



STATUS OF R&D IN MAURITIUS: Use of R&D measurements as a policy tool

Moving Towards Innovation

Dr M Madhou

Dr S Moosun

Mrs Naginlal-Modi Nagowah

Mrs S Patten-Ramen

1.0 Introduction

The Republic of Mauritius is striving to become an innovation driven economy. Hence, the country is investing much effort in building up its Research and Innovation Ecosystem. Some of the major policy decisions include the creation of a Ministry to oversee Innovation in 2014, the launching of the National Innovation Framework in 2018 (Ministry of Technology, Innovation and Communication, 2018), the strengthening of the Mauritius Research Council (MRC) into the Mauritius Research and Innovation Council (MRIC) in September 2019 and the identification of the MRIC as the National Focal Point to submit National R&D data to UNESCO Institute of Statistics (UIS) in May 2019. The National Innovation Framework (NIF) (2018-2030) which is the national policy document on innovation rests on three pillars: enhancing capacity building in terms of human skills, upgrading and setting up of new infrastructure such as centres on innovation and provision of incentives such as funding schemes and tax measures to encourage both public and private sectors to engage in Research and Innovation.

As part of the NIF (2018-2030), a Mauritius Innovation Scoreboard (MIS) (Appendix 1) has been formulated to evaluate progress made along the recommended strategies by making quantitative measurements. The MIS consists of 38 indicators classified under 4 pillars: Human Resources, Finance and Support, Innovation Rate and Bibliometric Indicators. Consistent with this measure, the MRIC has been nominated as National Focal Point to submit National Research and Development (R&D) data to UIS. This article demonstrates how the R&D measurements made for the UIS coupled with bibliometric indicators is enlightening policy makers on the performance of Mauritius in Research, Development and Innovation as well as identifying gaps and potential remedial measures to boost the National Innovation Ecosystem.

2.0 Situational Analysis

The public sector consists of 27 Ministries and 107 parastatal bodies. Out of the 107 parastatal bodies, four institutions are especially mandated to conduct R&D. These are:

- a. Mauritius Oceanography Institute (MOI) operating under the aegis of the Ministry of Blue Economy, Marine Resources, Fisheries and Shipping and is expected to play a key role in providing data and information to assist the Government in the sustainable development of the ocean economy.
- b. Food and Agricultural Research and Extension Institute (FAREI) operating under the aegis of the Ministry of Agro Industry and Food Security. FAREI has the responsibility to conduct research in non-sugar crops, livestock, forestry and to provide an extension service to farmers in Mauritius including its outer islands.
- c. Mauritius Research and Innovation Council (MRIC) operating under the aegis of the Ministry of Information Technology, Communication and Innovation. The MRIC advises the Government on matters concerning applied research, innovation and research and development issues.

- d. Mauritius Sugarcane Industry Research Institute (MSIRI) operating under the Mauritius Cane Industry Authority (MCIA) falls under the aegis of the Ministry of Agro-Industry and Food Security. The MSIRI conducts research on all aspects of sugarcane in order to enhance the cost effectiveness and competitiveness of the cane industry and to improve the efficiency of Mauritian sugar factories.

Following a national survey, based on established methodologies (OECD Frascati Manual, 2015), on human resources and expenditure on R&D, for the financial year 2019/2020, all ministries, including the ones listed above, performing R&D were identified.

Table 1: Involvement of Ministries in R&D

Ministry and/or parastatals /departments operating under that Ministry engaged in R&D	Ministries not engaged in R&D
Ministry of Agro-Industry and Food Security	Attorney General's Office
Ministry of Arts and Cultural Heritage	Ministry of Commerce and Consumer Protection
Ministry of Blue Economy Marine Resources Fisheries and Shipping	Ministry of Environment, Solid Waste Management and Climate Change
Ministry of Education, Tertiary Education, Science and Technology	Ministry of Gender, Equality and Family Welfare
Ministry of Energy and Public Utilities	Ministry of Health and Wellness
Ministry of Finance, Economic Planning and Development	Ministry of Industrial Development, SMEs and Cooperatives (Industrial Development Division)
Ministry of Financial Services and Good Governance	Ministry of Housing & Land Use Planning
Ministry of Information Technology, Communication and Innovation	Ministry of Local Government, Disaster and Risk Management
Ministry of Labour, Human Resource Development and Training	Ministry of National Infrastructure and Community Development
Ministry for Rodrigues, Outer Islands and Territorial Integrity	Ministry of Public Service, Administrative and Institutional Reforms
Prime Minister's Office	Ministry of Social Security and National Solidarity
Ministry of Land Transport and Light Rail	Ministry of Tourism

	Ministry of Youth Empowerment, Sports and Recreation
	Ministry of Social Integration and Economic Empowerment
	Ministry of Foreign Affairs, Regional Integration and International Trade

It was noted that a number of Ministries which are involved in Science, Technology and Innovation (STI) sectors (Environment/Solid Waste Management/Climate Change; Health/Wellness; Housing/Land Use Planning; National Infrastructure/Community Development; Local Government/Disaster & Risk Management) do not conduct R&D activities. This could be further explored to empower the Ministries to do so.

3.0 Research and Innovation Resources: Funding and Researchers

The total R&D expenditure in Mauritius amounts to around (Mauritian Rupees) MUR 1.8 billion, which represents 0.37% of GDP. This is a relatively low GERD compared to the target of 1% set by the African Union in 2006 and even lower compared to the most innovative economies in Asia and Europe which have GERDs exceeding 2 % and even 3 %. However, at this point, Mauritius is still comparable to other African countries and Small Island Developing States except Singapore (Figure 1).

This low GERD is recorded despite Government measures to increase R&D funding through the National Innovation Program and the National Research Funds. The National Innovation Program (NIP) has involved an additional budget of MUR 125 million to MUR 150 million annually over the past three years and a National Research Fund of MUR 50 million has been effective since 2018 for academic research in universities. The NIP is aimed at funding innovative programs, particularly those involving both the public and private sectors.

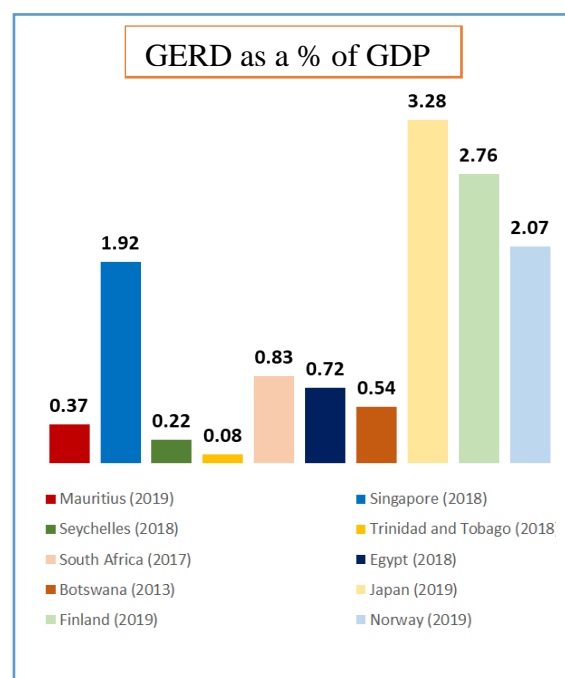


Figure 1: GERD of selected countries as % of GDP
(Figures in brackets refer to the most recent year for which data was available)

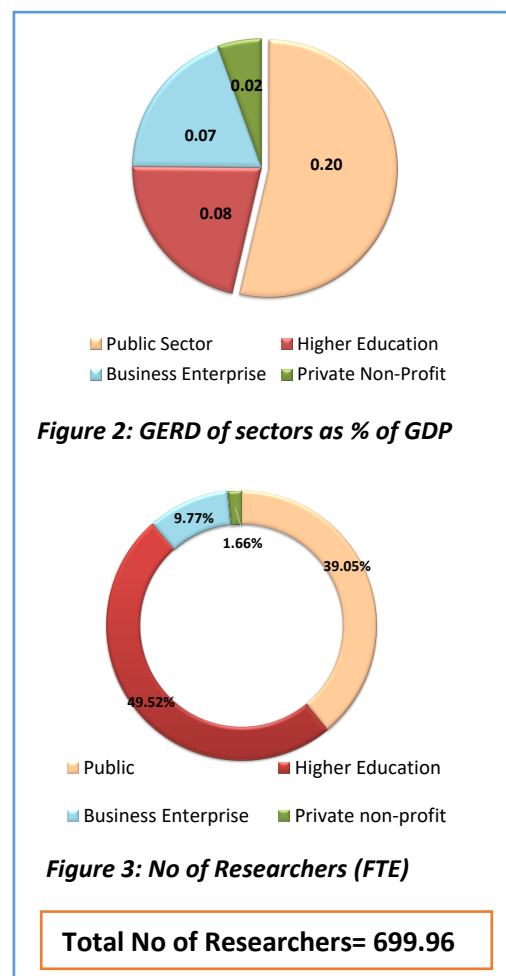
The breakdown for sectoral R&D expenditure is given in Figure 2. It was found that most R&D funding comes from Government sector.

The total number of researchers was 553 per million of inhabitants, which is comparable to other African nations but is significantly lower than more innovative economies (which can be around ten-fold higher).

The lowest BERD aligns with the lowest percentage (9.8 %) of researchers (FTE) operating in that sector, compared to the Higher Education (49.5 %) and Government sectors (39.0%) (Figure 3).

Consistent with best practices from innovative economies, these figures call for efforts for the Business sector to invest in R&D.

Ongoing Government measures to increase BERD include the introduction of tax incentives since 2017 to motivate local and foreign companies to invest in R & D in Mauritius and the strengthening of the legislation to protect IP rights through provision of the Industrial Property Bill 2019. The Bill has passed parliament and awaiting proclamation.



4.0 Synergy between Sectors

Figures revealed the highest R&D expenditure is made by Government (0.20% of GDP) followed by 0.08 % of GDP in Higher Education. However, it was also found that the highest percentage of researchers are operating in the Higher Education Sector.

This might be a call for Government to develop strategies for an even distribution of inputs in terms of funding and human resources for maximum efficiency.

Expenditure by fields indicated that the different sectors had different priorities: for Government, highest investment (56.9%) was in the field of Agricultural and Veterinary Sciences while for Business enterprise, Engineering and Technology was found to be the field of research being prioritized (57.0%) (Figure 4). However, in Higher Education and Private non-profit sectors, highest investment is observed in the field of Natural Sciences (67.0% and 25.6% respectively). This could indicate a potential mismatch between research needs of the Business sector and the research priorities in the Government and Higher Education sectors. This could be the reason behind the low academia-business collaboration.

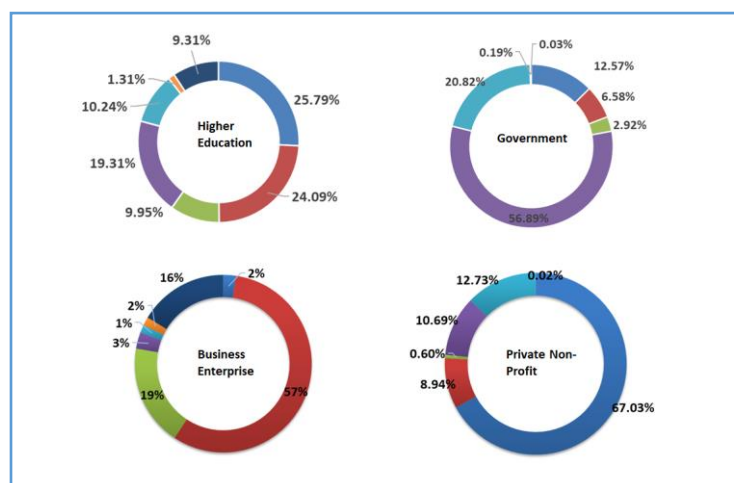


Figure 4: GERD by Field of Research (%)

The Scopus database was used to analyze peer reviewed publications for Mauritius for the year 2020. Consistently, the bibliometric analysis revealed that the percentage of collaborative publications between Higher Education Institutions and Business and/or Government sector ranged from 0 to 1%, revealing a low collaborative rate.

Table 2: Total no of publications for 2016-2020

Year	2016	2017	2018	2019	2020
No of Publications	318	357	351	564	479

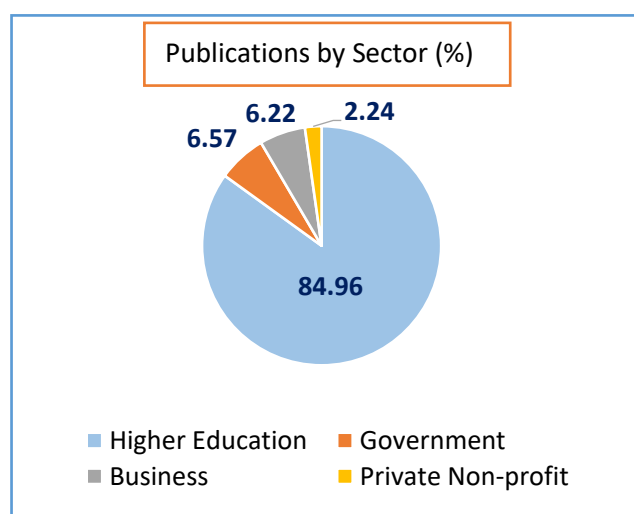


Figure 5: Share of publications by Sector (2016-2020)

The Academia/Business collaboration is crucial in any National Innovation Ecosystem, hence emphasizing on the importance of introducing incentives to allow such partnerships. Since 2014, the MRIC has introduced a number of collaborative research and innovation grant schemes to incentivize businesses to collaborate with universities and local research organisations on a matching grant basis hence sharing the risks of investing in Research and Innovation activities. But the persistent low BERD could possibly be attributed to the SME sector which contributes 40% of our GDP. These enterprises operate on low turnovers and might not have adequate funds/expertise to invest in the collaborative research and innovation grant schemes which operate on a matching grant basis.

In this case, it might be worthwhile exploring simpler measures such as innovation vouchers and student placements in enterprises to facilitate such partnerships.

Highest R&D expenditure is in the Government sector and yet bibliometric analysis conducted over the past 5 years (2016-2020) revealed that highest publication outputs (85.0%) is from Higher Education, mainly from University of Mauritius.

Greater synergy between Universities and Ministries could increase the publication output and allow academics to contribute to research needs in the public sector.

5.0 Alignment with country goals

Bibliometric indicators are also being analysed to evaluate R&D outputs in terms of publications. Mauritius has the sovereign rights to explore and exploit the resources of an Exclusive Economic Zone of around 2.3 million km² and a continental shelf of 396,000 km² managed jointly with the Republic of Seychelles, with the vision of the Republic of Mauritius to become a Blue Economy (Figure 6). Yet from 2018 to 2020 only 6.6% of local publications relate to the Ocean sector.

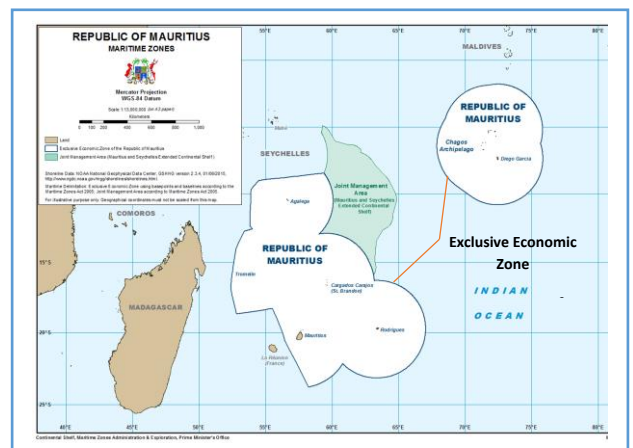


Figure 6: Exclusive Economic Zone of Mauritius

This suggests a need to formulate strategies to empower R&D in the ocean sector.

Mauritius lies in the middle of the Indian Ocean, at about 2,000 kilometers off the south-eastern coast of the African continent. Hence, it has poised itself to become a knowledge hub in the region and forge its partnerships with mainland Africa. Yet, a bibliometric analysis of local publications in 2018-2020 revealed that about 69.4% of Mauritian peer-reviewed publications had an international counterpart. Only 18.5% of these publications were co-authored with an international partner from Africa.

This calls for special Research and Development grants to be formulated to allow Mauritius Africa partnerships in R&D.

6.0 Concluding Remarks

- It is worthwhile mentioning that the R&D measurements made for UNESCO are also being used to upgrade the MIS which is a tool used to evaluate performance and formulate evidence-based strategies.
- These measurements are impacting directly on 6 indicators of the Global Innovation Index report (published by Cornell University and WIPO) as follows:
 - Researchers, FTE/mn pop,
 - Gross Expenditure on Research & Development, % GDP
 - GERD financed by business, %
 - GERD financed by abroad, %
 - GERD performed by business, %
 - Research talent in business enterprise
- Besides the use of bibliometric analysis is also contributing to get better insights on the indicators Scientific & technical articles/bn PPP\$ GDP and Citable documents H-index of the Global Innovation Index Report.
- The R&D indicators form part of a wider program aiming at the use of data to monitor the innovation performance of Mauritius. The importance of data collection and analysis is obvious as the GII report 2020 reported that the ranking of Mauritius is attributed to a ‘mix of new data availability, data revisions at the source, and performance effects’, following the most notable rank change from 82 out of 130 countries in 2019 to 52 out of 131 countries in 2020 (Cornell University, INSEAD and WIPO, 2019; 2020).
- It is worth mentioning that new R&D measurements addressing the use of digital technologies and health related issues might gain increasing importance in the present pandemic context.

Useful links and References

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MAURITIUS INNOVATION SCOREBOARD

