boundary commissions in Africa<sup>10</sup>. The choice of map scale depended entirely on the stage of development of the area and the method used for the topographical survey depended on the scale of the maps. For scales up to 1: 20 000 the plane-table were used, whereas for smaller scales tacheometric methods were applied<sup>11</sup>.

### ***The organisation of survey and mapping work***

Official British mapping during the 19th and early 20th centuries was dominated by the military with most of the surveyors and cartographers belonging to the Corps of Royal Engineers. The intelligence system of the War Office had its origin in 1803 when the *Depôt of Military Knowledge* was formed in the Quartermaster-General's Department. In 1857 this branch was absorbed into the Topographical and Statistical Department which, in turn, in 1873 merged into the newly formed Intelligence Department.

In January 1881 the Intelligence Department began numbering its output of map, plans, and drawings according to a sequence which is still in use today. In June of that year the Department changed its name to the Intelligence Branch, and January 1888 it became the Intelligence Division. By 1893 this name was regularly abbreviated to IDWO which was used as a prefix to the unique number allocated to the map in the order in which it was issued. By 1904 a Directorate of Military Operations (DOM) was formed as a branch of the Department of the Chief of the General Staff. Because the former Intelligence Division became subsumed in the DOM as the Topographical Section, all new maps henceforth carried the serial number TSGS (Topographical Section, General Staff). In April 1907 the Topographical Section was renamed Geographical Section, after which all maps of foreign areas borne the imprint GSGS<sup>12</sup>.

By 1900, only a few official military maps of British Africa on medium scales were available<sup>13</sup>. Except for some Property Index Maps on 1 : 800 000 of the southwestern Cape Colony, a military sketch of Northern Natal on a scale of 1 : 63 360 (GSGS 1223), and 1 : 380 160 maps of Swaziland (IDWO 805) and Zululand (IDWO 1088), South Africa was still unmapped. Of the planned 8-sheet map of British Central Africa on a scale of 1 : 253 440 (IDWO 1092), only one sheet had been printed. Parts of British East Africa were covered on scales of 1 : 1 584 000 and 1 : 760 020, and in West Africa parts of Sierra Leone (IDWO 1240), the Gold Coast (IDWO 1097), and the Coast of the Niger Protectorate (IDWO 1135) were mapped on a scale of 1 : 506 880. The only colonies of which relatively large-scale topographic maps had been produced, was Egypt and the Egyptian Sudan. Upper Egypt and the Sudan was covered by 32 sheets on a scale of 1 : 250 000 (IDWO 1281); whereas the Nile Valley was mapped on scales of 1 : 253 440 (IDWO 736 and 1164), and 1 : 126 720 (IDWO 456, 595, 1067, 1165, 1169 and 1180).

### ***The Boer War***

The Boer War was fought by the two Boer Republics (the Orange Free State and the South African Republics) against the British Empire from October 1899 until May 1902. With the advent of the war South Africa was still unmapped<sup>14</sup>. The Boers had no tradition of mapping whereas the British, who were unfamiliar with the country, urgently needed military maps. Two types of map were in use<sup>15</sup>. The first type was the so-called compilation map which was compiled by fitting together the existing title diagrams of farms or tracts of land like the pieces of a jigsaw puzzle. Although not very accurate, these maps provided much needed place names and strategically important information on the physical topography of the country. The first series to be produced, the Imperial Map on a scale of 1 : 250 000<sup>16</sup>, was followed by the Major Jackson's or First Transvaal Series, and the Degree Sheet Series of the Transvaal and Orange Free State on a 1 : 250 000 scale. The second type of map was the conventional survey map which was executed in the field by officers of the Royal Engineers Corps and printed by the Ordnance Survey in Britain<sup>17</sup>.

Cartographically the Boer War proved to be a watershed in the history of British military mapping. The Minutes of Evidence taken before the Royal Commission on the War in 1903<sup>18</sup> made it clear that many of the setbacks the British Army experienced during the war could be ascribed to inadequate maps of the country. If Britain it wanted to retain its political supremacy in Southern Africa, it would have to make provision for the systematic mapping of the region<sup>19</sup>.

### ***The Arc of the 30th Meridian***

By the end of the 19th century an accurate trigonometrical base was a prerequisite for topographic mapping. One of the first people in Africa to realize this, was Sir David Gill, H.M. Astronomer at the Cape Observatory from 1879 until 1907. Immediately after his arrival in South Africa, Gill proposed to the British authorities a gridiron network of trigonometrical chains covering the whole of South Africa. Once this network was completed, the triangulation had to be extended northwards along the 30th degree of longitude to Cairo, in Egypt, from where it could be connected with Struve's Russian-Scandinavian Arc. Gill's vision was that the Arc, when completed, would form the backbone of all mapping in Africa. After persuading the Governor of the Cape, Gill also solicited the support of the British War Office, and the first leg of the Arc was measured from 1883 to 1892 when the Geodetic Survey of the Cape Colony and Natal was executed by a team of Royal Engineers. The geodetic survey of the Free State and Transvaal followed after the Boer War and, by 1907, when Gill retired from office, the Arc extended from the Cape almost as far north as the present Lake Tanganyika. The northern segment began in Egypt in 1907 and was by 1930 completed as far south as 22° 10' N. The measuring process along the remaining section of the Arc was slowed down considerably by the two World Wars and it was not before 1954, 75 years after its initiation, and 40 years after Gill's death, that the last gap was closed in the Sudan<sup>20</sup>.

### **THE CARTOGRAPHY OF COLONIAL RULE**

With the Scramble for Africa completed, Britain had to start administering its new colonies. By 1900 the interior of the continent was known, but it was still unmapped. Medium and large-scale topographic maps were necessary if the colonies were to be exploited, administrative structures to be established, land to be allocated for agricultural purposes, and roads and railway lines to be built. The colonies also needed to be defended and peace and order had to be maintained amongst the indigenous peoples. Learned societies in Britain such as the British Association and the RGS agreed that what was necessary, was "the construction of a homogeneous and consistent geographical map of that part of Africa which affects Imperial interests"<sup>21</sup>. The question nobody knew how to answer, was how this should be done.

#### ***The Colonial Survey Committee (CSS)***

The Boer War raised important questions regarding the cartographical capability of the War Office and in the ensuing years much time was spent on discussions how the future mapping of Africa had to be conducted, and the degree of responsibility the War Office had to assume<sup>22</sup>. By August 1905 some coordination was effected when the Colonial Survey Committee (CSS) was established to advise the Foreign Office as well as the Colonial Office on all matters concerning the survey and exploration of British Africa<sup>23</sup>. The CSS consisted of a representative of the Colonial Office, the Director-General of the Ordnance Survey, and the officer in charge of the TSGS (later GSGS). The latter was to be responsible for the compilation of maps and the Ordnance Survey for the reproduction of all maps except cadastral plans. At its first meeting the CSS laid down specific technical requirements as well the mapping scales to be used for topographic mapping, namely 1 : 62 500; 1 : 125 000; 1 : 250 000, 1 : 500 000 and 1 : 1 000 000. An overriding decision was that each colony or protectorate should be covered at a scale not smaller than 1 : 250 000.

From 1906 until 1946 all survey and mapping work in British Africa was regulated by the CSS. By 1906 survey departments had already been established in most colonies and protectorates and after 1905 parties of Royal Engineers were purposefully sent to Africa to execute topographical surveys, primarily on a scale of 1 : 250 000, but sometimes also on 1 : 125 000.

#### ***Topographical mapping***

The official War Office maps produced of British Africa prior to 1906 were on scales of 1 : 1 000 000 and 1 : 250 000 IDWO 1539 on a scale of 1 : 1 000 000<sup>24</sup> was printed in colour and by 1906, 43 of the envisaged 132 sheets were published<sup>25</sup>. IDWO 1764 (the 1 : 250 000 "old series" of 1.5° longitude sheets) covered parts of Nigeria, the Gold Coast, Abyssinia, the Anglo-Egyptian Sudan, British Somaliland, Uganda, the East Africa Protectorate, and also parts of the Central Africa Protectorate where the series was designated IDWO 1469<sup>26</sup>. By 1906, 185 sheets of this series had been published in a provisional form in black and white only<sup>27</sup>.

Although IDWO 1539 and IDWO 1764 covered large areas, the maps were of a poor quality<sup>28</sup>. According to the 1906 Annual Report of the CSS, the bulk of the available source material consisted of sketches which were made by explorers and civilians, or by military officials when they toured on duty or accompanied military expeditions<sup>29</sup>. This material which was then fitted into the survey frameworks provided by the various Boundary Commissions.

### **1906 – 1914**

The Boer War had a lasting effect on British military mapping policy and after 1906 various teams of Royal Engineers were sent to Africa. Topographical surveys were carried out in South Africa in the Orange River Colony (1905 to 1911), the Southern Transvaal (1910 to 1911) the Cape Colony and Basutoland (1907-1914), as well as in the Gold Coast and Nigeria in West Africa, and in Uganda and in the East African Protectorate. Various boundary commissions were also active during this period with minor triangulation work undertaken in East Africa. The map of Africa which was published in 1913 to illustrate the progress of surveys and explorations, shows considerable progress in systematic surveys since 1906 with large areas having been subjected to “surveys of an intermediate class”<sup>30</sup>.

In 1910 the CSS announced that all maps of Crown Colonies or Protectorates which were  $\frac{1}{4}^\circ$ ,  $\frac{1}{2}^\circ$  or  $1^\circ$  square, with meridians and parallels for edges, would in future be numbered according to the sheet-line system which had been approved for the International Map of the World. In the case of a series such as GSGS 1764, this meant that all  $1\frac{1}{2}^\circ$  longitude sheets published prior to 1910 were considered part of the “old series” whereas all new sheets published after 1910 would be part of the “new series”<sup>31</sup>.

Some of the more important 1 : 250 000 map series which were commenced before World War I were GSGS 1764 (new series) of the northern Cape Colony, Sierra Leone, Nigeria, the Gold Coast (Ghana), the East African Protectorate (Kenya), Nyassaland (Malawi) and Somaliland; GSGS 2567 of Basutoland, and GSGS 2571 of Uganda. On a scale of 1 : 125 000, GSGS 2230 of the Orange River Colony (South Africa), Kenya Colony, and Egypt, were published<sup>32</sup>.

### ***The Inter-War years***

World War I brought mapping worldwide to a halt. Surveying and mapping in Africa also suffered as Royal Engineers were either recalled for service or redeployed. Some map series that had been in progress before the war, were continued after the war, but at a much slower pace. In 1936 Winterbotham found that published topographical maps resulting from reliable survey (including boundary commission and local surveys) during 1922-1935 covered only 170 000 square miles compared to 480 000 square miles during the period 1900-1913<sup>33</sup>.

### ***The Directorate of Colonial (later Overseas) Surveys***

Surveys executed during the Inter-War years were done in a piecemeal fashion and during the 1920s and 1930s the War Office and the Colonial Office spent much time and energy in deciding how to coordinate and finance surveying and mapping in Africa. In 1946 central control over civilian mapping was effected by the establishment of the Directorate of Colonial (later Overseas) Surveys (DCS) by the Colonial Office as a central survey and mapping organisation for British colonies and protectorates<sup>34</sup>.

The Director of the DCS, Brigadier Martin Hotine, undertook to map 900 000 square miles in the British colonies within the first 10 years – a task he wanted to achieve using the relatively new technique of aerial photography<sup>35</sup>. The first priority was to strengthen the trigonometric base and during the first years primary, as well as secondary and tertiary triangulation, were undertaken in almost all the African colonies<sup>36</sup>. The arrival of the Tellurometer in 1957 helped to speed up the work and by 1960 a firm trigonometric control had been established in especially East Africa.

In the field of mapping new policies and technologies helped to enlarge the output. Initially a considerable amount of preliminary mapping at a scale of 1 : 50 000 was carried out to meet urgent needs, but later on maps were produced at scales varying from 1 : 25 000 to 1 : 125 000 depending on the degree of development of an area<sup>37</sup>. Aerial photographs of the colonies were provided by the Royal Air Force and the production of maps was increased by the use of new instrumentation and graphic methods<sup>38</sup>.

### ***End of Empire***

Most African colonies became politically independent during the late 1950s or 1960s, and in 1957 the DCS was renamed the Directorate of Overseas Surveys (DOS). The new name reflected the changed relationship between Britain and its erstwhile colonies which henceforth had to formally apply for aid in the field of surveying and mapping. The British Empire in Africa had come to an end and with it Britain's obligation to fill the empty gaps in the map of the continent. From the 1960s onwards the provision of surveys and maps for administrative and developmental purposes would be the responsibility of the relevant African states themselves.

## **CONCLUSION**

Although Britain's role in colonial Africa might initially have been exploitative, the DCS did not treat its cartographical responsibility lightly. From 1946 to 1957 great strides were made to map British Africa. It is however lamentable that organised systematic mapping came to the African colonies so late and that not more had been done at an earlier stage. Had this been the case, the figures announced in 1980 that

not more than 2.4% of Africa was mapped at scales of 1 : 25 000 and larger; only 23.8% at scales of 1 : 50 000 and larger, and only 17.2 % at scales of 1 : 100 000 and larger, might have been very different<sup>39</sup>.

<sup>1</sup> See Liebenberg, E.. 2003. From Barrow to Jeppe – The development of 19th century cartography in South Africa, in *Proceedings of the Symposium on the History of Cartography of Africa*, ICA Commission on the History of Cartography, Cape Town, 4-5 August 2003.

<sup>2</sup> Maps of the Eastern frontier can be found in the Cape Archives and the British National Archives. A guide to the latter is Penfold, P. 1979. *Maps and Plans* in the Public Record Office, 34(Africa).London: HMSO.

<sup>3</sup> Collier, P. and Inkpen, R. 2003. The Royal Geographical Society and the development of surveying 1870-1914. *Journal of Historical Geography* 29(1), 93-108.

<sup>4</sup> Bridges, R.C. 1994. Maps of East Africa in the Nineteenth Century. In: J.C. Stone (ed.), *Maps and Africa*. Aberdeen: Aberdeen University African Studies Group.

<sup>5</sup> Du Plessis, J. 1965. *A history of Chjristian Missions in South Africa*. Cape Town: Struik (facsimile edition).

<sup>6</sup> Stone, J. 1995. *A short history of the cartography of Africa*. Lampeter, Wales: Edwin Mellen.

<sup>7</sup> Hudson, B. 1972. The New Geography and the New Imperialism: 1870-1918. *Antipode* 9(2), 140-153.

<sup>8</sup> Winterbotham, H.S.L. 1936. Mapping of the Colonial Empire. *Scottish Geographical Magazine* 52(5), 292.

<sup>9</sup> Winterbotham, H.St.J.L. 1929. The demarcation of international boundaries. In: *Report of Proceedings of the 1928 Empire Conference of Survey Officers*. London: HMSO.

<sup>10</sup> *Ibid.*

<sup>11</sup> *Ibid.*,178.

<sup>12</sup> Frith, G.T. 1907. The topographical section of the British General Staff. *Royal Engineers' Journal* 5, 66-79; Watson, C.M. *History of the Corps of Royal Engineers*, vol. III (reprinted 1954). Chatham: Institution of Royal Engineers.; Jewitt, A.C. 1992. *Maps for Empire. The first 2 000 numbered War Office Maps*. London: British Library.

<sup>13</sup> Intelligence Division, War Office. 1899. *A guide to recent large scale maps including both surveys and compilations; together with a list of some large sheet atlases, forming a supplement to "Notes on the Government Surveys of the Principal Countries of the World" (1882)*. London: HMSO.

<sup>14</sup> Liebenberg, E.C. 1973. Die topografiese kartering van Suid-Afrika, 1879-1972. Unpublished MA dissertation, University of South Africa.

<sup>15</sup> Liebenberg, E.. 2007. Maps of the Boer War, 1899-1902. Paper presented at the 22rd International Cartographic Conference of the International Cartographic Association (ICA), Moscow, Russia, 4 to 9 August, 2007.

<sup>16</sup> Board, C. 2004. The Imperial Map Cape Colony: towards a cartobibliography. In: *Wiener Schriften zur Geographie und Kartographie*, Band 16, edited by W. Kainz, K. Kriz and A. Riedl., 17-24.

<sup>17</sup> Liebenberg, E. 2007. *Ibid.*

<sup>18</sup> Royal Commission on the War in South Africa, 1903. *Minutes of Evidence*, vol.I. London: HMSO.

<sup>19</sup> Liebenberg, E.. 1997. Mapping British South Africa: The Case of GSGS 2230. *Imago Mundi* 49, 129-142.

<sup>20</sup> Zackiewicz, T. 1997. "The Arc of the 30th Meridian". *South African Journal of Surveying and Mapping* 24(2), 65-82.

<sup>21</sup> Holdich, T.H. 1901. How are we to get maps of Africa? *Geographical Journal* 18, 590-601.

<sup>22</sup> McGrath, Gerald. 1976. *The surveying and mapping of British East Africa, 1890-1946*, 1-31. In: *Cartographica* 13, Supplement no. 3. Monograph 18. Toronto: University of Toronto Press.

<sup>23</sup> Colonial Survey Committee, 1906. *The surveys and explorations of British Africa*. Colonial Reports – Annual no. 500. London: HMSO.

<sup>24</sup> Jewitt, A.C., *op. cit.*, 356.

<sup>25</sup> Colonial Survey Committee, 1906, *op. cit.*, 6.

<sup>26</sup> Jewitt, A.C., *op. cit.*, 411.

<sup>27</sup> Colonial Survey Committee, 1906, *op. cit.*, 6.

<sup>28</sup> *Ibid.*

<sup>29</sup> *Ibid.*

- <sup>30</sup> Colonial Survey Committee, 1913. *The surveys of British Africa, British Honduras, Ceylon, Cyprus, Fiji, Hong Kong, Jamaica, Malay States and Trinidad*. Colonial Reports – Annual no. 775. London: HMSO
- <sup>31</sup> Colonial Survey Committee, 1910. *The surveys of British Africa, Ceylon, Cyprus, Fiji, Jamaica, Trinidad, British Honduras*. Colonial Reports – Annual no. 644. London: HMSO.
- <sup>32</sup> Geographical Section, General Staff, War Office. 1923. *Catalogue of Maps*. London: HMSO.
- <sup>33</sup> Winterbotham, H.S.L. 1936. Mapping of the Colonial Empire. *Scottish Geographical Magazine* 52(5), 298.
- <sup>34</sup> McGrath, G. 1983. *Mapping for Development. The Contribution of the Directorate of Overseas Surveys*. Published in *Cartographica* 20 (1 and 2). Monograph 29-30. Toronto: University of Toronto Press.
- <sup>35</sup> Macdonald, A. 1996. *Mapping the world. A history of the Directorate of Overseas Surveys 1946-1985*. London: HMSO,
- <sup>36</sup> See Annual Reports of the Directorate of Colonial (Geodetic and Topographical) Surveys, 1946 to 1957.
- <sup>37</sup> McGrath, G. 1983, *op cit*.
- <sup>38</sup> Collier P. 2002. The impact on topographic mapping of developments in land and air survey: 1900-1939. *Cartography and Geographic Information Science* 29(3), 155-174.
- <sup>39</sup> Brandenberger, A.J. and Ghosh, S.K. 1985. The world's topographic and cadastral mapping operation. The 1980 United Nations' survey on the Status of World Cartography. *Photogrammetric Engineering and Remote Sensing* 51(4), 437-444.