

Title

Building up of a National Innovation System for a Poor Country – Case evidence from the national innovation system of Mozambique

Authors

Maria Lima-Toivanen, Organizations, Networks and Innovation Systems Unity, Technical Research Center of Finland – VTT, Tekniikantie 2, Espoo, 02044 Finland.
E-mail: maria.limatoivanen@vtt.fi

Tracy Wyman, BusinessWorks: www.bizworks.co.mz

Nina Rilla, Organizations, Networks and Innovation Systems Unity, Technical Research Center of Finland – VTT, Tekniikantie 2, Espoo, 02044 Finland

Michael Kahn, Stellenbosch University and Research and Innovation Associates.

Keywords

Mozambique, developing countries, poverty, innovation systems failure.

Note

VTT – Technical Research Center of Finland. Authors acknowledge the funding received by the Ministry of Foreign Affairs of Finland for the realization of the project “Capacity Building for Innovation at the Eduardo Mondlane University” which gave opportunity for development of the present work.

In today's innovation focused policy-making, inputs in science, technology and innovation (STI) are seen as key drivers in attaining sustainable economic growth, social development, environmental protection and institutional capabilities. This is especially true for the poorest developing countries, where policy-makers struggle with the competing demands of growth and the fight against poverty and rampant diseases, often against a backdrop of war and corruption, and with limited capacity and human and financial resources. Efforts to build institutions to carry out innovation-related activities and initiatives to build national innovation systems (NIS) are often demanded and supported by external actors, but can fail for lack of capacity, political will and internal buy-in.

This paper aims to identify the main institutional barriers to the development of a well-functioning NIS in Mozambique. Mozambique makes a case example worth exploring due to its recent investments in enabling the organs of an IS based on the strong economic growth that the country has experienced over the last 15 years. Despite reaching macroeconomic stability and experiencing impressive economic growth, poverty reduction has stagnated, job creation remains below expectations, manufacturing is still at 1970s levels and the vast majority of manufactured products and processed foods are imported. Moreover the country R&D expenditure is low and heavily dependent on donor inputs. All of which underpin the need for innovation, both in firms and society generally in the country. The paper investigates both the external (mainly development aid funding schemes of donor countries) and internal, i.e. Mozambican science and technology-related policies and programs, aiming to identify strengths and weaknesses in the institutional landscape of the Mozambican STI system and to provide recommendations on key institutions and institutional functions that should exist for an innovation system in a developing country to grow and function effectively.

The scientific productivity, as a result of investments in science and technology, in developing countries is essential for their economic and social development and overcoming of hunger and poverty, poor sanitation and illiteracy and stop being the victims of exploitation (Salager-Meyer, 2008). Aid-donors are much more willing to provide economic aid for combating of famine, for example in the case of Africa, than to effectively promote scientific research in developing countries or to contribute to their technological development (Salager-Meyer 2008). The need to combat famine by itself justifies the merit of the aid but do not help in achieving the needed impact for the development in the long-run.

The exploration of weaknesses in national systems of innovation in developing countries, and frameworks with which to approach strengthening them is a relatively new area of research (e.g. Bell and Pavitt 1993, Lall *et al.* 1987, Lall 1992, Intarakumnerd *et al.* 2002, Muchie 2003). It is expected to find in emerging innovation

systems weak intersectoral links, the absence of interface units and universities specialized mainly in the supply of manpower (Galli and Teubal 1997 cited in Chaminade *et al.* 2009), as opposed to entrepreneurial R&D. Human capital tends to be low (Oyelaran-Oyayinka and Barclay 2003), as is absorptive capacity within industry and universities and among users, links between these are weak or non-existent and policy-making capacity is also low (Chaminade *et al.* 2009). They often lack key organizations and institutions altogether, and that those which exist tend to be weak (Edquist 2001, Rodrik 2007). In the case of African, for example, weak institutional structures are the key factor limiting both the quantity and quality of R&D in the agricultural sector (Clark 2002), and weak institutions are the key limiting factor in South Africa's innovation system (Rooks and Oerlemans 2005).

Mozambique is located in Southeast Africa and has a population of about 23,5 million inhabitants, mostly of young adults as it performs very poorly in terms of the Human Development Index, placed 184th among 187 countries (UNDP 2011). It is a resource rich country although poor in infrastructure and means of exploiting its wealth for the benefit of its citizens. It was a colony of Portugal from 1505 to 1975. From 1963-1975, the revolutionary insurgency against Portuguese rule left the country without adequately functioning public institutions as well as lacking business enterprises that existed in the past. After independence a civil war disrupted the country from 1975-1992. A peace agreement was reached in 1994 and since then, the country has enjoyed relative economic stability and real social gains in health, education and some empowerment through associations and decentralization but most people remain poor as they were in recent past (Hanlon and Smart 2008). In order to qualify for external support from international financial agencies and development aid the country has adopted a series of institutional arrangements that have delivered some economic results what cannot be clearly stated as development (Hanlon and Smart 2008). Nevertheless, influenced by developing aid targeted at improving the institutional arrangement for support to science and technology developments, the government of Mozambique has recognized the importance of STI as key tools for the country's reorientation towards a knowledge-based society and has worked to develop the organizations and institutions constituting the NIS. It has designed important institutional and political instruments in the area, such as the development of a 10-year Strategic Plan for Higher Education (2000), the Science and Technology Policy (2003), the creation of the Ministry of Education and Culture and of the Ministry of Science and Technology (2005), the Science, Technology and Innovation Strategy (2006) and the Strategic Plan for Formation and Development of Human Resources in Science and Technology (MCT 2006). Most of these initiatives are in agreement with the Action Plan for Eradication of Absolute Poverty – PARPA (Massuanganhe 2005, IMF 2011), and its strategic vision, Agenda 25. These institutions are operating within a context of high poverty, low levels of secondary education and pervasive illiteracy and innumeracy (Day 2007) and a tertiary education system facing crises of access, funding,

infrastructure, quality and relevance (Mário *et al.* 2003). Although some of the key building blocks exist and are functioning, these constitute a system of innovation *in the early stages of development* (Hydén 2006, Elming and Abrahamsson 2010, Day 2007). There is a need then, to understand how the country's NSI has been functioning and its impact to change the current situation and benefit its citizens in order to expand their own development.

For the performance of the system as a whole we base our analysis on two recent studies undertaken by the Ministry of Science and Technology: firstly, an 'STI Mapping' exercise in which 22 key institutions in the STI system (research institutions, coordinating bodies, funding agencies) were interviewed and their capacity assessed (at a very high level), and secondly, an enterprise survey on the innovation behaviour of firms, based on a representative sample of firms across all sectors and provinces. As a result of the evaluation we propose a framework for strengthening the Mozambican STI system with a focus on key institutions and institutional capacities.

It seems that quite many of the problems and challenges regarding performance of Mozambican science and technology system are similar to that of other emerging systems. The system is being built around the idea of a science and technology system, instead of one of innovation, which would have better means of contributing to the overall development of the country. Even when it is possible to identify certain strengths of the system they are made in relation to the context of lack of resources in terms of finances, human capabilities and infrastructure. The level of innovation that can be said is related to grassroots. Considering the context of the country they are extremely important and should be encouraged but one has to bear in mind that the technological innovations are drivers of economic performance and the lack of absorptive capacity undermines possibilities of promoting catching up. The political implications of this analysis are evident for its outcome, which can be used by policy-makers as a means to direct the STI policies in the country and promote a movement towards more sustainable development for Mozambican citizens.

References

- Bell, M., Pavitt, K. (2003). Technological Accumulation and Industrial Growth: Contrasts between developed and developing countries. *Ind Corp Change*, 2, 157-210.
- Chaminade, C., Lundvall, B. A., Joseph, K. J., Vang, J. (2009) Designing IS policies for development in the new global context. In B. Lundvall, K., Joseph, C. Chaminade, J. Vang-Lauridsen (Eds.) *Handbook of innovation systems and developing countries: building domestic capabilities in a global setting*. Cheltenham: Edward Elgar.
- Chapman et al (2010). *DFID's Mozambique Country Programme 2006-2009*. Evaluation Report. UK Department for International Development.

- Clark, N. (2002) Innovation Systems, Institutional Change and the New Knowledge Market: Implications for third world agricultural development. *Economics of Innovation and New Technology*, 11, 353-368.
- Day, B. (2007). *Innovation in Mozambique*. Unpublished report produced for the World Bank. Pretoria: Non-Zero-Sum Development.
- Edquist, C. (2001). Systems of Innovation for Development (SID). Background paper for chapter 1: "Competitiveness, Innovation and Learning: Analytical framework". *Unido World Industrial Development Report (WIDR)*. Innovation, Vienna: UNIDO.
- Elming, S.-Å., Abrahamsson, K. (2010). The National Research Fund (FNI) as a Tool for Research Capacity Building in Mozambique: An in-depth assessment of Sida support to Ministry of Science and Technology (MCT) within the research cooperation with Mozambique. *Sida Review*. Stockholm: Sida.
- Government of Mozambique (2006). *Action Plan for the Reduction of Absolute Poverty, 2006-2009 (PARPA II)*. Republic of Mozambique, Maputo.
- Hydén, G. (2006). University and Faculty Research Funds at Universities in Mozambique, Tanzania and Uganda. *Sida Evaluations*. Stockholm: Sida, Department for Research Cooperation.
- Intarakumnerd, P. Chairatana, P.-A., Tangchitpiboon, T (2002). National Innovation Systems in Less Successful Developing Countries: The case of Thailand. *Research Policy*, 36, 680-693.
- Lall, S. (1992). Technological Capabilities and Industrialization. *World Development*, 20, 165-186.
- Lall, S., Khanna, A., Alikhani, I. (1987). Determinants of Manufactured Export Performance in Low-Income Africa: Kenya and Tanzania. *World Development*, 15, 1219-1224.
- Mário, M., Fry, P., Levey, L., Chilundo, A. (2003). *Higher Education in Mozambique: A case study*. Oxford: James Curry Ltd.
- Massuanganhe, I. J. (2005). Modelling PRSP II & Poverty Reduction in Mozambique Local Development: Econometric analysis of factors determining millennium development goals by 2015. Working Paper 6. *Governance & Local Development Series*, UNDP Mozambique.
- Ministério da Ciência e Tecnologia (2006). *Plano Estratégico de Formação e Desenvolvimento de Recursos Humanos para a Área de Ciência e Tecnologia*, Maputo.
- Muchie, M. (2003). Rethinking Africa's Development through the National Innovation System. In: Muchie, M., Gammeltoft, P., Lundvall, B.-A. (eds.) *Putting Africa First: The making of an African Innovation System*. Aalborg: Aalborg University Press.
- Oyelaran-Oyayinka, B., Barclay, L. A. (2003). Human Capital and Systems of Innovation in African Development. In: Muchie, M., Gammeltoft, P., Lundvall, B.-A. (eds.) *Putting Africa First: The making of an African Innovation System*. Aalborg: Aalborg University Press.

Republic of Mozambique (2006). *Mozambique Science, Technology and Innovation Strategy (MOSTIS)* - Time Horizon: 10 years. Mozambique: Council of Ministers.

Republic of Mozambique (2000). *Strategic Plan of Higher Education in Mozambique 2000-2010*. Maputo: Ministry of Higher Education, Science And Technology.

República de Moçambique (2003). *Política de Ciência e Tecnologia*. Maputo.

Rodrik, D. (2007). *One Economics Many Recipes: Globalization, institutions and economic growth*. Princeton: Princeton University Press.

Rooks, G., Oerlemans, L. (2005). South Africa: A rising star? Assessing the effectiveness of South Africa's national system of innovation. *European Planning Studies*, 13, 1205-1226.

Salager-Meyer (2008). Scientific Publishing in Developing Countries: Challenges for the future. *Journal of English for Academic Purposes* 7 (2008) 121-132. Elsevier.

UNDP (2011). Human Development Report 2011: Sustainability and Equity: A Better Future for All. UNDP