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Innovation, the informal economy and development: The case of Zambia

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National systems of innovation have been serving as the conceptual framework and vehicle to address poverty and national competitiveness in developing countries. Zambia has been building its NSI since 1964, but the existing system suffers from serious shortcomings related to an insufficient conceptually inclusive framework and the absence of direct and concrete pro-poor innovation policy instruments. The system lacks strong interactive dynamics and suffers from weak governance. Zambia has also followed an export-driven industrial economy, but the expected knowledge spill-over gains from large mining operations have not been realised. The paper examines national innovation strategies by emphasising the importance of the informal sector and the potential for innovation at grass-roots level. It examines the evolution of science and technology policies by highlighting how the excluded areas can be included. The absence of pro-poor innovation and lack of inclusive policies are highlighted as factors contributing to low productivity and socioeconomic imbalances.

Keywords: Zambia, national systems of innovation, poverty, informal sector, innovation policy, development cooperation.

JEL classification

Introduction

Science and technology (S&T) policy has become an important part of national development worldwide. In the case of Zambia, the absence of an effective national science and technology policy since independence in 1964 may have contributed to the country's under-development, poor economic performance and high incidence of poverty. At the beginning of 1964, S&T was not one of government's priorities in national development processes. Instead, all national development activities were implemented through various micro-economic programmes. Some of the objectives of these programmes were to increase industrial production for various key products and help in the creation of new industries. However, the programme did not achieve its desired goal due to lack of focus and coordination. Furthermore, adoption and diffusion of technology was poor and thus it proved difficult to sustain industrial development on a long-term basis. Zambia has two major economic sectors: mining and agriculture. Between 1964 and 1991, Zambia's economic and industrial performance deteriorated, which consequently brought hardship with high poverty levels for the majority of Zambians (National Policy on Science and Technology 1996). As industrial performance became uncompetitive, many local industries closed and this was followed by protests across the country. In responding to the deterioration of the economy, the government realised that

economic transformation was inevitable. The government recognised that science and technology were central to creating wealth and improving the quality of life. The first science and technology policy framework was drafted and released in 1996.

The majority of Zambians live in rural areas and agriculture is their main source of livelihood. But since 1964, the agricultural sector has not been fully exploited. According to the IMF's Zambia Poverty Reduction Strategy Paper (PRSP) 2002–2004, the challenge for poverty reduction and how best to create and expand the opportunities for the poor should be the key approach to ensuring a strong focus in poverty reduction strategies. However, as outlined in the PRSP, the highest priority lies in developing rural agriculture but this cannot be achieved without government will. Furthermore, in the absence of national strategies in adapting science and technology, the country is unlikely to achieve increased crop yields, produce new scientific knowledge and above all sustain the fertility of farming land. In essence, science and technology can contribute to national productivity and economic growth for Zambia provided it is managed effectively. Government's recognition of S&T as a catalyst for creating economic growth was strategically important for the nation. Consequently, this was followed by the drafting of the 1996 S&T policy document. Zambia's three decades without a national S&T strategy is an issue that needs to be recognised. Zambia has

depended largely on the mining sector in the past three decades, and this has been identified as one of the contributory factors for the country's lack of development in science and technology and innovation. According to the Fifth National Development Plan 2006–2010, as the price of minerals, mostly copper, fluctuated to low levels, revenues were drying up and furthermore, political change made it difficult to develop sound strategies (Ministry of Finance and National Planning 2006),

This paper offers a perspective on the most challenging issues of how national systems of innovation can be adapted to the context of sub-Saharan Africa in general and Zambia in particular. Interviews were conducted with leaders from government institutions and the private sector in order to establish whether linkages within the national system of innovation are weak or strong. The interviews comprised questions with elements on national goals that are set in the S&T policies to enable us to measure the achievements of the implementation. Our finding is that a vacuum existed between the government ministry and key actors within the innovation system, which resulted in weak interactions and contributed to limited flow of information. All respondents stressed the need for government to play a leading role in enhancing interactions amongst the stakeholders and this confirms the weak linkages within the national system of innovation. Furthermore, this study also emphasises the need to conceptually integrate pro-poor and inclusive strategies in national innovation system policies and practices.

Innovation for development

Policy makers and academics are increasingly recognising the complexity and challenges in understanding how innovation contributes to the development of poor economies. We still have a long way to go to generate sufficient evidence to pinpoint how innovation systems can be developed in the context of low income economies in Africa, Latin America and Asia. (OECD 2007, OECD 2010, Lundvall et al. 2009, Malerba and Manil 2009, UN Millennium Project 2005).

A key observation emerging in the literature is that the Western or rich countries' innovation system models or industry-led catch-up strategies are not themselves applicable or replicable in the context of developing countries. This is because developing countries have a unique institutional set-up, often inherited from the colonial era. The informal sector plays a central role in the national economy but insufficient firm population, lack of resources and capabilities leads to suffering and rampant poverty (Kraemer-Mbula and Wamae 2010, Toivanen and Ponomariov 2011, Easterly, 2006).

Thus to build a broader understanding and conceptual framework for innovation and development, we need a closer look at how innovation systems really are emerging and what the actual organisational, economic

and policy dynamics are driving knowledge systems in developing countries. Within this context, this paper investigates the evolution and prospects of the national system of innovation in Zambia, one of the small, poverty ridden African countries that are often overlooked in research.

At the outset, the very application of the notion of national systems of innovation within the development context, with its focus on the process of creating and diffusing innovations within specific national economies is problematic (Hodgson et al. 1994, Freeman 1974, Nelson 1993, Lundvall 2003). This approach stresses the networked flow of technologies and knowledge among people, enterprises and institutions as key to bridge idea generation and knowledge implementation. Kraemer-Mbula and Wamae (2010) highlighted the need for sub-Saharan Africa to adapt the national systems approach and emphasise the need for such strategies to deal with pro-poor issues and the informal sector.

The significance of the informal sector for innovation systems and policies is of critical importance in the least developed countries, such as Zambia. The poor survive mainly through informal networks and rarely depend or have access to economically significant formal institutions or practices (Kandachar and Halme 2007, Banerjee and Duflo 2011). Furthermore, as noted by Reinie Biesenbach and his colleagues (2010), employment of science, technology and innovation in benefiting the poor requires close and local understanding of how poverty is created and maintained, as well as powerful implementation strategies to truly empower individual people and marginalised communities (GRA, 2009:49). Also, all too often, advocates of knowledge or STI-driven development fail to recognise the role of users. The true needs of poor communities are not identified and projects are driven by donor or project advocates, not to mention the need to advocate co-creation with the poor in innovation projects (Toivanen 2011, Toivanen et al. 2011, Loikkanen and Toivanen, 2011).

Economic development since independence

At Zambia's independence in 1964, the country was in the middle income group with a per capita income of US\$ 800. By 2002, the per capita income had dropped to half the amount at US\$ 405. The economy declined further in the mid-1970s as a result of the 1973 oil crisis. Despite the help received from the donor community, the downward trend continued throughout the 1980s, affecting exports due to low copper prices on the world market. In 1991, a new government came into power with the strong objective of transforming the country through economic liberalisation, which involved privatising key parastatal organisations. Although this was a sound government agenda, it did not live up to its planned objectives because of several shortfalls such as, among

others, the lack of strategic focus on revitalising the agricultural sector.

Zambia is a resource-based economy that still depends on mining activities as a source of its revenues. From the beginning of 1991, the government implemented several versions of economic reforms, but most of these did little to contribute positively to national development. During this time, the government ignored the importance of leveraging and integrating science, technology and innovation into national development processes. However, during the same period in the mid-1990s, it became clear that in order to foster growth and create wealth, the government needed to start exploring the means to embed science, technology and innovation programmes into the national development agenda with various developmental programmes (Siame 2007: 43).

Poverty in Zambia

Poverty in Zambia is serious and widespread. According to the Zambia poverty assessment report of 1994, about 69% of all Zambian households’ expenditure per adult was below a level sufficient to provide basic needs. William Easterly (2006: 70) pointed out in his seminal book, *White man’s burden*, that Zambia was ranked seventh worst country in the world in terms of per capita growth rates between 1980 and 2002. During this period, income per head decreased almost 2%. In the same period, foreign aid amounted to 20% of national gross domestic product, and the country had been receiving support from IMF for 53 years (Easterly 2006). By pointing out such failures across Africa and the world in reduction of poverty, Easterly questioned the broader approach to donor driven economic and development planning, a view that can be echoed in national innovation system efforts in developing economies as well.

In all given records, this is a serious problem which requires urgent strategic measures on national level to tackle the problem. Table 1 shows the poverty gap in both rural and urban towns corresponding with the total population from 2001 to 2005. The data clearly shows that in 2002 and 2004 the poverty gap was considerably higher in rural districts than in the urban towns.

The 2010 UN Development Index (UNDP 2010) indicates that between 1980 and 2010 Zambia’s human development index rose by 0.1% annually from 0.382 to 0.395 in 2010, which gives the country a ranking of 150 out of 169 countries with comparable data. The human

development index of sub-Saharan Africa as a region increased from 0.293 in 1980 to 0.389 today, and places Zambia above the regional average. Having said this, Zambia needs to prioritise investing in human resource development to foster economic growth and thereby improve living standards.

Zambia’s agricultural and industrial sectors have no strategic innovation policies that aim at promoting development in the clusters. This means that these sectors are not contributing to sustainable growth at optimal level. Unless these clusters are developed with a proper approach, poverty will continue to be the biggest problem faced by the government. While foreign investment is actively flowing into the country, tangible benefits would only be realised through balanced concession. It is the duty of governments to commit themselves to good planning and devising strategies that are aimed at sustainable growth. For example, the health sector continues to be deprived of professionally trained manpower because most of the skilled personnel leave the country for better prospects abroad (Ngulube et al. 2004). However, government has a huge task ahead as building capabilities and developing strategic plans should be prioritised in order to optimise science and technology diffusion.

Historical evolution of the Zambian national science, technology and innovation system

Zambia’s post-independence policies were trial and error for the new state. During this time, the government focused more at distributing resources and trying to provide the Zambian majority with access to basic services such as health and education. Today, Zambia’s economy is growing at an average of 6% per annum (IMF 2007). While there is so far little empirical evidence that shows that Zambia’s national system of innovation functions, or whether it even exists, it makes one wonder what economic factors are contributing to growth. The country has a relatively good knowledge infrastructure, although most of it fails to meet and deliver what it was designed for. For a long time, both universities and research institutions have been chronically underfunded and government has not been able to develop instruments to fund such institutions and other sectors. Overall, this has had negative implication on the flow of knowledge amongst key actors. While it remains logical that universities and research institutions should function as sources for the production and diffusion of knowledge, Zambia’s case is rather different (UNCTAD 2006).

One of the biggest challenges that Zambia faces is how to harness the abundant resources it has into wealth for the country’s population. The key to all this is how well the country can apply and use science and technology as a driving force to boost development for the whole economy. Recognising the role of S&T and giving innovation policy a critical role in national development is one way forward. The Zambian government adopted its 2009

Table 1: Zambia poverty gap for 2002 and 2004

Year	2002	2004
Population, total	10 972 245	11 472 278
Poverty gap at urban poverty line (%)	19	22
Poverty gap at rural poverty line (%)	31	44

Source: World Bank (2010)

revised policy on Science, technology and innovation with an aim of making science and technology as a recipe in national development activities. The policy incorporated the key aspect of ‘innovation’ that was left out in the first policy prepared in 1996, which laid the foundation for the current importance of STI-policies in Zambia today (see the Ministry of Science, Technology and Vocational Training (MSTVT), *Science, Technology and Innovation Policy*, 2009).

Post-independence STI-policies

Zambia did not have a specific science & technology policy per se until 1996, when it was drafted to map the role of S&T in national development. S&T policy during the early post-independence period was embedded within the national development plans. However, the implementation of the 1996 S&T policy didn’t produce the tangible results that it was planned for, because the Ministry of Science, Technology and Vocational Training (MSTVT) was at the time in the process of rearranging itself. The MSTVT was a leading partner in the implementation of the STI policy. The STI policy advocated an inclusive participation of public institutions, e.g., National Business Technology Center (NTBC) and other public research organisations. However, our field study shows that the failure of government to play a leading role in overseeing broad participation of all stakeholders was one reason for the failure of the 1996 STI policy.

The National Council for Scientific Research (NCSR) is Zambia’s government funded statutory research organisation. If anything, the NCSR is supposed to play a major role in fostering STI activities. The objective of the NCSR among others is to perform and build capacities in research and development (R&D), food technology, textile, building and industrial minerals, agriculture and natural resources. However, poor government allocation of funds directed for research activities has led to crippling operation capabilities. Furthermore, the many shortfalls in the research sector today are inherited from the post-independence period partly due to an inadequate policy focus on science and technology and insufficient investment by the private sector in innovation programmes (Ministry of Finance and National Planning 2006).

Analysis of the Zambia science, technology and innovation system

Science and technology policy of 1996

The Ministry of Science, Technology and Vocational Training (MSTVT) drafted the first S&T policy in 1996 as a measure to address the deteriorating economy and industrial performance in Zambia. After independence in 1964, Zambia did not have a national policy on science and technology and did not recognise the important role S&T played in national development processes. The National Science and Technology Policy of 1996, was designed to embed S&T as part of the culture in

key sectors to promote competitiveness. The ministry’s assertion in the S&T policy of 1996 admits that the absence of an economic policy framework that includes S&T aspects created a vacuum in spearheading development in key sectors of the economy (MSTVT 1996).

The 1996 National Science and Technology policy’s mission can be summarised as having targeted the improvement of the quality of life for all Zambians: to promote and exploit science and technology as an instrument for developing an environmentally friendly indigenous technological capacity in sustaining socio-economic development. Concise as it sounds, the mission’s key objectives do not outline a pragmatic approach to how various tasks would be implemented sustainably. The main problem of the 1996 S&T policy document is that it is over ambitious, given that the instruments and infrastructures are far short of capacity, underfunded and lack resources. While the emphasis on promoting indigenous knowledge is welcome, the document does not provide a mechanism of how this would be developed in the long term. The 1996 S&T policy falls short of addressing poverty alleviation strategies and it lacks a pro-poor approach. As a result, stakeholders regarded the 1996 S&T as a mere policy document per se.

Challenges and current situation of the 1996 S&T policy

Currently, the 1996 S&T policy document is still being used as a referral document and it also provided a background for drafting of the revised version known as Science, Technology and Innovation Policy of 2009 (STI policy) that incorporated the ‘innovation’ aspect. However, as mentioned in the 1996 S&T policy, one of the objectives was to impact on economic growth through creating wealth and jobs by supporting the creation of micro, small and medium enterprises (MSME), but there were a lot of shortcomings such as the lack of a support mechanism, which means that, even today, the success rate of MSMEs is relatively low (Mwenechanya 2011: 14). Furthermore, lack of financial instruments to facilitate technology diffusion, transfer, innovation and commercialisation is the biggest challenge for the government. For example a quote from the S&T policy of 1996: ‘Outlines more on restructuring of the institutional framework in science and technology by separating policy and advisory functions from the research and development function and creating of management board’. But at the same time, the policy document admits that very little of rationalisation is covered in terms of creating funding mechanisms for research and development. Creating of financial instruments that are strongly attached to government budgetary allocation is critical to ensure sustainable operations of institutions.

Science, technology and innovation policy of 2009

The national science, technology and innovation policy of 2009 is a revised version of the 1996 S&T policy

framework. The final draft was released in 2009. One of its key objectives is to strengthen the science and technology framework and forge closer links between the programmes of the research and development community and prioritise various sectors in national wealth creation, productivity and competitiveness. The policy document is distinctively different in that the key 'innovation' element was incorporated, unlike the 1996 S&T policy. Although some components of the 1996 S&T policy were transferred into the revised 2009 STI policy, emphasis on enhancing innovation activities is considered extremely important.

Both the S&T policy of 1996 and the 2009 STI policy recognise the need to provide incentives to facilitate technology diffusion, transfer, innovation and commercialisation but not explicitly outlining how instruments for incentives would be developed on long term. While provision of incentives remain crucial in implementation processes, the lack of access to modern and appropriate technologies is proving to be hampering the progress in achieving significant growth within MSMEs. Promoting innovation activities in small-scale businesses and the private sector as a whole is cardinal if Zambia is to achieve strong economic growth. For example, the STI policy of 2009 recommended the creation of a Youth Inventors' Fund to support youth in developing innovative ideas that would be converted into technological products. In essence, the STI policy of 2009 is supposed to drive innovation from grassroots to full commercialisation but instead it says very little about how grassroots innovations can be transformed into valuable knowledge and impact on national development.

According to the 2009 STI policy, the institutional structure of Zambia needs a new arrangement that would support a smooth implementation of the policy. It outlines that STI activities should cut across all sectors of the economy and ministerial portfolios but provides no operational framework for the long term. Similarly, successful implementation of the STI policy requires appropriate arrangements of institutions. Zambia's institutional arrangement is weak and ineffective (MSTVT 1996, 2009). Institutions are not structured to facilitate an effective implementation of policies due to the fact cabinet and ministerial lines provide overall direction and guidance which has proved difficult to coordinate. Du Plessis (2006) contrasts institutional change in Zambia to that of Europe, by stressing that the lack of time to adapt to a new economic and political environment is worth highlighting and considering for all policy makers.

Challenges and current situation of the 2009 STI policy

The Ministry of Science, Technology and Vocational Training (MSTVT) is responsible for implementing STI policy framework. As the ministry with the government mandate, its position is to lead all sectors in fostering the adaption of science and technology at national

level, but efforts to lead have a lot of shortcomings. There has been growing criticism from stakeholders towards the ministry for its failure to effectively plan and map out policy implementation strategies that are result oriented. According to our results from interviews conducted during the 2011 field study in Lusaka, Zambia, the MSTVT and stakeholders within the science and technology system showed that there is lack of smooth flow of information amongst actors and this is hampering the progress of national development. In both science and technology, policy documents clearly admit that Zambia's science and technology system is poorly coordinated and suffers from several shortfalls, among others weak linkages between government and institutions (MSTVT 1996, 2009).

The Fifth National Development Plan (FNDP) of 2006–2010 mentions the importance of science and technology as fundamental in generating new scientific knowledge and implementing existing technologies to adapt to local circumstances. But at the same time it recognises the challenge of building a mass human resource base in science and technology, which can only be realised through investing more in knowledge generation institutions.

Informal sector in the making of the Zambian national system of innovation

Conceptualising innovation systems is relevant due to the importance of country-specific interactions in creating a climate for innovation. The role of indigenous knowledge needs to be acknowledged in the making of Zambia's innovation system. In fact most innovation activities in the informal sector are in some ways derived from indigenous knowledge, which unfortunately is not explicit in the innovation system framework (Kraemer-Mbula and Wamae 2010).

For a developing country like Zambia with abundant natural resources, it is important to emphasise SMEs and industrial development because it would not only contribute to economic growth but helps stabilise society by creating jobs and further improving welfare. Building a viable NSI framework that addresses national needs is a vital step that can guide the country to sustainable economic growth. The major direction of the present NSI policy attempts to implement STI across all sectors of the economy and ministerial portfolios. Figure 1 shows that the STI institution framework has four levels with cabinet providing the overall direction. The framework is a top-bottom hierarchy and government has a stronger say in mandating how STI must be applied. However, the linkages and interaction pattern are vertically aligned and knowledge flows follow in the same links.

Developed countries are able to generate and extensively apply science and technology so as to ensure their development and global competitiveness. They have already created the necessary preconditions for the genera-

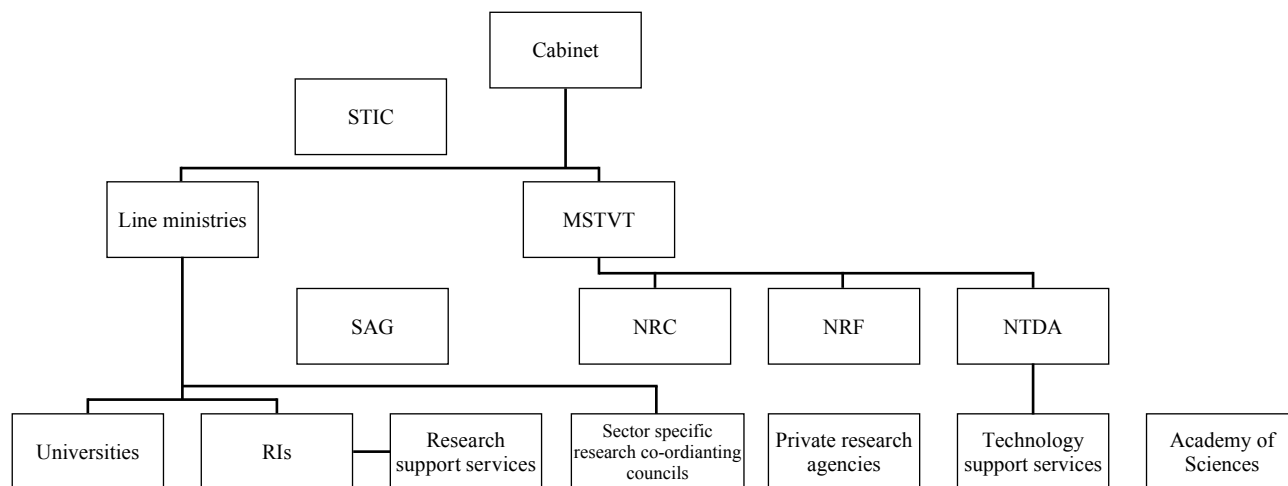


Figure 1: STI institutional framework. Source: MSTVT (2009)

tion, promotion, diffusion and application of scientific and technological knowledge, whereas in the case of many third world countries, the application of this knowledge in the realisation of their development objectives is at a very low level. In Zambia, this in turn is followed by socio-economic problems that are deeply rooted, largely due to the absence of a well-established scientific and technological base to generate and select, adapt and innovatively apply scientific and technological knowledge to solve development and environmental problems.

Innovation-led development implies that the way in which a region harnesses its assets is more important, in many ways, than the initial ingredients with which it starts. For example, Zambia has abundant fertile land that is suitable for growing various food crops, but it is underutilised. Science and technology can play a huge role in addressing improved methods of farming such as developing adaptable and or drought resistant crops that contribute to high yields. Improving farming methods through adapting science and technology can go a long way in alleviating the poverty that affects much of sub-Saharan Africa. One way to proceed in the search for ‘innovation niches’ is to determine the requirements, that is, the goods, services and/or skills of the major clusters in the local economy and to become a supplier to these clusters. (Torjman and Leviten-Reid 2003).

The concept of a national system of innovation is supposed to function on strong pillars of linkages and interaction amongst the actors involved in innovation performances through effective exploitation of science and technology knowledge. In a country like Zambia, Science and technology capacity building and applications need to be integrated with the overall national development plan. While Zambia has the necessary infrastructure, the NSI structure appears to be relatively weak. Actors involved do not relate to each other in enhancing a system of knowledge creation. It is important for the government to undertake a review over the

functions and interactions of the stakeholders of the national system of innovation. It lacks a participatory policy, adoption and implementation, including legal, operational and financial issues that make the national system of innovation more relevant, effective, efficient and sustainable.

The organisational structure of Zambia’s national system of science and technology is highly influenced by the government. Instead of being based on the decentralised governance structure of the nation to ensure active participation of the federal and regional stakeholders, all decisions are made within the cabinet (MSTVT 2009).

Defining local innovations in the formal and informal sectors

It is difficult to underestimate the importance of the informal sector for sub-Saharan economies. Despite of its central importance, we have currently very limited understanding of the role it plays and how innovation is being facilitated among informal economy stakeholders. Sub-Saharan Africa has the highest incidence of poverty and high unemployment in the world, and people have to survive and make a living often in highly challenging conditions, forcing or inducing them to engage in the informal sector to trade in goods and services. Yet, probably due to the political sensitiveness related to the informal sector, most sub-Saharan countries lack explicit or reliable structures and instruments to support business, entrepreneurship, innovation or other knowledge-based economic activities in the information sector, although innovation has a contribution to make in the sector.

Zambia has a lot of activities in grassroots innovation that exist in the private sector. The informal sector is predominantly found in the markets in Zambian towns. The informal sector provides employment to a larger segment of the population than the formal sector. But despite this, not much has been done to improve this sector, neither is there much organised effort to

research and analyse its contribution to the economy. The structures that have been put in place over the years are not sufficient to allow businesses to thrive, especially in locations such as markets. This is further weakened as the new STI policy appears to be insufficient in its approach to informal sector, for example in mobilising entrepreneurship at the base of the pyramid, among other things.

More needs to be done to help transform the entrepreneurial activities carried out in markets into viable businesses, fully integrated into mainstream economic life. From the look of things, the ruling class has no concept of what life is like for people in the informal sector, who have been systematically dispossessed of the opportunity to have decent work and dignity as human beings.

The unemployment rate in Zambia is about 50%, suggesting very high participation in the informal sector of the national economy (Siame 2007). Table 2 shows the GDP composition of three sectors. 85% of the working population works in the agricultural sector, which contributes about 19.7% to GDP, 6% in the industrial sector and 9% in services. This tells us how important it is for the country’s national innovation system to build a strategy for innovation in the agriculture sector through science, technology and innovation. The contribution of 19.7% is relatively low and this simply shows that commercial farming is small because most farming is done by small-scale farmers. As more and more people remain excluded from the security of waged or salaried employment, the number of workers in informal employment will rise (Andersson 2006).

In the Zambian context, local innovation is more predominant in the informal sector since it is the biggest employer for both the skilled and unskilled workforce and is extremely important in addressing directly poverty. Successes, however, can be described more in terms of the impact of products and services produced from local innovations that generate income for people involved in innovation activities.

Although agricultural production has increased over the last few years, hunger is one of the biggest problems that affect mostly rural people. However, efforts by the government to break the bondage of the people from alarming poverty levels have not been effective partly due to chronic scientific and technological deprivation. While local innovation has made a significant contribution mostly in the informal sector, poverty levels still continue to be high. But it may not be correct to say that alleviation of poverty is failing; on the contrary, it is rather slow and requires more effort in investing in various programmes that aim at addressing socioeconomic factors.

Local innovations in the private sector

The role of local innovations in raising growth can be seen as having an ‘indirect’ albeit extremely important effect on wellbeing. There are many areas where science and technology advancements could directly improve the lives of millions of people, through local product innovation and services. Zambia’s local innovation is born in the informal sector although it rarely comes to light in the mainstream economy. However, local innovations have connections with the private sector through small to medium entrepreneurship development (Siame 2007).

For a long period, the official policy has hoped for knowledge spillovers from the heavy mining industry cluster, a hope made visible strategy also in the 2006 published Fifth National Development Plan, which built on the 1995 Zambian mining policy in arguing that the large-scale mining sector has an important role to ‘facilitate skills and knowledge development in order to increase the stock of human capital’ and ‘facilitate the development of the service input sector, downstream processing, and beneficiation industries and centres of knowledge creation and innovation’. The paper also suggested that large-scale mining could boost small-scale mining, and thereby have wider social and economic impacts in the Zambian society. (MFNP 2006: 65–66).

Yet very little of this been accomplished over the past years, echoing perhaps known disappointments with large-scale industrial developments in poor African countries, as suggested by Brolen et al. (2007) in Mozambique. As often noted in the official planning documents, it is especially the small-scale producers who have difficulties in benefitting from implemented knowledge support activities. These types of problems are not limited to the mining sector, but are characteristic across domestic industries, such as agriculture, handicraft, building, and so on. The 2006 National Plan, which was sponsored by the IMF, noted difficulties to mobilise knowledge and skills in support of production in textiles, fisheries, live-stock and other small-scale producers’ sectors (MFNP 2006: 46–57).

Whereas the official, IMF and World Bank guided, national plans argue for synergies between large-scale industrial sectors and small-scale producers, the Zambian national science and technology strategy (2009) has emphasised the lack of or insufficient linkages between knowledge institutions and economic organisations. The weak networking of the national innovation system led public research organisations to duplicate research efforts. The strategy also identified that the private sector barely participated in national public research and development efforts, undermining the contribution of knowledge in the national economy and emphasising the lack of links to scattered small-scale producers. (MSTVT 2009)

Table 2: GDP composition by sector 2010

Zambia	Agriculture	Industry	Services
(%)	19,7%	33,7%	46.6%

Source: CIA-WorldFact book (2010)

Conclusions

Innovation has a great potential to lift the living conditions and prospects of the world's poor, but this cannot be achieved through traditional, narrow science and technology centered innovation policy and systems. Our discussion of the emergence and evolution of the Zambian national system of innovation has focused on the policy processes and the general performance of the system. Three key observations with implications for Zambia, the conceptual framework for national innovation systems, as well as for efforts to build pro-poor innovation policies emerge:

1. Under-investment in higher education, research, development and innovation. In spite of strong rhetorical and political commitment to invest in a knowledge-based society in Zambia, true investments in institutions and organisations for a broad-based national system of innovation have not materialised.
2. Interactive learning and networking is absent or poor within the national system of innovation. The Zambian national innovation system emulates a model of national system of innovation, but its essence, interactive learning and circulation of knowledge, remain poor or absent and lend little support to the processes of innovation. It appears that there are issues at almost all levels of the national system of innovation, at the level of governance, public research organisations, and industry-academia cooperation.
3. Informal sector and pro-poor innovation policy instruments are absent from the present national system of innovation strategy. Although the overwhelming majority of Zambians live and operate within the confines of the informal economy and in poverty, there are hardly any direct policy strategies or instruments to address these conditions. The objective of producing knowledge spillovers from large-scale and foreign direct investment funding of mining operations, as well as from large-scale agriculture to small scale producers, is recognised in policy planning, but there is hardly any real progress in delivering on such expectations, and it is difficult identify any concrete instruments addressing such needs.

The present state of our research does not permit us to point out what the factors are that have given rise to them or what forces are maintaining them, and this is an issue for future research. However, we are able to point out some concrete avenues of action, as well as conceptual considerations.

Lack of funding remains an issue for African innovation. In the context of Zambia, a country with abundant natural resources and home to world's largest mining operations, it strikes the common sense that there is no mechanism to direct money into investments in the knowledge economy, and certainly the issue of securing funding must be elevated within the scholarly discussion on innovation and development.

Finally, it is obvious that there is huge gap between the outspoken objective of harnessing science, technology and innovation to fight poverty and the absence of concrete policy instruments and measures delivering this. Zambian policies repeatedly emphasise how critical the national issue of poverty is, and how urgently the national system of innovation must address it. Yet, there are hardly any concrete measures to be identified, and the record on poverty alleviation in Zambia remains weak. Evidently, the academic community considering the conceptual framework on inclusive innovation and pro-poor innovation policies must spend more effort in inventing and developing real-world concrete methods and actions to harness innovation for the benefit of the poor.

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