

Externally funded research in the Okavango Delta, Botswana: A case study from the Okavango Research Institute

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Abstract—Even though Research and Development (R&D) is a key driver of economic growth and development, the contribution to R&D as a proportion of Gross National Income (GNI) is less than 1% in developing countries, including Botswana. This suggests that there is limited internally sourced funding for research, making external donors the major source of research funding in most developing economies. This study assessed dynamics in external research funding at the Okavango Research Institute (ORI) since the last 15 years. Data were sourced from project contracts from the institute's archives. Results revealed that external research funding has had a significant contribution to Botswana's research strategy. The key research area that received most funding was ecological research, while the International Development Research Centre and the EU were the most dominant research funding organizations at ORI. Donor agencies from only four continents contributed to research funding at ORI while there were none from South America and Australia. Furthermore, there was minimal research funding from multi-lateral and bi-lateral donors of which the Botswana government is a signatory. One key recommendation from this study is that government and academics should forge close partnerships to optimize leveraging of external research funding. This will ultimately drive R&D initiatives in the country, which is pivotal to economic growth and development

Keywords—*Natural resources management, Okavango Delta, Research and development; Research funding*

I. BACKGROUND

Expenditure on research and development (R & D) is a key indicator of a country's effort to engender innovation [1] which is a major driver of economic development [2]. Subsequently, rich nations spend more on R & D [1] and higher education than poorer countries [3] Invariably R & D, driven by expenditure on higher education, drives economic growth in rich nations compared to developing countries [3, 2]. As a consequence, developing countries depend on (external) development aid to drive their growth [4] Development aid to developing countries by 2007 reached US\$100 billion, while sub-Saharan Africa (SSA) received only US\$12.1 billion of

this as country programmable aid, which is only 12.1% of development aid reaching Africa [5] Generally, this has resulted in little aid reaching the developing world, which has created shortfalls in key development sectors such as research. To compound this, low-income countries and most SSA countries do not have research budgets [6], which is a major impediment towards sustainable development [7]. Most developing countries spend less than 0.25% of their Gross National Income (GNI) on R & D [8]. Therefore, some of the key challenges facing research in developing countries include limited material and financial resources, and poor physical and communication infrastructure [9]. One of the key drivers to economic competitiveness is university education that promotes research and innovation [2], which is one of Botswana's development policies [10].

Botswana is a middle-income country that has escaped most of the deep socio-economic challenges faced by other African countries [11]. However, despite its economic status, characterized by a relatively high per capita income [12], (internal) funding for research and development remains a challenge. The global ranking of Botswana in 2012 indicates that the country's contribution to R & D as a proportion of its GNI was 0.25%, placing it in the 86th position [8]. This poor and erratic funding has engendered lack of a comprehensive research activity in the country [13]. Nonetheless, because of its appreciation of the value of R & D towards economic development, Botswana has developed an innovation policy to "strategically focus on research and development" [10]. Although there are valuable natural resources in Botswana (as found in the Okavango Delta) serving as a major source of socio-economic livelihoods, there have been limited internally generated funds earmarked for environmental research. Subsequently, there is an urgent need to ensure that the ecological integrity of the Okavango Delta is safeguarded to ensure sustainable development. This is consistent with the Sustainable Development Goals (SDG's) as outlined in the [12] report. The aim of this paper is to highlight this externally funded research and ascertain its relevance to Botswana's research strategy.

The Okavango Research Institute is the main (government) research institute (of the University of Botswana) mandated to conduct research on the Okavango Delta. This study, therefore, assesses the level of external research funding, which the institute has received over the years, sources of its funding, and the research areas that have been funded.

II. MATERIALS AND METHODS

A. Study Area

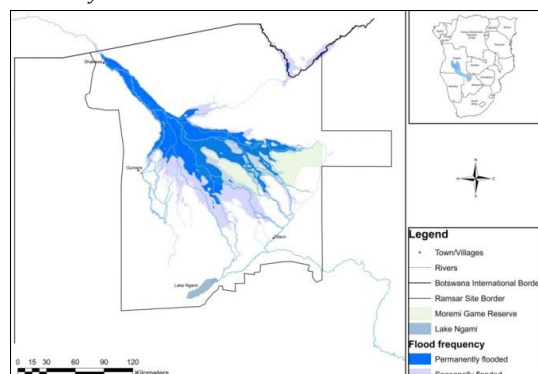


Fig 1 Map of the Okavango Delta

The Okavango Delta is one of the largest inland deltas in the world [14], and the largest source of surface water in Botswana [15]. It is located in semi-arid North-western Botswana (Fig 1), which enhances its value significantly, both as a source of water and livelihoods. The delta is the world's largest Ramsar site [16] and is also a World Heritage site. Current population statistics estimate the Ngamiland population at 152 284 [17], and the majority of these people depend on the Delta as a major source of their livelihoods [18]

B. Data Collection

Primary data on donor funding from 2001 to 2015 were sourced from archival records located in the Finance Office at the Okavango Research Institute (ORI). These data were mostly in the form of contracts signed between different donors and the University of Botswana.

III. DATA ANALYSIS

Donor funding data were captured using Microsoft Excel database for easy analysis. Donor data were summarized into frequencies which were then used to generate charts, line graphs and multi-graphs.

IV. RESULTS

Ten identified research areas were funded over a 15 year period in the Okavango Delta (Fig 2), in which the total funding was just over P120 million from four continents (Fig 3). Ecology, which received funding from three continents

except Asia, was the most funded research area, while cultural heritage, which received funding only from North America, was the least funded area (Fig 2). North America had the biggest contribution (approximately 57%) over the study period, while Asia contributed the lowest proportion (<1%) to research funding in the Okavango Delta. Funding agencies from other continents like South America and Australia have not provided any research funding in the delta during the study period. The EU was the main research donor at ORI over the study period (Table 1). While Africa provided the highest level of funding to Health, Europe provided the highest level of funding to energy and North America provided the highest level of funding to ecology (Fig 2). Qualitatively, research funding from Africa and Europe has increased steadily over the past 15 years while funding from North America decreased within the same period (Fig 4).

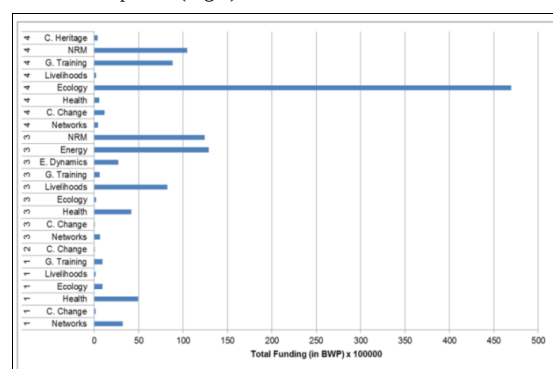


Fig 2 Comparison in funding among the four continents in each research area over the entire study period.

(Note: 1 = Africa; 2 = Asia; 3 = Europe; 4 = North America; C. Heritage = Cultural Heritage; G. Training = Graduate Training; C. Change = Climate Change; NRM = Natural Resources Management; E. Dynamics = Ecosystem Dynamics)

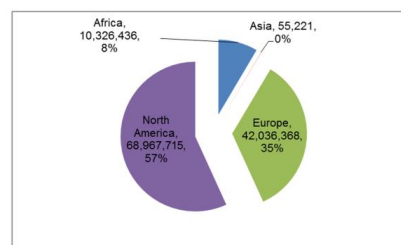


Fig 3 Relative proportion of research funding in the Delta from different continents between 2001 and 2015 where values indicate the total funding (in BWP) over the period

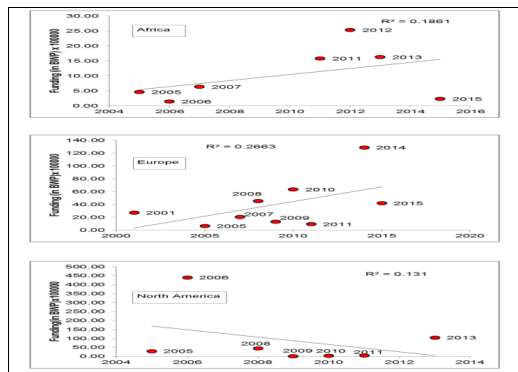


Fig 4 Trends in total research funding from each continent over the study period

TABLE 1 RELATIVE PROPORTION OF THE DIFFERENT FUNDING AGENCIES THAT HAVE FUNDED RESEARCH AT THE OKAVANGO RESEARCH INSTITUTE DURING THE STUDY PERIOD

Percentage (%)	Donor
3	ACP Group, Apina Project, Association of American Geographers, RISE ¹ , CDKN ² , FAO ³ , FCB ⁴ , Germany, Inqua Project, IUQR ⁵ , IUCN, NEA ⁶ , RP-PCP, DRFN ⁷ , UNESCO ⁸ , WARFSA, WaterNet, Wenner-Gren foundation for anthropological research, WHO ⁹
6	NASA, UNDP
8	START ¹⁰
11	IDRC ¹¹
14	EU

Note: 1 = Regional Initiative in Science and Education; 2 = Knowledge Management Team; 3 = The Food and Agriculture Organisation; 4 = Forest Conservation Botswana; 5 = International Union for Quaternary Research; 6 = National Executive Agency; 7 = The Desert Research Foundation of Namibia; 8 = United Nations Education and Scientific Organisation; 9 = World Health Organisation; 10 = International START Secretariat; 11 = International Development Research Centre

V. DISCUSSION

This study has revealed that research funding from North America, which once constituted the highest proportion of total research in the Okavango Delta, has decreased gradually between 2001 and 2015. Conversely, research funding from the rest of Africa and Europe has increased steadily during the same period. These local dynamics in research funding might reflect international macro-economic relationships between Africa and North America. According to the World Bank (2016) report, net official development assistance as percentage of GNI in 2014 exceeded the 0.7% of GNI limit set by the UN for several European countries (it exceeded 1% GNI for Sweden and Luxembourg), and was relatively low for the US (<0.25% of GNI). However, while the US was the largest donor by volume [12] to the developing world at US\$ 32 Billion in 2014, international development aid to Botswana has decreased substantially over time after it was declared an upper middle income country [11]. Hence, it can be argued that the gradual decrease in North American funding for research in Botswana could be based on the perception that Botswana is now capable of funding its own R & D initiatives.

Results (Table 1) reveal that most research on the Okavango Delta was funded by the EU, or EU based donors, while the second most common donors were based in North

America (IDRC and START). However, none of the donors came from any of the key agencies through which government has bi-lateral and multi-lateral agreements on natural resource or biodiversity conservation. This implies that ORI academics may not have taken advantage of funding from these international agencies like Ramsar, IUCN, the world Heritage Council, the CBD, or these funding agencies were not accessible to ORI. This notwithstanding, ORI should take advantage of the Ramsar status of the Okavango Delta, and its listing as a world Heritage Site to leverage funds from multi-lateral and bi-lateral donors for management and monitoring of the Delta's natural resources. It is noteworthy that IDRC is one of the dominant contributors to external research funding at ORI (Table 1). This is consistent with one of its key tenets of IDRC to "foster research activity" in developing countries [19].

Based on the results (Fig 2), ecological research received the highest funding between 2001 and 2015 in the Delta, while the second most funded area was Natural Resources Management (NRM). This finding buttresses the key mandate of ORI, which is natural resources management [20], and which makes the funding relevant to its mandate. Also, external funding at ORI falls within the research framework circumscribed by the Okavango Delta Management Plan (ODMP) through its research strategy [16], making the external funded research at ORI relevant to the Okavango Delta information gaps. The University of Botswana (UB) strategic plan [21] emphasizes the need to increase graduate student enrolment at the university as an effort to intensify research activity and competitiveness globally. The results show that some of the projects at ORI focused primarily on graduate training, which also fulfils the aims of the UB strategic plan. One of the key focus areas of the Botswana Tertiary Education Council (TEC) [10] is to develop a curriculum that equips students with "specialist knowledge" and "critical skills". Hence, the graduate training provided through external funded research at ORI contributes to this key area of the Tertiary Education Council. Therefore, externally funded research at ORI contributes to key government policies. However, there is need to create a broad based approach to leverage more funding from external sources. These will contribute to the limited internal funds available for R & D, which is a key component of economic growth and development.

There is concern that externally funded research in the SADC region might drive the research agenda of international funding agencies and not necessarily of the recipient governments [22]. However, this study has shown that this concern has not affected externally funded research at ORI. External research funding at ORI has contributed primarily to ecological and natural resources management research and graduate training in research. Nationally, ORI is, therefore, contributing to the twin goals of economic growth and development that Botswana needs. Knowledge generated from research in ecology and NRM will contribute towards monitoring and measurements of the country's efforts to achieve the SDG's [12] by 2030. Moreover, the current research at ORI is responding directly to the ODMP's research strategy, highlighting research gaps in the delta which will ultimately ensure sustainable use of its natural resources. Furthermore, despite the limited research activity in Botswana

due to limited research funding, Botswana is the second most productive country in SADC after South Africa [22]. Therefore, optimizing externally sourced research funding will certainly contribute significantly to R & D in Botswana.

VI. SYNTHESIS

Government has access to multi-lateral and bi-lateral donors for research funding, but has limited skilled manpower resources to conduct research. There is need for academic institutions and government ministries to forge research partnerships to access these funds. There are two clear pathways for Botswana academic institutions (like ORI) to leverage funds for research. (i) The local private sector (industry) can provide some of the funding needed for research in natural resources management. (ii) Multi and bi-lateral donors are another source of funding for R & D in Botswana. However, these can be achieved through a deliberate effort by government to create an enabling environment.

[2] Argues that there is need for enhanced cooperation between industry and universities to facilitate R & D (in the South African context). The same argument can be made for Botswana where government should create a favourable environment for the private sector (industry) to invest in R & D. Some of this can be through a tax credit system where companies investing in R & D receive tax exemptions/ breaks [13] subsequently, part of this investment should then be made available for research in natural resources management, which would contribute to the country's efforts to achieve the 2030 SDGs. According to the [23], achieving the SDGs will "end poverty and enhance social and economic development".

As highlighted by the [12] report, governments and developmental partners need to invest resources in data collection to monitor and measure progress against SDGs. Investing resources in R & D remains a challenge for a middle income country like Botswana suggesting that a measure of external funding for research is still necessary for generating relevant data meant for advancing development. Therefore, it is incumbent upon academic institutions like ORI and government to forge closer partnerships and collaborations to leverage funding from multi-lateral and bi-lateral development partners. Academic institutions have the human resources to undertake R & D while government has the political connections to access global financial resources. Therefore, SDGs can be achieved for the Okavango Delta communities through a close collaborative effort between ORI and government, to leverage funding for R & D from international actors. The current situation, where ORI seeks funding on its own, while government does not optimize utilisation of R & D funds available from its developmental partners, is unsustainable.

VII. CONCLUSION

This study has shown that external research funds can contribute to R & D in developing countries. Arising from the limited internal research funds in Botswana, donor funding sourced by academics at ORI has consistently contributed to the country's research strategies and other policies related to R & D. However, there is evidence that ORI has not been able to

utilise funding from multi-lateral and bi-lateral donors to which Botswana is signatory. This implies that external funding opportunities are yet to be optimized by ORI in intensifying research in the Okavango Delta. There is need for development of strategies to ensure that academics can access these funds. One strategic objective would be for government and UB to forge close collaboration to leverage external funding from multi and bi-lateral donors. In order to elevate its economic growth and development trajectory, a close partnership between the government of Botswana and both multi and bi-lateral donors will result in increased funding, leading to an enhanced R & D activity in the country.

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