Knowledge Sharing Program

2016/17 Knowledge Sharing Program with Tanzania:

A Study on Macroeconomic Stability and Strengthening Industrial Research for Sustainable Industrialization

Ministry of Strategy and Finance

KDI Korea Development Institute

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Preface

Knowledge is a pivotal driver of growth and the fruit of all endeavors dedicated to socio-economic development. Accordingly, knowledge sharing has become an essential tool in strengthening nations' capacity to design and execute policies and programs. On the global front, the UN is making efforts through its Sustainable Development Goals (SDGs) to underscore the role of both knowledge and knowledge sharing in tackling sustainable development issues and in establishing and enhancing global partnerships.

Indeed, knowledge laid the foundations for Korea's remarkable transformation from a poor agro-based economy into an industrialized nation with an open and democratic society. And the process, though arduous, has enabled Korea to accumulate invaluable and practical lessons not found in conventional textbooks. Now, as a global economic leader, Korea is working with the international development community and partner countries to identify key development challenges and solutions by sharing its tangible know-how and experience.

The Knowledge Sharing Program (KSP) was initiated in 2004 by the Ministry of Strategy and Finance (MOSF) and is implemented by Korea Development Institute (KDI). The program plays a vital role in further expanding knowledge sharing as well as in strengthening government partnerships with low to high income economies.As of this year, 940 research studies have been conducted with 59 partner countries. And in 2016, KSP policy consultations and capacity building workshops were organized with 28 partner countries including new partner countries such as Jordan and the Sub-Saharan Africa Partnership for Skills in Applied Sciences, Engineering and Technology (PASET).

The 2016/17 KSP with Tanzania was undertaken by MOSF, the Ministry of Finance and Planning (MOFP), and the Ministry of Education, Science and Technology (MEST) of the United Republic of Tanzania to support the study on "Macroeconomic Stability and Strengthening Industrial Research for Sustainable Industrialization." To that end, KSP and Tanzania engaged in a range of collaborative efforts including exchanging development experiences, conducting joint studies, and designing a policy action plan in line with the country's development targets.

It is with great optimism for the future of Tanzania that the results of the 2016/17 KSP are presented. I firmly believe that KSP will serve as a stepping stone to further elevate the mutual learning and economic cooperation between both our countries, and hope it will positively impact Tanzania's attainment of its goals for sustainable development.

I wish to convey my sincere gratitude to Senior Advisor Dr. Youngkwa Kim, Principal Investigator Prof. Woosik Moon as well as project consultants Prof. Sangyong Lee and Prof. Hosin Song for their extensive contributions. I am also grateful to Executive Director Dr. KwangeonSul, Project Manager Dr. Il Dong Koh, Project Officer Mr. Wooyong Jung and all members of the Center for International Development (CID) for their hard work and dedication to this program. Lastly, I extend my warmest thanks to the Tanzanian collaborates, Tanzania Industrial Research and Development Organization (TIRDO), Tanzania Engineering and Manufacturing Design Organization (TEMDO), the Center for Agricultural Mechanization and Rural Technology (CAMARTEC) and related agencies, project coordinators, and participants for their steadfast effort and support.

Joon-Kyung Kim
President
Korea Development Institute (KDI)

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Chapter 3

2016/17 KSP with Tanzania

Wooyong Jung (Project Officer, Korea Development Institute)

The Knowledge Sharing Program (KSP) with Tanzania was launched in 2011 given the eagerness of the Tanzanian government to join the ranks of the middle-income countries. From 2011–13, Korea Deposit Insurance Corp. conducted the KSP to modernize Tanzania's deposit insurance system. For the 2014 KSP, the Center for Korean Prosperity and Hankuk University of Foreign Studies in Seoul carried out a program for system improvement and capacity building for public-private partnership (PPP) projects. The following year, the KSP had Science and Technology Policy Institute (STEPI), Republic of Korea, hold a policy consultation to enhance the contribution of science, technology and innovation (STI) to Tanzania's national economic development.

The 2016/17 KSP marks the sixth year of the program, and Tanzania's Ministry of Finance and Planning (MOFP) and Ministry of Education, Science and Technology (MEST) submitted proposals for securing their country's macroeconomic stability and raising capacity of industrial R&D institutions, respectively. Per the requests, selected experts in those sectors from the Republic of Korea teamed up with Tanzania-based consultants as shown below.

〈Table 1〉 2016/17 KSP Consultation Team and Topics

	Topics	Researchers	Local Consultants
1	Macroeconomic Policy Framework for Economic Growth and Stability	Woosik Moon (Professor, Seoul National Univ.)	Jasson Bennett Bagonza (Principal Economist, MOFP)
2	Policy Suggestions to Secure the Tanzania Government Revenue	Hosin Song (Professor, Ewha Womans Univ.)	Yosepha Adam Tamamu (Principal Economist, MOFP)
3	Strengthening Industrial Research for Sustainable Industrialization	Sang Yong Lee (Professor, Hanyang University)	Raphael Tihelwa Chibunda (Director, MEST) Rogers Alfayo Msuya (Senior Research Officer, MEST)

As the first step of the 2016/17 KSP with Tanzania, the research team conducted the Kick-off Seminar and Pilot Study Oct. 22–27, 2016, in Dar es Salaam, Tanzania. Through a field trip, the Republic of Korea delegation identified the challenges facing the Tanzanian government and narrowed down the broad range of research targets to more specific and clear topics while building up a network with relevant organizations.

The additional pilot study on the MEST-suggested topic was carried out in the Tanzanian cities of Dar es Salaam and Arusha Jan. 21–26, 2017, to acquire the necessary information and data for research. For the MOFP-suggested topics, the additional pilot study was deferred according to the ministry's request.

Following the dispatch of two delegations to Tanzania, the Ministry of Strategy and Finance (MOSF), Republic of Korea, and Korea Development Institute (KDI) invited a Tanzanian delegation comprising policy practitioners including consultants to Seoul for the Interim Reporting and Policy Practitioners' Workshop April 2–9, 2017. During their stay in the Republic of Korea, the Tanzanian delegates visited government offices related to their topics as well as major companies such as Hyundai Motors and Doosan Heavy Industries. They also reviewed with Republic of Korea experts what the research team had achieved and discussed the direction of future studies.

As the final stage of the 2016/17 KSP with Tanzania, a Republic of Korea delegation visited the Tanzanian capital of Dodoma April 19–23, 2017, to share the KSP's final research findings and policy recommendations with high-level

policymakers and relevant stakeholders. In the Final Reporting Workshop and Senior Policy Dialogue, representatives from both countries held active discussions on policy suggestions and reaffirmed a deeper bilateral partnership.

From July 23–28, 2017, a Tanzanian delegation comprising officials from the MOFP, the Bank of Tanzania, and Tanzania Revenue Authority visited Seoul for the Capacity Building Workshop on macroeconomic stabilization and government revenue enhancement. Through this event, the Tanzanian delegates visited the National Assembly Budget Office, Korea Institute for Public Finance and Bank of Korea and discussed knowhow in related topics.

Executive Summary

Woosik Moon (Seoul National University)

This project is composed of three independent studies. The first is on designing a macroeconomic framework to enable the Tanzanian economy to maintain high growth while achieving stability. The second explores the best method of expanding government revenues. The third shares the experiences of the Republic of Korea's think tanks in propagating industrial technology and thus boosting economic growth with Tanzania's top three research institutes.

The first study identifies the three goals of Tanzanian economic policy: stimulation of further economic growth, maintenance of a stable macro-economic environment while prioritizing economic growth and sharing the fruits of growth with the wider Tanzanian public. With these objectives in mind, this study seeks to help Tanzanian officials to find various ways to strengthen their policymaking capabilities and develop appropriate instruments and tools for implementing macroeconomic policy. In addition, the macroeconomic policies of the Republic of Korea and Tanzania are compared, focusing on the post-1979 period for the former and the post-2008 era for the latter. Indeed, the macroeconomic situation the Republic of Korea experienced from the early 1980s resembles that of Tanzania after its 1996 reform. Per capita GDP in the Republic of Korea was around US$1,780 in 1980, when its economic stabilization started, while that in Tanzania hit US$1,000 in 1996.

In June 2016, the International Monetary Fund (IMF) published a report on Tanzania that served policy consultations between them. The six main pillars of discussion discussed in the report were increasing public investment, mobilizing

additional tax revenue, enhancing public spending efficiency, improving monetary and financial tools and policies, implementing growth-enhancing structural reforms and reducing vulnerability to external shocks.

Against this backdrop, this study focuses on reviewing macroeconomic policy in three areas: fiscal, monetary and financial, and exchange rate.

On fiscal policy, the IMF study recommended that Tanzania further reduce government spending to meet its deficit target, while recognizing the need for more infrastructure investment. This recommendation, however, failed to suggest concrete programs and measures though pointing to the proper direction. In this regard, the stabilization plan implemented by the Republic of Korea government under the name of "comprehensive economic stabilization programs" from 1979 could prove useful. Zero-based budgeting and other programs for fiscal consolidation could also be worth examining in detail.

For monetary and financial policies, the IMF study recommended that Tanzania's monetary policy framework, which targets reserve money and the money supply (M3), should be changed into one targeting interest rates. It concretely emphasized the need to stabilize the excess reserves of banks (interbank market) but failed to acknowledge that the monetary authority lacks the power to shift toward an open market operation. Also, the IMF study cited as a problem bank lending in Tanzania being independent from the central bank's authority yet suggested no remedy for it. The Republic of Korea's experience could again clarify these points and thus promote more investment and growth by lowering lending and long-term interest rates. Indeed, the country had a similar problem until the Bank of Korea (BOK) adopted a framework to keep inflation in check in 1998. A monetary policy oriented toward interest rates in Tanzania is hardly possible, however, as long as retail deposits remain the main funding source for banks and such deposits are unswayed by interest rate movements. Furthermore, this will require a shift in Tanzania toward a liquidity-abundant economy from one of constrained liquidity.

Finally, on maintaining a sustainable balance of payment, the IMF study concluded that though Tanzania's current account deficit (7–8 percent of GDP) poses a serious external risk, maintaining foreign currency reserves amounting to fourth months of imports is appropriate. Considering the Republic of Korea's experience, especially in the 1997-98 financial crisis, however, this is insufficient and the IMF's view is too optimistic. The report suggested additional measures to protect Tanzania from sudden changes in hot money, especially short-term capital, if it wants to liberalize its foreign exchange market. The Republic of Korea's experience shows that making exchange rates flexible to maintain external competitiveness is essential.

Comparing the experiences of both economies, this study seeks to help Tanzania consider what lessons from the Republic of Korea's experience to adopt in devising its own macroeconomic policy for promoting higher growth while maintaining stability. Obviously, the Republic of Korea's macroeconomic conditions and situations over the past three decades were not, and could not, be the same as those facing the Tanzanian economy. Nonetheless, policymakers of the two countries should compare their respective experiences for mutual benefit.

The second study focuses on the policy toward securing government revenue for the Tanzanian economy. The first section goes into the details of this revenue policy. The second section is an overview of the Republic of Korea's revenue policy over the country's development period of the 1960s and 70s. The cash receipt system (CRS) is recommended for the Tanzanian government to broaden its tax base by detecting cash transactions of the self-employed. The system enables the government to share information on cash transactions between consumers and stores or businesses. By giving tax benefits to both businesses and consumers for reporting cash transactions offers a key incentive to participate in the policy. In the past, information on cash transactions could be reported to the government by sellers only. Now, however, such data are automatically reported to the government and consumers once a cash receipt is issued. The CRS allows the same information on cash transactions to be shared by the consumer, seller and government in real time. Moreover, related technology is needed to implement the CRS. The implementation of CRS will thus give Tanzania the chance to step up its information and communications technology (ICT) to a higher level.

The problem is that immediate implementation of the CRS in Tanzania is difficult. Identification of a taxpayer when a cash transaction is conducted is necessary to implement the system. Yet Tanzania does not issue a personal identification number to each citizen. One solution to this problem is that the government could consider using mobile numbers. About 20 percent of transactions in the country's urban areas is done via mobile phones. Gradual implementation of the CRS is recommended from urban areas to rural. At the same time, the introduction of a personal identification system such as a social security or resident number as in advanced economies is required for the effective implementation of policies on social welfare, public health and tax.

The aim of the third study is examination of the experiences of think tanks in the Republic of Korea in propagating industrial technology and boosting economic growth for drawing lessons for think tanks in Tanzania. To this end, an overview is given of three Tanzanian research institutions: TIRDO (Tanzania Industrial Research and Development Organization), TEMDO (Tanzania Engineering and Manufacturing Design Organization) and CAMARTEC (Centre for Agricultural Mechanization and

Rural Technology). Then based on a survey on the perception of research staff on the roles of their institutions, their main problems are identified: insufficient budget and human resources, outdated facilities, weak links with the private sector and between supply and demand, and lack of technology transfer systems.

A country cannot industrialize without institutions to properly provide technical support to industry to enhance efficiency and advance technology. The Tanzanian government accordingly seeks to revitalize its industrial think tanks. The Republic of Korea provides a prime model that Tanzania can emulate: Korea Institute of Industrial Technology (KITECH).

The specific experiences of the Republic of Korea, especially the strategies and actions of KITECH, are the best benchmarks for Tanzanian industrial research institutions. The biggest difference between the two countries was found to be the degree of enthusiasm of the staff stemming from incentives. So this study elaborated on KITECH's policies and efforts to link think tanks with industries in relation to making suggestions for Tanzanian research institutes. KITECH's policy and practices mentioned in this report are the technology transfer process, small and medium enterprise (SME) contact center, partner company system, technology community, field partnership, open lab, regional business incubation center and support for globalization. Also, KITECH's human resource management of researchers and incentive programs are elaborated on.

Finally, this study suggests the following five action plans for Tanzania.

1) SME partner systems: Each technical staff member or researcher at a think tank needs to form long-term relationships with partner SMEs. Just as KITECH researchers have at least five SME partners, Tanzanian staff need a certain number of partners to take charge of their growth processes. Such relationships will raise staff responsibility and ensure continuous support from institutions to SMEs. At the same time, having clear SME partners will lead to the creation of incentive programs for technical staff.
2) Incentive systems for institutions: KITECH researchers are keenly aware that an SME's success leads to direct or indirect financial benefits; this explains why KITECH researchers are eager to help their partner SMEs. Tanzania needs to adopt a similar system. On top of basic salary, incentives are needed to spur technical staff to actively assist SMEs. Incentives must, of course, consider the financial conditions of an institution but the budget levels of Tanzanian think tanks are far from enough to implement bonuses. The government needs to earmark more budget from the beginning.
3) Independent operations: Regardless of changes in the cabinet or administration, research authorities need autonomy and consistency in

operations. For this purpose, the control tower of Tanzania's top three think tanks should be clearly defined.

4) Need for educational function: The Republic of Korea's university of science and technology (UST) model is a prime benchmark for Tanzania. A UST is a graduate school, and students there pursuing a master's or Ph.D. work and/or study at think tanks. Researchers with doctorates can serve as student advisers. Tanzania is urged to consider this educational function of research institutes. UST graduate students are encouraged or given the opportunity to work at TEMDO, TIRDO or CAMARTEC under certain agreements. This can help Tanzania in two ways. First, it will raise the quality of education and lead to education that is more field and industry oriented. Second and more importantly for research institutions, it can help alleviate the shortage of qualified human resources.

5) More inter-institute cooperation: A control tower is needed to help cooperation and coordination among Tanzania's top three think tanks. If this proves too difficult to do now, an alternative is organizing a council for coordinating research institutions. The council would help institutions share strategic goals and research plans. The pooling of resources also needs more serious consideration, as does regional specialization to promote cooperation. Since TIRDO and TEMDO are in different areas, regional specialization as KITECH can be considered.

2016/17 Knowledge Sharing Program with Tanzania:
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Industrial Research for Sustainable Industrialization

Chapter 1

Macroeconomic Policy Framework for Economic Growth and Stability

1. Introduction
2. Review of Tanzanian Macroeconomic Policy Framework
3. Assessment of Korean Macroeconomic Policies and Its Implications for Tanzania
4. Policy Recommendations

Macroeconomic Policy Framework for Economic Growth and Stability

Woosik Moon (Seoul National University)
Jasson Bennett Bagonza (Ministry of Finance and Planning)

Summary

In recent years, Tanzania has shown relatively good performance in macroeconomy, achieving relatively high growth and stable inflation. Despite such progress, progress has been unsatisfactory in reducing poverty and raising living standards for a wider range of people. Broadly speaking, the three goals of policy consultation are stimulating economic growth, maintaining a stable macro-economic environment while prioritizing economic growth and sharing the fruits of growth with the wider public.

With these objectives in mind, this study seeks to help the Tanzanian government find ways to strengthen its policymaking capacity and develop appropriate instruments and tools to implement macroeconomic policy. This study compares the macroeconomic policies of the Republic of Korea and Tanzania focusing on the post-1979 period for the former and the post-2008 period for the latter. Interestingly, the macroeconomic situation of the Republic of Korea in the early 1980s looks similar to that of the Tanzanian economy after the latter's 1996 reform. Per capita GDP in the Republic of Korea was around US$1,780 in 1980, when economic stabilization started, while that of Tanzania hit US$1,000 in 1996.

In June 2016, the International Monetary Fund (IMF) published a report for Tanzania that served as a policy consultation between the IMF and the government. The report's six main pillars of discussion covered increasing public investment,

mobilizing additional tax revenue, enhancing public spending efficiency, improving the tools and policies of the monetary and financial sectors, implementing growth-enhancing structural reforms and reducing vulnerability to external shocks.

Against this backdrop, this study's focus is reviewing three types of macroeconomic policy: fiscal, monetary and financial, and exchange rate.

For fiscal policy, the IMF study recommended that the Tanzanian government further reduce its expenditures to meet its deficit target, while recognizing the need for more infrastructure investment. This recommendation, however, failed to suggest concrete programs and measures, though suggesting the proper direction. In this regard, the stabilization blueprint that the Republic of Korea government implemented from 1979, called "comprehensive economic stabilization programs," can serve as an interesting case. Zero-based budgeting and other fiscal consolidation programs might also be worth examining in detail.

For monetary and financial policies, the IMF study advised that Tanzania change its monetary policy framework, which consists of targeting reserve money and the money supply (M3), into one targeting interest rates. This proposal emphasizes the need to stabilize the excess reserves of banks (interbank market). This suggestion, however, fails to acknowledge that the country's monetary authority lacks the power to shift toward open market operations. Also, the IMF study considers as problematic bank lending in Tanzania being independent from the central bank's oversight, but makes no suggestion to remedy it. Again, the Republic of Korea's experience could help clarify these points and thereby promote more investment and growth by lowering lending and long-term interest rates. The Republic of Korea's economy had a similar problem until its central Bank of Korea (BOK) adopted an inflation-targeting framework in 1998. A monetary policy oriented toward interest rates in Tanzania, however, is hardly possible as long as retail deposits remain the main funding source for banks and such deposits are unswayed by interest rate movements. Furthermore, the Tanzanian government would have to transform its economy from being liquidity constrained to liquidity abundant.

Finally, to maintain a sustainable balance of payments, the IMF study concluded that though Tanzania's current account deficit accounting for seven to eight percent of GDP poses a serious external risk, maintaining foreign currency reserves amounting to the value of four months of imports is appropriate. Considering the Republic of Korea's experience, however, this proposal will prove insufficient. In view of the Republic of Korea's currency crisis of 1997-98, the IMF's view seems too optimistic as it suggests additional measures to protect Tanzania from sudden changes in foreign capital movement, especially short-term capital, if the country wants to liberalize foreign exchange regulation. The experience of the Republic of

Korea, however, shows that allowing flexibility in foreign exchange rates is essential for maintaining external competitiveness.

Comparing the experiences of both economies, this study seeks to help the Tanzanian government consider what lessons from the Republic of Korea's experience to emulate so that the African country can develop its own macroeconomic policy framework for promoting growth while maintaining stabilization. Obviously, the macroeconomic conditions and situations the Republic of Korea faced over the past three decades were not, and could not, be the same as those of today's Tanzanian economy. Nonetheless, policymakers of both countries will find it mutually beneficial to compare their respective experiences.

1. Introduction

1.1. Objectives

In recent years, Tanzania has shown good performance in macroeconomy, with relatively high growth and stable inflation. Despite these developments, progress seems unsatisfactory in meeting growing demand for lowering poverty and raising living standards for a wider range of people. Broadly speaking, the three goals of policy consultation are stimulating further economic growth, maintaining a stable macroeconomic environment while prioritizing economic growth and sharing the fruits of growth with the wider public.

With these objectives in mind, this study seeks to help the Tanzanian government find ways to strengthen its policymaking capacity and develop appropriate instruments and tools for macroeconomic policy.

In comparing the experiences of both economies, this study intends to devise an appropriate framework of macroeconomic policy toward promoting more growth while maintaining stabilization.

In June 2016, the International Monetary Fund (IMF) published a report for Tanzania that served the policy consultation between the IMF and the Tanzanian government. It identified six main pillars of discussion.

i. Raising public investment
ii. Mobilizing additional tax revenue
iii. Enhancing public spending efficiency
iv. Improving monetary and financial sector tools and policies

v. Implementing growth-enhancing structural reforms
vi. Reducing external vulnerability

The first three pillars concern fiscal policy while the last three refer to monetary and foreign exchange policies. Against this backdrop, this study focuses on reviewing the third pillar covering fiscal consolidation policy, the fourth covering stable but growth-oriented monetary and financial policies and the sixth on the policy for sustainable external balances.

For fiscal policy, the IMF study recommended that the Tanzanian government further reduce its government expenditure to meet its deficit target, while recognizing the need for more infrastructure investment. This recommendation, however, did not come with a suggestion for a concrete program and measure, though in the proper direction. In this regard, the Republic of Korea's stabilization plan implemented from 1979 could serve as an interesting case study for further examination.

For monetary and financial policies, the IMF study suggested that Tanzania change its monetary policy framework, which targets reserve money and the money supply (M3), into one targeting interest rates. The proposal concretely emphasized the need to stabilize the excess reserves of banks (interbank market), but failed to acknowledge that the country's monetary authority lacks the power to shift toward open-market operation. Also, the IMF study considered as problematic bank lending in Tanzania being independent of the central bank's oversight, but suggested no concrete remedy to this problem. The Republic of Korea's experience could again help clarify these points and thereby promote more investment and growth by lowering lending and long-term interest rates. Indeed, the Republic of Korea's economy had the same problem until the central Bank of Korea (BOK) adopted an inflation-targeting framework in 1998. For Tanzania, however, an interest rate-oriented monetary policy is hardly possible as long as retail deposits remain the main funding source for banks and such deposits are not swayed by interest rate movements. Furthermore, the Tanzanian government would need to make a shift toward becoming a liquidity-abundant economy from being a liquidity-constrained one.

Finally, on maintaining a sustainable balance of payments, the IMF study concluded that though the current account deficit equal to seven to eight percent of GDP poses a serious external risk, maintaining foreign currency reserves worth four months of imports is appropriate. Given the Republic of Korea's experience, this will prove insufficient. Another look at the latter's 1997-98 currency crisis shows that the IMF's view is too optimistic. The IMF suggested additional measures to protect Tanzania from sudden changes in foreign capital movement, especially

hot money, if it wants to liberalize foreign exchange regulation. The Republic of Korea's experience, however, shows the importance of allowing flexibility in foreign exchange rates to maintain external competitiveness.

Obviously, the macroeconomic conditions and situations facing the Republic of Korea over the past three decades were not, and could not, be the same as those of today's Tanzanian economy. Nonetheless, policymakers of both countries should compare their respective experiences for mutual benefit.

1.2. Comparison between Tanzanian and Korean Economies

To compare the macroeconomic policy frameworks of the Republic of Korea and Tanzania, this study contrasted the economic situation of Tanzania after 2008 with that of the Republic of Korea after 1980 because per capita GDP levels in these two periods were similar. For instance, per capita GDP in Tanzania was US$1,927 (PPP base) in 2008 and around US$2,000 in the Republic of Korea (PPP base) in 1980. Furthermore, as <Tables 1-1> and <Tables 1-2> show, the macroeconomic situation in the Republic of Korea in the early 1980s was quite similar to that of Tanzania in recent times. In the early 1980s, the Republic of Korea had major deficits in its current account and budget as well as comparatively high investment and export ratios, much like in Tanzania today.

The 2008 global financial crisis brought about new challenges to the Tanzanian government. First, it had to lower its GDP growth projection from eight percent to five percent for 2009–10 and accordingly readjust its investment and employment targets downward. The country's export sector was hit particularly hard. As export commodity prices continued to fall on the world market, both export demand and tourism revenue dwindled. To counter the shock from the crisis, the government came up with the following responses:

i. Formed a crisis committee led by the Bank of Tanzania (BOT) governor, who regularly updated and advised the government
ii. Devised a two-year economic rescue plan for fiscal 2009–10 to 2010–11
iii. Applied for a loan of US$336 million from the IMF under the exogenous shock facility (ESF) to fill the gap in the balance of payments
iv. Channeled TZS 21.9 billion of that package directly to the banking sector to cover losses suffered by bank clients like cooperatives and companies that bought agricultural products from farmers
v. Introduced food distribution to curb food shortages and allocated TZS 20 billion in fiscal 2009–10 budget to ensure food availability at reasonable cost

vi. Released a stimulus package of TZS 200 billion through commercial banks as affordable capital for businesses

vii. Intensified surveillance of both domestic and international markets for capital and finance through the BOT to oversee the performance of all financial institutions

These measures helped the Tanzanian economy recover from the global financial crisis. <Table 1-1> summarizes the country's macroeconomic situation since the crisis.

〈Table 1-1〉 Main Economic Indicators of Tanzania, 2009–14

(Unit: %)

	2009	2010	2011	2012	2013	2014
GDP growth rate	7.4	6	7	6.4	6.9	7
CPI inflation	10.3	12.1	7.6	12.7	16	7.9
M2 growth rate	20.8	21.8	15	16	10.9	27.2
Gross fixed investment	28.8	28.7	32.8	30.6	30.5	32.7
Gross domestic savings	16.2	16.9	18.0	16.7	16.9	20.6
Exports	17.4	18.7	20.8	21.3	17.7	19.4
Imports	26.3	29.1	36.0	33.1	31.1	29.8
Current account	-6.3	-7.0	-12.9	-9.6	-11.3	-10.4
Gov't revenue	15.9	16.2	15.4	16.3	17.6	17.1
Gov't expenditures	22.8	25.7	27	26.6	26.2	26
Budget deficit	-8.6	-9.3	-11	-11.6	-9.6	-8.9

Note: Except for growth, inflation and M2 growth, all indicators are expressed as a percentage of GDP.
Source: Ministry of Finance and Planning and Bank of Tanzania, World Bank development indicators.

In the Republic of Korea, the economy was hit hard in 1980 in the wake of the second oil crisis. Before 1979, the government's main priority was rapid economic development; consequently the focus of macroeconomic policy was economic growth. As the government pushed for a policy promoting the heavy and chemical industries from 1973, it inevitably had to strengthen price controls, import restrictions and regulations, thus distorting not just the goods market but also the financial market. The outbreak of the second oil crisis made it clear that this strategy was not sustainable over the long term, thus a program of comprehensive macroeconomic stabilization was adopted for liberalizing price controls and many import restrictions;

tax reform was also initiated. These measures ended up stabilizing and reviving the national economy (See Table 1-2).

〈Table 1-2〉 Main Indicators of Republic of Korea's Economy in early 1980s

(Unit: %)

	1980	1981	1982	1983	1984	1985
GDP growth rate	-1.7	7.2	8.3	13.2	10.4	7.7
CPI inflation	28.7	21.4	7.2	3.4	2.3	2.5
M2 growth rate	26.9	25.0	27.0	15.2	7.7	15.6
Gross fixed investment	30.3	26.3	26.7	27.6	27.2	26.8
Gross domestic saving	22.5	22.7	24.4	26.0	28.0	28.4
Exports	28.5	30.0	27.4	28.0	29.4	27.3
Imports	37.1	37.2	32.9	30.1	28.5	25.9
Current account	-10.1	-8.4	-6.8	-3.9	-1.8	-2.0
Gov't revenue	18.4	18.7	17.7	17.2	16.7	16.6
Gov't expenditures	21.4	23.0	21.6	18.6	17.9	17.4
Budget deficit	-3.0	-4.3	-3.9	-1.4	-1.2	-0.8

Note: Except for the growth rate, inflation and M2 growth rate, all indicators are expressed as a percentage of GDP.
Source: Bank of Korea.

2. Review of Tanzanian Macroeconomic Policy Framework

2.1. Overview of the Economic Situation before the 2008 Global Financial Crisis

Despite its rich deposits of natural resources, Tanzania is among the world's least industrialized countries per the World Bank. This unfortunate situation has remained largely the same nearly five decades after the country's independence, suggesting the nation's instability to sufficiently exploit its growth potential. For more than four decades, Tanzania relied on agriculture as the mainstay of its economic and social development (FAO, 2001), thus growth remained mediocre. Gross domestic product

(GDP) averaged real growth of four percent per year (constant 1992 price base) before 2000 Real growth per capita hit just 1.2 percent, less than half of the annual rate of population growth of 2.8 percent.

Over the last decade before the 2008 global financial crisis, Tanzania had shown better performance with real GDP growing an average of seven percent, yet its pattern of sectorial growth was mixed.

First, agriculture grew a relatively sluggish 4.1 percent despite the sector being the mainstay of the economy in accounting for around half of GDP and employing 73.6 percent of the population. This was largely due to the dominance of rain-fed agriculture, which is not reliable.

In contrast, wholesale and retail trade accounted for 16 percent of GDP but showed high growth of eight percent over the same period. Finance, accounting for 10 percent of GDP, enjoyed even higher growth of 10.7 percent. This stellar performance was attributed to financial reforms and increased competition in financial services. Construction also grew at a relatively high clip of 8.7 percent on average, largely due to better infrastructure development, (i.e., roads and bridges, railways, ports, airports and commercial and residential buildings). The highest growth, however, was seen in communications with an average of 19.5 percent thanks to a surge in mobile phone use, though the sector's share to GDP was among the lowest at under 2.5 percent on average.

Electricity and gas also saw improved performance largely thanks to a boost in electricity generation, especially from thermal and gas sources. Generation from hydropower sources declined due to dilapidated infrastructure, unreliable rainfall and an increase in human economic activities detrimental to water sources at power generation dams. Though electricity and gas account for about two percent of GDP, the sector is considered the most essential for economic development because of its positive links to manufacturing, trade and mining.

2.2. Macroeconomic Situation and Performance after the Year 2008

Tanzania's economic policy continued to focus on sustaining macroeconomic stability through support measures for strong economic growth. They included maintaining fiscal stability via both revenue mobilization and prudent expenditure management and controlling the money supply to meet targets for inflation and economic growth, as well as maintain an adequate level of foreign exchange reserves. Combined with actions to support private sector-led development and

promote exports, such a policy enabled Tanzania's GDP to grow an annual average of 7.2 percent over the last five years. Despite the 2008 global financial crisis and ensuing recession, GDP in Tanzania grew 5.4 percent in 2009–10.

Inflation proved problematic, however, accelerating from 2006 and averaging 11.3 percent in 2009. As a result, the central Bank of Tanzania (BOT) raised its mid-term inflation target in 2008 from five percent to seven percent. The main short-term challenge was thus to reduce the double-digit inflation rate to single digits. The mid-term objective was alleviation of infrastructure constraints in critical sectors such as transportation, communications and energy and setup of a mechanism for translating economic growth into broad-based poverty reduction. Restoring the government's credibility in fighting corruption was also key amid a series of high-level corruption scandals.

Tanzania's foreign reserve holdings exceeded US$2.6 billion, enough to finance more than four months of imported goods and services. Moreover, the amount of foreign exchange-denominated deposits of Tanzanian nationals held by commercial banks remained stable at US$1.5 billion, equivalent to another two months of imported goods and services. Foreign-currency holdings of commercial banks added another 15 days to this amount. The country thus had enough foreign currency reserves to last 6.5 months.

2.3. Assessing Main Macroeconomic Tools and Policies after the Year 2008

After 2008, Tanzania underwent major reforms in social and economic modernization in civil service, privatization of state-owned enterprises (SOEs), setup of a market-friendly regulatory framework, improved efficiency of monetary policy, advancement of the banking sector and deepening of trade liberalization. Policy actions from 2008 were organized around the National Strategy for Growth and Reduction of Poverty (NSGRP), popularly known in Kiswahili as MKUKUTA. This comprehensive five-year program put together after consulting with the donor community and, to an extent, civil society. The first MKUKUTA was organized around the three themes or clusters: (a) growth and poverty reduction; (b) improvement of quality of life and social wellbeing; and (c) governance and accountability. MKUKUTA II launched in mid-2010 considered the same three clusters. From a growth perspective, this strategy running from 2010–15 was ambitious and targeted annual GDP growth of eight to ten percent on average over that period.

2.3.1. Fiscal Policy

Since the end of the 2008 global financial crisis, the Tanzanian government has made significant strides in strengthening its budget through strategically allocating budgetary resources with the aim of spurring economic growth and reducing poverty. Public spending has been raised on productive sectors, infrastructure investment and social welfare areas, and such spending consumed about 60 percent of overall government expenditures between 2007–08 and 2011–13. The sectors benefitting from higher public spending include agriculture, roads and transportation, energy, education, water and agriculture. The government through its deliberate efforts showed that public spending should be strategically prioritized and aligned with the objectives of economic growth and poverty reduction as outlined in the TV 2025, FYDP, BRN and MKUKUTA. This was a response to the need for ensuring public spending being geared toward sectors with bigger impact in spurring economic growth for sustained poverty reduction. Recently, these objectives are also included in the BRN initiative.

Furthermore, public spending continued to rise on development programs and projects seeking to expand the economy's growth potential. Development spending was consuming more than eight percent of GDP (average of 2008–09 to 2012–13), or about four percentage points higher than in the period before 2007–08. About half of the country's development spending comes from domestic resources, in contrast to previous years when development spending was solely foreign funded. While the focus on development spending has increased, a good level of recurrent spending was also ensured to improve the quality of social and infrastructure services. Overall the significant increase in government spending over the past ten years is geared toward promoting economic growth and reducing poverty in the country. Tables 4 below provides a breakdown of public spending by development and recurrent programs.

〈Table 1-3〉 Public Spending as Share of Gov't Budget

(Unit: %)

	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14
Productive sectors	5	6	8	6	5	4
Infrastructure sectors	18	18	18	20	21	19
Social sectors	32	35	33	32	33	32
Subtotal	55	59	59	58	59	55
Others	45	41	41	42	41	45

〈Table 1-3〉 Continued

(Unit: %)

	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14
Total expenditures	100	100	100	100	100	100

Source: Ministry of Finance, 2014.

2.3.2. Monetary and Financial Policies

The main thrust of government policy in fiscal 2009/10 was to utilize the collective force of fiscal and monetary policy to limit the severity of the global economic downturn on domestic economic activity; this was, in turn, supposed to set the Tanzanian economy on firm footing for returning to its mid-term growth path as the world's economic and financial conditions normalized. To mitigate the adverse impact of the crisis on the economy, the Tanzanian government implemented a countercyclical stimulus, with monetary policy providing ample liquidity to reduce the threat of a slowdown in credit growth and economic activity in the ensuing global economic downturn and subsequent weak demand for exports. The BOT also performed daily monitoring of the banking system to ensure financial stability, and this was key in attaining the government's broader macroeconomic objectives. Specifically, the government set the following objectives for 2009/10:

i. Attain real GDP growth of five percent from 2009 and 5.7 percent from 2010 and beyond
ii. Cap annual inflation at six percent from 2010 onwards
iii. Collect domestic revenue worth at least 16.4 percent of GDP from 2009/10 and beyond
iv. Limit government expenditures to 27.5 percent of GDP
v. Secure official foreign exchange reserves sufficient to cover at least five months' worth of imported goods and services from 2009–10 and beyond

Tanzania's monetary development after the 2008 global financial crisis could be summarized as follows:

The monetary growth rate slowed in the first half of 2009/10, reflecting the effects of the crisis on credit availability. The average annual growth of the extended broad money supply (M3), including foreign currency deposits, was 18.3 percent in the first half of 2009/10, down from an average 20.8 percent in the first half of 2008/09. The annual growth of M2 fell to an average 19.7 percent in the first half of 2009/10 from the average 28.2 percent reached in the first half of 2008/09, while that of the narrow money supply (M1) plummeted to 13.2 percent from 27.2 percent over

the same period. M3 suffered a lower decline in growth compared to M2 and M1 because of the weakening of TZS against the US dollar.

Meanwhile, average reserve money in the first half of 2009/10 saw average growth of 25.5 percent, little changed from 25.3 percent in the corresponding period of 2008/09, while the annual growth of reserve money dropped to 27 percent from 29.2 percent over the same period.

A strong adjustment in the public's portfolio preference should have occurred, as manifested by the drastic reduction in the average contribution of currency in circulation outside the banking system to M3 growth to 9.3 percent in the first half of 2009/10, down from an average 21.2 percent in the first half of 2008/09. Currency in circulation seemed to be flowing into non-transferable bank deposits, whose average contribution to M3 growth rose to an average 48.4 percent, up from 40.4 percent over the same period.

The cautious lending stance of banks triggered by the global financial crisis led to annual expansion of credit to the private sector to fall to an average 19.7 percent in 2009/10, as opposed to 39.7 percent in the first half of 2008/09. The annual growth of credit to the private sector reached 9.6 percent in December 2009.

To cope with these situations, the BOT reviewed the Lombard and discount rates. From July 2009, the margins applied on the base rates to determine the Lombard and discount rates were changed from fixed percentage points to proportions of the base rates. These changes led to a decline of the Lombard rate from 7.35 percent in June to 4.13 percent in July 2009, and a drop in the discount rate from 10.31 percent to 6.95 percent over the same period. Both rates remained low on average (3.7 percent for Lombard and 4.6 percent for discount) in the first half of 2009/10.

2.3.3. Exchange Rate Policy

After the 2008 global financial crisis, the foreign exchange rate in Tanzania remained freely determined on the inter-bank foreign exchange market (IFEM) and the BOT, in its pursuit of monetary policy objectives, structured its sale of foreign currency to reduce volatility in the foreign exchange rate and dampen speculative practices. A watchful eye was kept on market developments, with a view to warding off speculative tendencies that could arise from the prevailing crisis.

2.4. Recent Key Policies and Reforms

Tanzania's macroeconomic performance has recently remained strong vis-à-vis key policies and reforms. Real GDP expanded 6.7 percent in the first half of 2016 driven by mining, transportation, communications and financial services. Headline inflation declined to 4.5 percent in October 2016, besting the government's target of five percent. The external current account deficit is estimated to have substantially declined in 2015/16, relative to 2014/15; the last staff report's projection fell to 5.6 percent of GDP, mainly owing to lower imports of capital goods. Gross international reserves amounted to US$4.1 billion in September (worth 3.5 months of prospective imports). The TZS remained stable against the US dollar in 2016. Other recent performances caused by key policies and reforms are described below:

2.4.1. Fiscal Policy

The 2016/17 budget and program envision large increases in capital spending and revenue and an overall fiscal deficit worth 4.6 percent of GDP. Budget execution in the first quarter (July-September) was slower than expected, resulting in a surplus worth 0.3 percent of GDP. Tax revenue was broadly in line with the program, but non-tax revenue collection, particularly from state-owned enterprises (SOEs), were lower than expected. Spending, especially capital spending, was low due to shortfalls in external financing and delays in spending authorization.

The overall cash fiscal deficit was 3.5 percent of GDP in 2015/16, slightly above 3.3 percent in 2014/15 and targeted under the program, mainly reflecting an overrun in goods and services and a shortfall in non-tax revenue collection from SOEs. Tax revenue shot up in 2015/16, falling in line with program expectations.

In external financing, grants and net external financing disbursements in the first quarter of fiscal 2016/17 fell short of program expectations by about 0.3 percent and 0.8 percent of GDP, respectively. Government authorities stepped up contacts with development partners to speed up the disbursement of project and budget support financing. External financing shortfalls, however, required adjustments in development spending (0.6 percent of GDP lower than programmed). Such shortfalls, coupled with weak commitment controls, led to a slight rise in the stock of domestic payment arrears (0.1 percent of GDP) despite efforts to settle sizable amounts owed to construction companies.

2.4.2. Monetary Policy

Monetary policy in Tanzania since early 2016 has been tighter than planned. Annual growth in average reserve money (ARM), the BOT's operational target, has

consistently undershot targets throughout the year due to lower liquidity injections from fiscal operations (text figure). Consequently, interbank rates were elevated and the growth of both M3 and private sector credit continued slowing to 2.5 percent (year-on-year) and 10.3 percent, respectively, by October 2016. In response to the tight liquidity conditions, the BOT stepped up liquidity injections primarily through reverse repurchase arrangements, foreign currency purchases and swaps with commercial banks. As a result, interbank rates stabilized while foreign assets held by the BOT increased despite shortfalls in foreign financing.

2.4.3. Tanzania's Second Five-Year Development Plan, 2016/17–2020/21 and Improving Business Environment

The theme of FYDP II is "Nurturing Industrialization for Economic Transformation and Human Development." This strategy relies on Tanzania's comparative advantages like its agricultural and mining potential, large labor force and prime geographical location that makes it a natural trading and logistics hub for East Africa. To facilitate growth led by the private sector, the government aims to tackle the country's large infrastructure gap and create a business environment conducive to job creation. Other goals are reduction of poverty through improvement of social services and income security and promotion of social welfare protection. Given the nation's large investment needs, the government plans to mobilize domestic revenue and utilize public-private partnerships (PPPs) for large infrastructure projects to limit government borrowing. The KSP staff believe that FYDP II is broadly in line with the government's vision of economic transformation to sustain high growth and reduce poverty.

The FYDP II proposes a series of broad intervention actions to that effect, and the government has undertaken recent measures including boosting the transparency of business registration and licensing, facilitating land transactions, raising the coverage of private credit bureaus, and digitizing court procedures and case management in commercial cases at the High Court. Sustained progress will require the full involvement of all stakeholders, most importantly the private sector, in the design of policy initiatives. The private sector believes that the lack of timely communication of government strategies is negatively affecting its decision-making process.

2.4.4. Progress of Structural Reforms

While four out of the five structural benchmarks (SBs) in the fifth PSI review were not met, the Tanzanian government took intermediate steps and was expected to implement specific actions by the end of 2016. For instance, the limit on the net open foreign exchange (FX) position of banks was raised and a study on FX swaps was expected to be completed by the end of December 2016. In addition, progress was

seen in previously missed benchmarks. The statutory minimum reserve of banks and clearing accounts were unified in June, partial reserve averaging was scheduled to be implemented in January and amendments to the Government Loans, Guarantees and Grants Act (GLGGA) were submitted to parliament in November. To prevent the emergence of new domestic payment arrears, authorities also enhanced commitment controls.

3. Assessment of Korean Macroeconomic Policies and Its Implications for Tanzania

3.1. Overview of the Macroeconomic Situation before the Year 1980

Along with the sudden surge in oil prices in 1979, the Republic of Korea's macroeconomic situation began to rapidly deteriorate, creating a sense of crisis among the public as well as policymakers. This prompted the adoption of the country's first major stabilization program launched on April 17, 1979, with the title "comprehensive economic stabilization policies (CESP)." Nonetheless, full implementation of this program was postponed until Chun Doo-hwan assumed the presidency in 1980. Until then, the country was left to suffer from a budget deficit, high inflation and current account deficit for the following three main reasons.

First, more government spending was required to attain political and social stability. For instance, the government maintained a dual grain pricing system to stabilize farmers' incomes and accordingly set up in 1970 a government fund for grain purchases and management (called the Grain Management Fund). As the government purchased rice and wheat from farmers at prices higher than the market, however, this fund inevitably registered a huge deficit. To resolve this problem, the government relied on borrowing from the central Bank of Korea, and this caused chronic inflation nationwide. Similarly, the government set up a fund for fertilizers also financed by the BOK that also ran a deficit, though small.

The money created by the borrowings of these two funds from the BOK soared; according to Nam (1984), the amount accounted for 37 percent of the growth of the money supply from 1976-78 (Nam, p.7).

And as the government from 1973 began to pursue ambitious industrial development, in which the industrial development focus shifted from the light industry to the heavy and chemical industries (HCI) such as steel, petrochemicals

and shipbuilding, the government's budgetary burden had clearly grown too big to be sustainable, not to mention the huge investment losses of Korean corporations. As fiscal loan and investment programs (FLIP) were perceived as insufficient to support these industries, the National Investment Fund was created to mobilize financial resources through the issuance of specialized bonds and deposits from the government budget. Domestic banks were also required to spend 10–30 percent of the net increase in their savings account deposits to buy the fund's bonds. The creation of this fund seemed inevitable as a means to raise the investment financing of HCI, given the shortage of domestic savings and absence of a developed capital market. The domestic saving rate needed to rise from around 15 percent, to at least 25 percent to finance HCI investment. According to Kim and Whang (1997, p.262), for instance, the scale of such investment skyrocketed from KRW 309.8 billion (5.1 percent of GNP) in 1972 to KRW 4,560.3 billion (10 percent of GNP) in 1981. These excessive investments drove the government deeper into debt.

At the same time, tax incentives were offered including preferential depreciation allowances, tax breaks and exemptions for exporters and strategic industries, and these also contributed to aggravating the government's fiscal balance.

The second reason for the nation's economic malaise was that financial markets were under strong pressure to assist in implementing the pro-HCI policy and provide cheap credit (policy loans) to these industries. Certain policy loans were directly provided through government-owned banks such as the Korea Development Bank and the Korea Export-Import Bank (Eximbank). According to Cho and Kim (1997), for instance, policy loans accounted for 60 percent of commercial bank loans and half of domestic credits by the end of the 1970s. Furthermore, the interest rates for these loans were set lower than those of general bank loans regulated by the government, not to mention the market rate as represented by the curb market rate. From 1973–81, when the pro-HCI policy appeared, the inflation rate exceeded both those of loan and deposit interest, resulting in negative interest rates.

〈Table 1-4〉 Share of Policy Loans (Avg. by Period)

	1973–81	1982–86	1987–91
DMB policy loan (as pct. of DMB loan)	63.0	59.4	59.5
Total policy loan (as pct. of domestic credit)	48.9	40.8	30.9

Note: The DMB policy loan includes loans for imports of key raw materials, mutual installment and machinery, equipment loans to the export sector, special equipment funds and special long-term loans; total policy loans include those of the KDB and Eximbank in addition to DMB policy loans.

Source: Cho and Kim (1997).

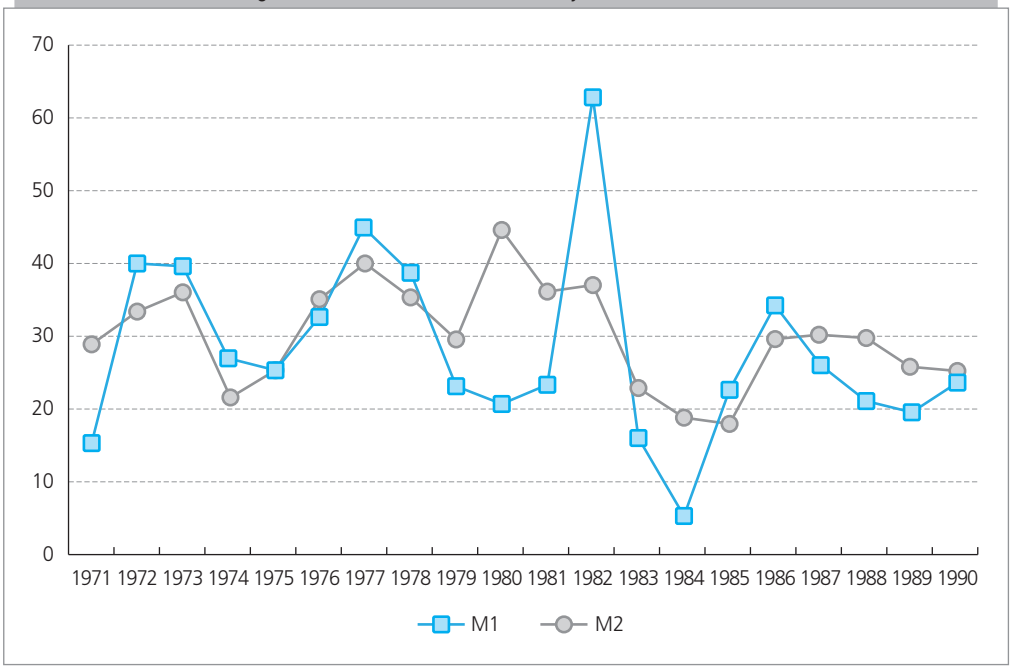
〈Table 1-5〉 Inflation and Interest Rates (Avg. by Period)

	1973–81	1982–86	1987–91
Inflation rate (CPI)	17.9	3.64	6.74
Time deposits	15.7	9.2	10.0
Bank loans	17.3	10.9	12.4
- NIF	15.1	10.9	11.5
- Exports	9.9	10.0	10.0
Curb market	40.5	26.1	20.8

Source: Bank of Korea, Cho and Kim (1997).

Against this backdrop, monetary policy was a simple tool for providing the so-called growth money. Just as commercial banks had to support the pro-HCI policy, the BOK was also bound to back commercial banks by compensating their losses. For instance, the policy loans of commercial banks were automatically rediscounted by the BOK, implying that most such loans were financed by the printing authority of the central bank. So though monetary policy officially targeted monetary aggregates such as M1 and M2, it was ineffective in the control of the money supply and prevention of inflation. The BOK had two contradictory goals: suppression of the quantity of money under control while simultaneously supplying a sufficient amount of cheap growth money. This brought about two consequences. First, consumer credit had to be squeezed out in favor of industrial loans. Second, inflation remained rampant given the government's priority on growth rather than inflation control, for which the BOK had to serve. As [Figure 1-1] shows, the growth rate of money supply was a high 30 percent per annum in the 1970s.

[Figure 1-1] Growth Rates of Money Stock from 1970–90



Source: Bank of Korea.

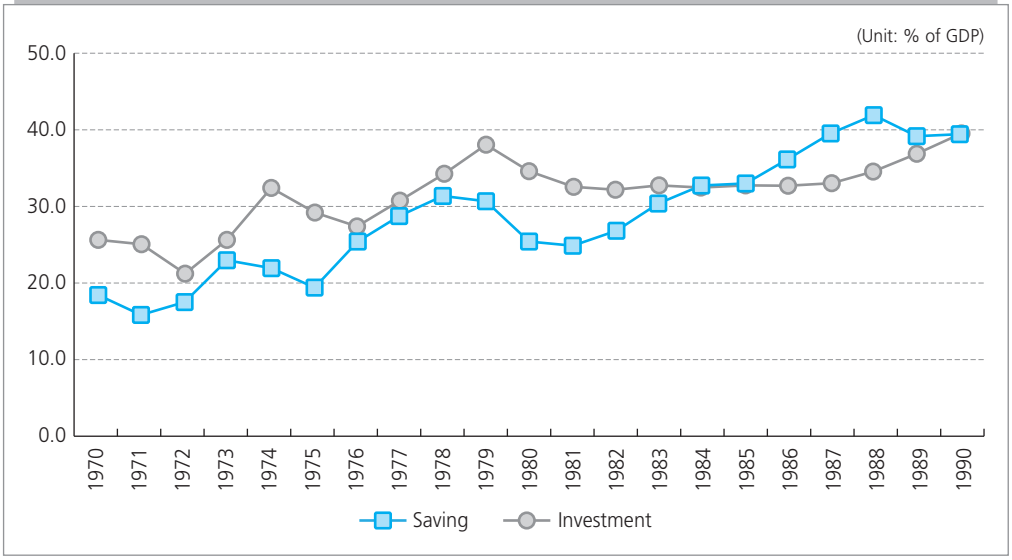
The rise of consumer price index (CPI) inflation created new distortion. Real estate soared in price and many affiliates of major conglomerates actively engaged land speculation through excessive bank loans. On many occasions, the government tried but failed to limit this type of land investment.[1)] And faced with the absence of a strong program for macroeconomic stabilization, the government had to control the prices of individual goods and set up an extensive price monitoring system for a wide range of items. This system of direct price control clearly resulted in raising the cost of price monitoring and eroding market efficiency.

The third reason for the country's economic strife was deterioration in the balance of payments due to excessive investment in HCI. Until 1979, gross domestic investment as a percent of GDP continued to grow rapidly, outpacing domestic savings. As a result, the gap between investment and savings widened and foreign funds were used to finance the trade deficit resulting from such a gap. The amount of foreign loans reached US$27 billion (equal to 48 percent of GDP) in 1979, driving

1) This led the government to announce a comprehensive policy measure under the title "Policies to Strengthen the Financial Structure of Large Conglomerates" on Sept. 27, 1980. The policy proposed eight agenda items: 1) sale of real estate for non-business purposes; 2) restructuring of affiliates of conglomerate; 3) readjustments of types of business associations and cooperatives; 4) prevention of abuse of bankruptcy law; 5) limiting government rescue financing; 6) strengthening the credit management capacity of banking institutions; 7) implementing an external auditing system; and 8) providing tax credits to support improvement of the financial structure through cost savings. But this did little or nothing to ease land speculation by conglomerates.

the economy to the edge of its balance-of-payments crisis. From then on, along with the implementation of the stabilization program, domestic investment started to decline, falling from its peak of 38 percent of GDP in 1979 to 32 percent in 1981. Because the amount of savings declined as well, however, the gap between investment and savings lingered until 1986.

[Figure 1-2] Saving and Investment 1970–90



Source: Bank of Korea.

3.2. Start of Comprehensive Economic Stabilization Policies

Per Cho (2013) and Jang (2015), the establishment of the so-called comprehensive economic stabilization policies (CESP) in 1980 marked "a paradigm shift in economic policies" because of the need to challenge the economic framework dominated by pro-HCI policy and the national economic strategy led by the government. Reflecting the growing need for a market-oriented economic system and stabilization program, the newly inaugurated President Chun Doo-hwan made CESP his top policy priority. This was no easy decision because most stabilization measures to control chronically high inflation were bound to be unpopular. Intra-government clashes also occurred between the powerful Economic Planning Board (EPB), which led CESP as an overarching institution in charge of economic development and management, and ministries that wished to stick to the old growth framework out of fear of loss of influence. For instance, the Ministry of Commerce and Industry was concerned over the declining influence of the pro-HCI policy and the Ministry of Agriculture and Fisheries fretted over the abolition of the dual grain pricing system. The Ministry

of Finance opposed the stabilization package for financial market deregulation. Political resistance to CESP turned out to be quite strong and public opinion over the issue was greatly divided.

The situation required a strong and comprehensive communication strategy to win public favor for CESP. As then EPB Vice Minister Kang Kyung-sik , recalled, "there was simply too much opposition to CESP as it would create more dissent from the visible losers than consent from the unorganized and invisible winners. Balancing these two political forces was a necessity, and it seemed obvious that the only viable approach at the time was to make public opinions as favorable as possible to put political pressure on the opposing parties (newly translated from Cho's quote, 2012)."

In the early stage of CESP implementation, however, communication simply relied on radio broadcasts and newspaper ads. A more systematic and comprehensive strategy of communication was developed over time, culminating in the formation of the Economic Policy Public Relations Planning Group. One year later, this group was added as the permanent Department of Economic Education Planning under the EPB. In this respect, CESP also helped to democratize the authoritarian government order at the time. First, stabilization reform had been led by the president but a group of technocrats working together within the EPB eventually took over. Second, CESP took a more bottom-up approach rather than the top-down method in economic policy in the sense that discussions, forms of persuasion and communication substituted for orders, commands and instructions.

CESP was finally launched through this effort. The main content of the program (announced on April 17, 1980) can be summarized as follows:

i. Stabilizing inflation and improving the supply-and-demand conditions for basic goods
ii. Maintaining fiscal austerity
iii. Readjusting HCI investment projects
iv. Improving policy toward monetary and financial markets (including reform of policy loans and interest rate liberalization)
v. Limiting speculative investments in real estate and revising regulations
vi. Implementing measures for stabilizing the supply of basic goods
vii. Securing stability in the livelihoods of the lower-income class

Unlike ordinary stabilization that refers to emphasis on controlling inflation over promoting economic growth, CESP included far broader objectives such as making the economy freer through the promotion of market mechanisms and more open through stimulating competition.

3.3. Main Macroeconomic Stabilization Tools and Policies

3.3.1. Fiscal Policy

3.3.1.1. Reform of Dual Pricing System and Reduction of Money Financing

To stabilize the economy, the government decided to cut public spending and maintain fiscal balance. To this end, its top priority was reducing the structural budget deficit through reform of the dual-pricing system subsidizing grain and fertilizer prices.

The government controlled the purchase price of grain, insisting on the prevalence of economic logic over political slogan. Politicians worldwide can easily succumb to the request of peasants for higher prices of rice, ignoring the question of fiscal soundness. This was true for the Republic of Korea; Jang (2015) said, "the National Assembly decided to deal with the inevitable deficit from such grain management with more borrowing from the Bank of Korea (p.30)." Technocrats, however, convinced the public of the virtue of price stability and the risk of a vicious cycle that would result in high rice prices drifting up further via high wages and inflation. In 1981, for instance, the price of rice paid by the government to farmers was set at 14 percent above the previous year's price, far below the level demanded by the opposition party (45.6 percent) or the Ministry of Agriculture and Fisheries (at least 24 percent) (Heung-ki Kim, 1999, p.289; Economic Planning Board, 1994, p.109).

The government thus focused its policy on containing inflation in rice prices. As a result, the rise in rice prices plummeted from 25 percent in 1980 and 14 percent in 1981 to 7.3 percent in 1982 and zero percent in 1983. Such prices rose three percent in 1984 and six percent in 1985 but this was in line with the government's policy goal of price stability.

Moreover, as the government started to reduce its deficit, its borrowings from the BOK dwindled as well. For instance, <Table 1-6> shows that the scale of monetary financing from the BOK plummeted from KRW 526 billion in 1981 to KRW 196 billion in 1982. The figure slightly rose to KRW 245 billion in 1983 but after the government started a budget freeze in 1983, monetary financing stopped and led to debt redemption by the BOK in 1984. Similarly, the level of the government's bond borrowing began to fall from 1983, ending with a decline in the direct underwriting of government bonds by the BOK.

〈Table 1-6〉 Consolidated Budget Deficit in 1980s

(Unit: hundred million won)

	1980	1981	1982	1983	1984	1985	1986
Deficit	11,737	21,109	22,221	9,506	9,229	7,133	649
Domestic	8,560	15,779	15,463	5,517	6,134	2,727	2,109
- BOK borrowing	2,650	5,260	1,964	2,453	-13	-65	-
- Bonds	2,742	10,927	11,885	3,029	-1,636	-4,179	-310
- Others	3,168	-408	1,614	35	7,783	6,971	-
Abroad	3,177	5,330	6,758	3,989	3,095	4,406	-1,460

Source: 40-year History of Korean National Finance, Vol. 7.

3.3.1.2. Zero-based Budgeting

Given its goal of strengthening tight fiscal policy and maintaining fiscal balance, the government also tried to raise the effectiveness of fiscal policy as a counter-cyclical instrument by enhancing the flexibility of budgeting and spending. Against this backdrop, zero-based budgeting (ZBB) was introduced in 1982. The idea behind ZBB was to review all government spending and activities from scratch to reduce or stop outdated or less important programs and endeavors. Using the budget of 1982 as the base, the government reassessed the necessity and priority of all budget items for 1983 from a zero baseline. Under the existing budgeting system, in which a budget was allocated based on that in the previous year, budget increases of 20–30 percent were common. The strict application of ZBB, however, clearly served the government's policy goals of stabilizing the economy and maximizing budget savings and investment efficiency.

<Table 1-7> shows that all expenditure items in the 1983 budget experienced cuts ranging from 10–50 percent from those of the 1982 budget. As a result, the annual expenditure budget increased just 8.8 percent from the main budget in the previous year.

〈Table 1-7〉 Budget Cutting via ZBB in 1983

(Unit: million KRW, %)

	1982	1983	Cost reduction (%)
Expenses (foreign)	13,681	11,789	1,892 (13.8%)
Service charge	13,394	6,498	6,896 (51.5%)

〈Table 1-7〉 Continued

(Unit: million KRW, %)

	1982	1983	Cost reduction (%)
Subsidies to private sector	163,194	135,862	27,332 (16.7%)
Asset acquisition	31,641	26,146	5,495 (17.4%)

Source: 40-year History of Korean National Finance, vol.3.

3.3.1.3. Mid-term Plan on Fiscal Management

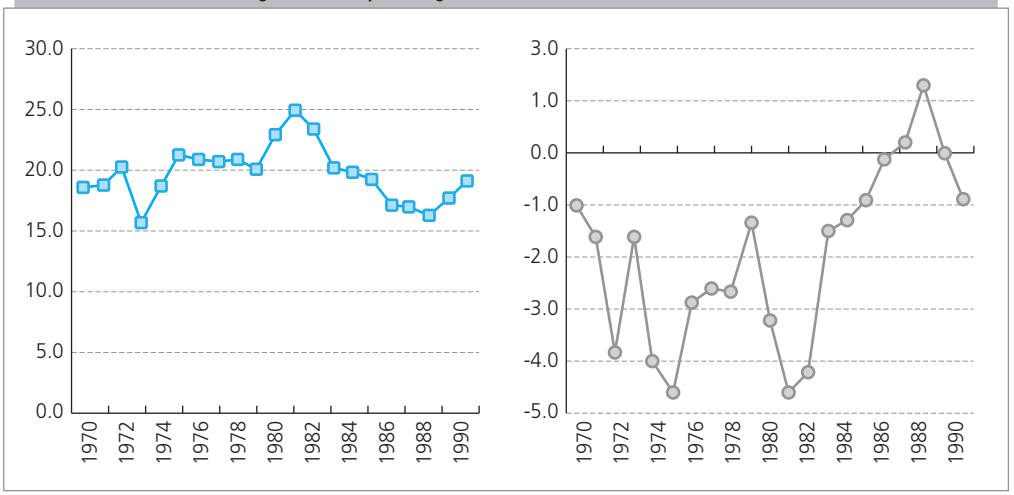
The mid-term plan on fiscal management refers to a system in which the directions of resources and distribution are organized through mid-term plans spanning three to five years to overcome the limitations of conventional one-year fiscal plans (Jang 2015). The government introduced this type of plan in 1982. Under this new system, the Economic Planning Board (EPB) presented a five-year direction for resource allocation from the macro perspective by devising a contingency plan before March, when annual budgeting guidelines were given. After that, every ministry submitted yearly budget proposals for fine-tuning by the EPB. This program proved largely ineffective from its introduction, however, but according to Jang (2015), it was nonetheless meaningful because "it offered opportunities to the government to review fiscal management directions over the mid to long term, and the plans were used internally by the government, which sought to maintain fiscal soundness (Jang, p.62)."

3.3.1.4. Budget Freeze in 1983

The government's tight fiscal policy lasted until 1983. A freeze of the national budget put the wages of public servants and the government's purchase price for rice for 1984 to the same level as in 1983. The reason behind the budget freeze was that despite strong opposition from select political circles, the government was sold on the virtue of stabilization and acceleration of price stability, after witnessing a drop in the inflation rate to single digits in the early 1980s from more than 20 percent in the late 1970s. Another reason was that a budget freeze could help mitigate discontent from the agricultural sector that might occur in the event of the suppression of rice purchase prices, which was considered essential for price stability. The government was also careful to ease the burden of ordinary citizens and small and medium enterprises (SMEs) that could be hurt by stabilization packages.

In conclusion, [Figure 1-3] shows that the share of public spending to GDP rose until 1982 but started to decline afterwards. Along with this trend, the government's fiscal balance rapidly improved enough to post a fiscal surplus in 1987.

[Figure 1-3] Spending and Fiscal Balance as Pct. of GNP



Source: Nam and Kim (1997).

3.3.2. Monetary and Financial Policies

Along with its tight fiscal policy, the government also implemented tight monetary policy to control inflation. The M2 growth rate, which was 36 percent between 1976 and 1979, was reduced to 25 percent between 1979 and 1981 and further down to 14 percent between 1983 and 1985 (P.J., Kim, 1995, p.217).

Furthermore, along with CESP, the EPB prepared a plan for market-oriented reform to enhance the efficiency of credit allocation and prevent financial repression. This reform mainly consisted of the following agenda:

- Liberalization of interest rates
- Liberalization of the foreign exchange market
- Reform of the policy loan system
- Deregulation to boost the autonomy of bank management
- Strengthening of the Bank of Korea's independent authority
- Improvement of collateral-based lending practices
- Strengthening control over lending to large corporations
- Promotion of bank mergers and acquisitions

After consultation with the Ministry of Finance, which was responsible for the implementation of the agenda, a few agenda items including the reduction of policy loans and deregulation of bank management rules could be effected. For instance, the government decided to gradually reduce policy loans based on the three principles of prohibiting new policy loans, consolidating existing loans and handling

new loans under budget account items. Critics argued that restoring the function of interest rates should have preceded institutional reform, but little progress was made in this area. Other attempts went toward improving the autonomy of banking institutions in their operations, including personnel management and business practices. The most significant reform, however, was the liberalization of interest rates, which had long remained repressed to support domestic industry, especially HCI. Though partial and gradual, the relaxation of interest rates resulted in the latter rising to an average of five to six percent. The interest rate on general bank loans, for instance, was raised from 19 percent to 25 percent per year. The rate adjustment was partly designed to offset a potential rise in inflation resulting from the policy of exchange rate devaluation, which was accompanied by the stabilization package (further discussed in the next subsection). The impact of rising interest rates seems to have been substantial enough to stabilize the national economy and reduce inflation. Despite a surge in the early 1980s as a part of a stabilization package, interest rates were adjusted downward on eight occasions before June 1982.

3.3.3. Exchange Rate Policy

The exchange rate of the national currency (KRW) versus the US$, which had been fixed since 1974, was devalued 20 percent from KRW 484 to KRW 580 per US$1 in January 1980. Exports were falling mainly due to the eroding international competitiveness of domestic industry, which in turn was caused by a rapid rise in wages and prices. The real exchange rate by 1979 had fallen around 27 percent below the 1975 level and devaluation was an obvious choice to boost the economy and improve the balance of payments (Nam, 1994, p.34). At the same time, the fixed exchange rate system was replaced by that of a multi-currency basket as a follow-up measure, making the KRW more flexible. The KRW continued to lose value even after this devaluation and as a result, the average KRW–US$ exchange rate reached 731 in 1982, a depreciation of around 50-percent from 484 in 1979.

3.4. Assessing Macroeconomic Performances

The first half of the 1980s was probably the most successful period of economic stabilization in the Republic of Korea's history. The inflation rate based on the consumer price index (CPI), plummeted from around 20 percent per year to the far more stable level of three percent from 1983. As <Table 1-8> shows, the country's success in reducing inflation rivaled that accomplished by advanced economies like Germany and Japan.

〈Table 1-8〉 CPI Inflation Rates for Principal Countries

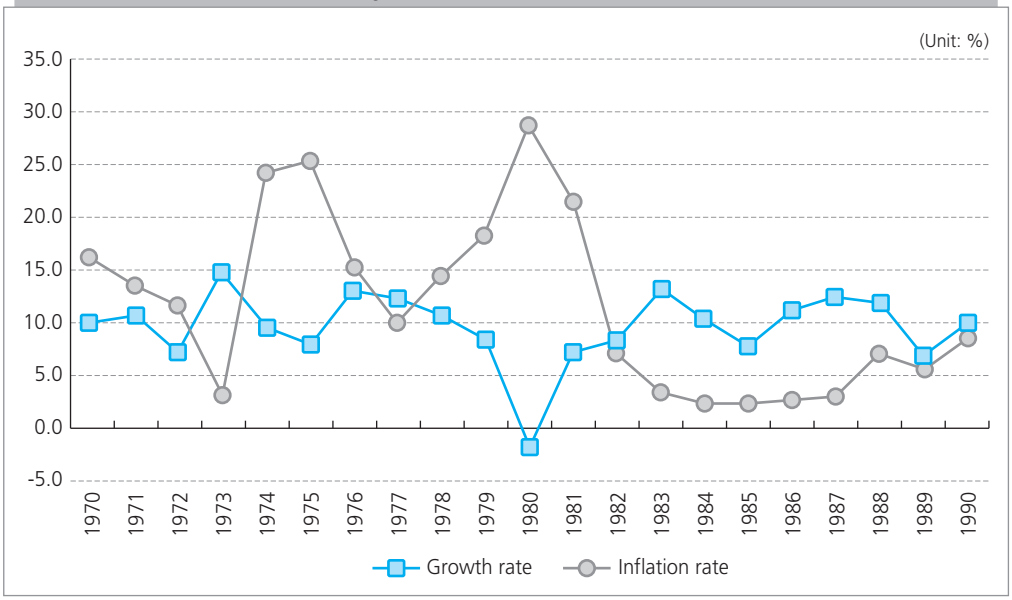
(Unit: %, Avg. by Period)

	Korea	Japan	US	UK	France	Germany
1977–81	18.6	5.8	9.9	13.5	11.3	4.5
1982–86	3.6	1.9	3.8	5.5	7.5	2.6

Source: OECD.

With inflation stabilized and export competitiveness secured, the economy regained its growth momentum. Though the growth rate, which jumped to around eight percent in 1981 and 1982, was largely due to technical effects of low base in 1980, the country's economic rebound was highly robust and significant. Over the 1983–85 period, for instance, economic growth continued to rise at a 10-percent annual clip.

[Figure 1-4] Growth and Inflation

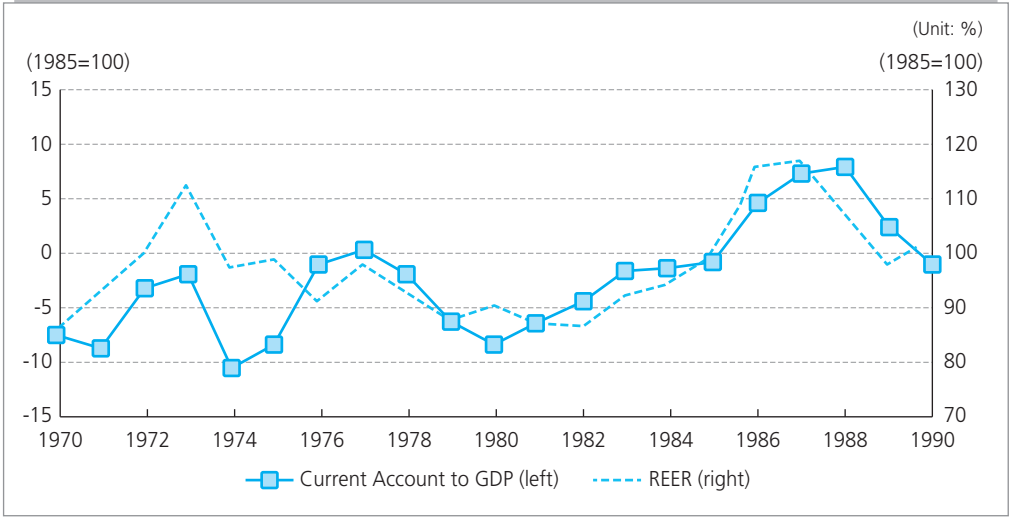


Source: BOK.

Inflation containment also made a great contribution to resolving the balance of payments crisis that overshadowed the economy. The amount of foreign debts exploded in the 1970s. By the 1980s, when the current account deficit saw substantial deterioration due the second oil shock, it reached almost 5 percent of GNP. As mentioned earlier, the government resorted to devaluation to cope with the crisis. But because inflation remained high until 1982, this nominal devaluation could not be translated into that of the real effective exchange rate, a measure of exporters'

recovery of price competitiveness; thus the current account balance did not immediately improve. But as the KRW continued to lose value while inflation was stabilized, the real effective exchange rate began to depreciate, reducing the current account deficit. Eventually, when the Japanese yen (JPY) sharply appreciated due to the Plaza Accord in 1985, the Republic of Korea could, for the first time in its modern economic development, attain a surplus in its balance of payments.

[Figure 1-5] Real Effective Exchange Rate and Current Account to GDP



Source: Cha, Dong-Se (1997) and Cho (2013).

3.5. Stabilization and Monetary Policy after the Currency Crisis

Among the reforms proposed by CESP, the push toward changes in the financial sector was often interrupted and proved gradual if implemented. The reason was that unlike the EPB, which was more active and progressive in liberalizing financial markets, the Ministry of Finance was more concerned about abrupt liberalization and deregulation of the financial system. This delayed full-fledged restructuring of the financial market such as the liberalization of interest rates and autonomy of the BOK until the outbreak of the Asian currency crisis in 1997-98.

After agreeing to provide a bailout package for the Republic of Korea in December 1997, the International Monetary Fund (IMF) insisted that the government pursue economic reform targeting macroeconomic stability and implement reforms in the financial, corporate and labor sectors. Against this backdrop, the government first drew up a tight budget, constraining its budget growth to 3.8 percent, which was far lower than the growth of nominal GDP. The budgets of local governments

were also downsized. As the economic recession worsened into a depression, however, the government soon moved toward adopting a more accommodative fiscal policy. The rise in government expenditures from 1997 primarily intended to build up a social safety net, which was little developed at the time. Consequently, public outlays for social welfare surged, but the inevitable fallout of more funding for social programs was a large jump in the fiscal deficit and increase in public debt. For instance, the level of public debt jumped to 30 percent of GDP from under 20 percent in 1996 (Moon, 2009).

In monetary and financial policies, the BOK since December 1997 had taken an extremely tight stance in monetary policy; this resulted in extremely high interest rates, though they were later dragged down. For instance, the call rate soared to almost 30 percent a year, or more than double the pre-crisis rate of around 12 percent, which was already high. This fueled an extensive debate over the appropriateness of monetary policy. In retrospect, this tight monetary policy merely aggravated the currency crisis, spreading the malaise to create a general banking crisis. The goal of the IMF-ordered policy of high interest rates was to prevent the hoarding of US dollars and capital outflows from the Republic of Korea. Yet this policy proved ineffective in preventing foreign capital outflow from the country or attracting foreign capital; instead, it worsened the business environment for struggling domestic companies. For example, the ratio of dishonored bills jumped from 0.506 percent in mid-1998 to more than 1.5 percent in mid-1999 (Cho, 2010). Many small and medium-size enterprises (SMEs) that went bankrupt could have been saved if not for the high interest policy implemented over the crisis period. The vicious circle soon spread to large and financial companies. A wave of bankruptcies worsened unemployment and forced a rethinking of the high interest policy. This bitter experience prompted many Koreans to distrust the IMF.

The tight monetary policy was doomed to failure because it was implemented as domestic consumption was declining. As a member of the IMF delegation later admitted, the goal of the tight monetary policy was only to quash the currency crisis by maintaining high interest rates for the sake of attracting foreign (short-term) capital. The question of the shortage of aggregate demand received no serious consideration. In contrast, the stabilization policy of 1979 mentioned earlier was successful largely because its goal was to cool the excessively overheated economy. More interesting was the responses of the US and major advanced economies when they faced the 2008 global financial crisis. All these countries adopted extremely lax monetary policy and aggressively lowered interest rates, contrary to what the Republic of Korea and other Asian countries were obliged to do in 1997. This proved again that the policy of tight monetary supply and high interest rates the Republic of Korea adopted after the 1997-98 Asian currency crisis was neither economically appropriate nor politically correct. The policy of low interest rates adopted by the

US helped the Republic of Korea lower its rates in 2008, despite the depreciation of KRW.

Another important transformation occurred in the monetary policy framework after the Asian currency crisis. Following consultations with the IMF rescue team, the Bank of Korea (BOK) made a shift toward inflation targeting in 1998, abandoning the monetary targeting strategy it had used as a monetary policy framework. In inflation targeting, the central bank announces an explicit inflation target and implements policy to achieve it. In the early stage of inflation targeting in the Republic of Korea, the rate of increase in the consumer price index (CPI) was used as a target indicator because of its familiarity with the public. The target inflation rate was set at 3±1 percent except for 1998 (set at 9±1 percent reflecting the sharp depreciation of KRW following the outbreak of the currency crisis) and 2000 (set at 2.5±1 percent) through 2004. Furthermore, as the monetary aggregate gradually lost its effectiveness as an intermediate target, the BOK, along with the adoption of an inflation targeting regime, focused on using the call market interest rate as an operating variable.

[Figure 1-6] Comparison of Inflation and Monetary Targeting

Approach	Operation Schemes				
Inflation Targeting	Policy Instruments • Open market operations • Central bank loan and deposit system • Reserve requirement system	→	Targets • Shot-term interest rates • Reserve base • Reserve requirements	----------> ↑ Information variables • Interest rates • Money supply • Exchange rate, etc.	→ Ultimate Goal • Price stability
Monetary Targeting	Policy Instruments • Open market operations • Central bank loan and deposit system • Reserve requirement system	→	Targets • Shot-term interest rates • Reserve base • Reserve requirements	→ Intermediate Target • Money supply	→ Ultimate Goal • Price stability • Economic growth • Full employment

Source: BOK, The Bank of Korea, A Sixty-year History.

The use of the call rate as an operating target started on Sept. 30, 1998, when the BOK decided to cut the interest rate through its open market operations. This was deemed a fundamentally new departure in that a specific interest rate target was announced. Considering that the overnight call rate closely tracks the rate applied in open market operations, this measure represented a big step toward an operational framework for monetary policy, taking the overnight call rate as its operating target. From May 1999, the overnight call rate consolidated its position as the operating target of monetary policy. The introduction of the call rate target framework certainly widened the scope for the flexible adjustment of liquidity, and this greatly helped prevent market turmoil from spreading via open market operations. As the call rate became virtually fixed at its target level regardless of liquidity conditions in the money market, its function of information signaling and liquidity allocation greatly weakened. As a result, short-term transactions of funds grew excessively concentrated in the call market, detracting from the development of the money market. To support interest rate-driven monetary policy more effectively, the BOK decided to utilize the one-week RP rate as the reference rate from March 2008.

The liberalization of interest rates pursued since the early 1990s was an essential precondition for this shift to an interest rate-driven monetary policy. As interest rates started to fluctuate flexibly across financial markets, a growing correlation was seen between financial markets and a rising sensitivity to interest rate movement by economic agents. <Table 1-9> shows that this was the case for the Republic of Korea. This certainly assures the proper function of a monetary transmission mechanism that goes from short-term through long-term interest rates to the real sector.

〈Table 1-9〉 Correlation Coefficients between Principal Financial Markets

	1989–1991	1992–1994	1995–1997	1998–2000
Call CD rate	0.73	0.86	0.85	0.99
Call corporate bond	0.78	0.78	0.81	0.97
Call gov't bond	-	-	0.92	0.88
CD- corporate bond	0.75	0.95	0.84	0.98
CD gov't bond	-	-	0.90	0.93
Corporate-gov't bond	-	-	0.91	0.95

Source: Bank of Korea (2003). Monetary Policy in Korea.

A continued current account surplus brought about by lower investment demand since the eruption of the Asian currency crisis was also an underlying cause of the adoption of the call rate as an operating instrument of monetary policy. As the

government decided to complete the deferred reform of the financial sector along with its policy consultations with the IMF, comprehensive financial reform and restructuring ensued. Because the government wanted to liquidate unsound financial institutions as early as possible, a massive wave of corporate bankruptcies and large-scale layoffs of staff followed. Against this backdrop, domestic companies made lowering their debts and bank borrowings a priority. The amount of fixed investments plummeted, and this led to the replacement of growth-oriented management with one stressing profitability and inducing a slowdown in the growth rate.

As chronic excess investment turned into long-term excess savings, the BOK had to shift its main task from supplying liquidity to the economy to absorbing it. To this end, the central bank relied on two types of open market operations; the issuance of monetary stabilization bonds (MSBs) and the purchase and sale of securities. MSBs are issued by the BOK itself, introduced in 1961 to absorb the increasing liquidity of the economy when its holdings of government bonds were amply insufficient. These bonds have relatively long maturities and are held until maturity once issued. They are thus used as a major tool in structural adjustment. In contrast, the purchase and sale of securities are employed for the adjustment of short-term liquidity.

〈Table 1-10〉 Instruments of Open Market Operation

		Type of operation	Eligible securities
Long-term adjustment	Withdrawal	Issuance of long-term MSBs	-
		Outright sales of securities	Government and public bonds held by the BOK
	Supply	Repurchases of MSBs with long-term remaining maturities	-
		Outright purchases of securities	Government and public bonds held by counterparts
Short-term fine-tuning	Withdrawal	Reverse RPs	Government and public bonds held by the BOK
		Issuance of long-term MSBs (with a maturity of 14 days)	-
	Supply	RPs	Government and public bonds held by counterparts
		Repurchases of MSBs with long-term remaining maturities	-

Source: Bank of Korea (2013), Monetary Policy in Korea.

Finally, on the exchange rate policy side, the Republic of Korea shifted to a pure free-floating system shortly after widening the daily exchange rate's fluctuation band from +/-2.25 percent of the market average rate to +/- 10 percent. Despite the change, the government retained the right to intervene in the foreign exchange market to avoid excessive volatility in the exchange rate.

4. Policy Recommendations

4.1. Future Challenges Facing Tanzanian Government

The challenges facing Tanzania's economic growth and macroeconomic policy implementation can be summarized as follows:

i. Low level of application of modern technology and innovation
ii. Inadequate number of skilled personnel in both the public and private sectors
iii. Nascent and underdeveloped private sector
iv. Long-time overdependence on rain fed, subsistence and smallholder farming type of agriculture as main livelihood and the economy at large
v. Inadequate capital and poor infrastructure (roads, buildings and equipment)

For the Tanzanian government to tackle these challenges, the Republic of Korea's experiences could provide key insights. From the latter country's perspective, for example, Tanzania should focus on actively promoting its industrialization and exports. Export promotion looks promising because it will allow Tanzanian companies to import modern technologies from abroad while simultaneously benefiting their employees by allowing them to learn by doing and get needed skills. Export promotion also helps create business opportunities and entrepreneurs, leading to the development of the private sector. Given that Tanzania under its fifth government has embarked on industrialization as a strategy to become a middle-income country, the Republic of Korea's experience will prove especially helpful. Leaving a more detailed examination of the country's industrial development to Kruger (1997) and Ahn and Kim (1997), this study is limited to identifying the following strategies and measures pertinent to Tanzania:

i. Application of ambitious industrialization strategy of 1973 in which the Republic of Korea shifted from light industry to the heavy and chemical industries (HCI)
ii. Creation of a national investment fund to mobilize financial resources

through the issuance of special bonds and deposits from the national budget

iii. Tax incentives including preferential depreciation allowance, tax breaks and tax exemptions for exporters

Agricultural development was another area that witnessed drastic structural change. Despite farmers receiving price subsidies from the government, a dramatic fall occurred in the shares of the agricultural sector. When the government's economic development strategy started in 1961, for instance, agriculture employed 56 percent of the population and accounted for 40 percent of GDP. These shares, however, dropped to 28 percent and 15 percent in 1980, respectively, and further down to 15 percent and nine percent in 1990. Agriculture's decline was largely due to the rapid expansion of domestic industry, as the working population from agriculture were absorbed by factories and corporations. The main strategy for agricultural development thus went toward attaining balanced development between the industrial and agricultural sectors. For Tanzania, this experience will prove interesting (See Moon and Sul, 1997, for a more detailed explanation) and serve as an area of comparative study.

Finally, the issues of shortage of capital and infrastructure can be analyzed and compared. This study handles these issues from the perspective of macroeconomic policy. Because resolving the shortage of capital and infrastructure means the mobilization of massive financial resources, the stability goal of macroeconomic policy tends to be neglected or understated. Given the Republic of Korea's heavy emphasis on economic growth over its industrialization period, for instance, its macroeconomic policy was subject to a big constraint.

4.2. Implications of Korean Macroeconomic Policies for Tanzania

In fiscal policy, the Tanzanian government needs to further reduce public spending to meet its deficit target, while recognizing the need for more infrastructure investment. The IMF study agreed with this point but made no suggestions for a concrete program and measure. In this regard, the stabilization plan implemented by the Republic of Korea from 1979 might prove to be a case study worth a closer look. Two key points are:

i. Reduction of government spending through zero-based budgeting and maintenance of fiscal balance

ii. Control over purchase prices of grain

In monetary and financial policies, the monetary policy framework should shift from targeting reserve money and the money supply (M3) to focusing on interest rates. The IMF study advised Tanzania to stabilize the excess reserves of its banks (interbank market) and raise the efficiency of transmission channels for monetary policy. But the IMF failed to acknowledge that the monetary authority of Tanzania lacked the power to shift to open market operation, and made no suggestion to remedy the problem.

The Republic of Korea can again help clarify these points through its experience. Its interest rate-oriented monetary policy was only possible under two conditions. First, financial markets were sufficiently developed and liberalized. Second, excess liquidity arose through a continued current account surplus. Unless these two conditions are met, adoption of an interest rate-oriented monetary policy will prove extremely difficult. Until then, money stock targeting and credit rationing look inevitable due to the urgency of promoting investment in the strategic sectors by prioritizing bank lending and lowering long-term interest rates. Harmonizing the stabilization goal of monetary policy with the government's growth strategy, the policy loan system was a huge challenge that often fueled serious conflicts between the Bank of Korea (BOK) and Ministry of Finance. This problem was not solved until the BOK adopted an inflation-targeting framework in 1998.

Given Tanzania's priority on industrialization over other policy goals, this experience shows that an interest rate-oriented monetary policy is hardly possible if retail deposits remain the main funding sources for banks and such deposits are not swayed by interest rate movements. This will remain so until the Tanzanian government changes its economic emphasis to liquidity abundant from liquidity constrained.

4.3. External Challenges and Lessons for Tanzania

The diverse external challenges facing Tanzania emanate from:

i. Collapse of the East African Community
ii. Frequent fluctuations in world oil prices
iii. Natural calamities such as drought, floods and earthquakes
iv. International shocks such as the 2008 global financial crisis and the 1990-91 Gulf War

Compared to the Republic of Korea of the 1980s, Tanzania seems to have an external environment that is more precarious. Under such circumstances, maintaining a sustainable balance of payments should undoubtedly be one of the top policy

priorities. Against this backdrop, the IMF study concluded that though the current account deficit equal to seven to eight percent of GDP poses a serious external risk, maintaining the foreign currency reserves equal to the value of four months of imports is appropriate. Considering the Republic of Korea's experience, however, this will prove insufficient. The IMF's view seems too optimistic given the lessons learned by the Republic of Korea in the 1997-98 Asian currency crisis. The IMF also suggested additional measures to protect Tanzania from sudden changes in foreign capital movement, especially short-term capital, if it wants to liberalize foreign exchange regulation. Furthermore, the Republic of Korea's experience shows that allowing more flexibility in foreign exchange rates helped maintain stability in the real exchange rate and external competitiveness. The flexibility of the real effective exchange rate is expected to help restore the balance of payment equilibrium, reducing Tanzania's current account deficit.

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Chapter 2

Policy Suggestions to Secure Tanzania Government Revenue based on Cash Receipt System of Korea

1. Introduction
2. Current Status of Tanzania Government's Revenue Policy
3. Korea Experience to Mobilize Tax Revenue
4. Policy Suggestion to Broaden Tax Base: Cash Receipt System (CRS)

Policy Suggestions to Secure Tanzania Government Revenue based on Cash Receipt System of Korea

Hosin Song (Ewha Womans University)
Yosepha Adam Tamamu (Ministry of Finance and planning)

Summary

This chapter focuses on a policy to secure stable government revenue for the Tanzanian economy. The first section explains the details of Tanzania's revenue policy and the second gives an overview of the Republic of Korea's revenue policy over its development period of the 1960s and 70s. The cash receipts system (CRS) is highly recommended to the Tanzanian government to broaden its tax base through detection of the self-employed's cash transactions. The system enables the government to share information on cash transactions between consumers and stores or businesses. Because they both stand to benefit, stores and consumers have incentive to participate in the CRS. In the past, data on cash transactions could be reported to the government by sellers only; the CRS allows the automatic reporting of such transactions to the government and consumer once the cash receipt is issued. The same information can thus be shared by the consumer, seller and government in real time under the CRS. Moreover, more advanced technology is needed to implement the system. The implementation of the CRS is also expected to help Tanzania develop its information and communications technology to a higher level.

Immediate implementation of the CRS in Tanzania, however, might not be possible. Identification of a personal taxpayer who performs the cash transaction is necessary in the system, yet Tanzania has no system of social security or personal identification numbers for citizens. To get around this problem, the government can consider using a mobile number as identification. About 20 percent of transactions

in Tanzania's urban areas is done via mobile phones, thus gradual implementation of the CRS is recommended from urban to rural areas. At the same time, the government should introduce a personal identification system such as social security or resident number so that individual identification is required for implementing policies toward social welfare, public health and tax.

1. Introduction

1.1. Background

Tanzania's Ministry of Finance and Planning is responsible for public finance and economic management. Its core functions include revenue collection and expenditure management; formulation and implementation of fiscal and monetary policy and strategy; mobilization and management of external resources; and management of public assets and investments.

Like most developing countries, Tanzania has deficits in both external balances based on the objective of enabling the government to step up public investment in infrastructure such as roads and airports. Recently, more attention has gone toward using public resources to implement planning and budgeting. Despite the government's efforts toward resource mobilization and allocation, challenges remain such as mitigating the gap between revenue and government expenditures.

The general objective of this project is spurring fast socioeconomic growth in Tanzania by sharing the approaches used by partner countries such as the Republic of Korea. Specifically, an interactive form of knowledge sharing between partner states will be developed to help Tanzania realize its macroeconomic policy in key areas such as revenue collection. Over the implementation period, the project will highlight mobilization of domestic revenue through policy consultation and suggestions, capacity-building workshops and seminars. Through this project, Tanzania will benefit from the Republic of Korea's experience in economic development and the results are expected to expedite socioeconomic development in all levels of the country. The selected topic for Tanzania is "Policy Suggestions to Raise Government Revenue."

1.2. General Performance of the Tanzanian Economy for 2015/16

The Tanzanian economy in 2015 continued to register strong growth of an estimated seven percent. The highest growth rates were recorded in information and communications technology (ICT), public administration, construction, finance and insurance, and transportation and storage. Growth was supported by strong export demand for manufactured products and tourism, ample credit to the private sector and the positive income shock from lower global prices of oil. In 2016, real GDP was projected to continue rising about seven percent. Growth is expected to stay strong over the medium term, supported by large infrastructure investments in energy and transportation under the latest five-year development plan (FYDP II).

A low-income country should build the capacity to secure more tax revenue, and this is the most important goal of Tanzanian government policy. Like other low-income countries, Tanzania must deliver basic services to its people; finance its ever-rising public spending for reducing poverty in line with the government's five-year development plan (FYDP) as well as on public goods critical to economic development; transform the Tanzanian economy into middle-income status through sustaining macroeconomic stability and developing industries creating jobs especially for youths; and enhancing agricultural productivity to raise income as the majority of Tanzanians depend on this sector.

2. Current Status of Tanzania Government's Revenue Policy

2.1. Overview of Government Revenue

Tax is an enforced levy or charge imposed by the government on its citizens or residents usually payable in monetary form. This required contribution or payment is needed to support the government and public purposes. Taxes are compulsory financial contributions to government revenue made by a person or group from worker income and business profits or value added to the cost of goods, services and transactional expenditures of a public authority.

For proper tax payment and collection, voluntary tax compliance requires emphasis. Such compliance refers to the self-assessment of a taxpayer on his/her ability to pay taxes and then payment of the relevant tax amount to the government

Most developing countries need to spend more of their tax revenues on public infrastructure, education and health, hence the need for more efforts to raise such revenues if they want to enhance economic growth and escape the poverty trap. The Tanzania Revenue Authority (TRA), the country's tax watchdog, has raised revenue collection, improved voluntary compliance, minimized collection costs, widened the tax base, and controlled tax evasion and fraud. In absolute terms, tax revenue collected by the TRA increased from TZS 9,908,975.4 million in 2014/15 to TZS 12,525,377.6 million in 2015/16, while the revenue-to-GDP ratio rose from 10.8 percent to 15.3 percent. The TRA's target ratio is 21 percent (URT, 2012).

2.1.1. External Resources

The Tanzanian government has continued collaborating with development partners to reduce poverty. Such partners have supported the government through a range of development programs and direct budgetary support. In 2015/16, the partners committed TZS 2,322 billion, of which TZS 660 billion was for budgetary support, TZS 199 billion for basket funds and TZS 1,463 billion for direct projects. As of December 2015, TZS 169.6 billion worth of budgetary support was received, equivalent to 26 percent of the annual target, TZS 176 billion in basket funds and 381 billion in direct project funds, representing 88 percent and 26 percent respectively.

The low performance is blamed on several reasons. First, certain development partners that gave general budgetary support revised their commitments downwards and set new conditions; some of them decided not to disburse support following a change in their international development policies. For project funding, one reason for the poor performance was different interpretations of the new VAT law on tax exemptions. Since most of these development projects are exempt from VAT, delays in implementation have resulted. Another factor is slow implementation of these projects that consequently affect funding disbursement.

2.1.2. The Domestic Revenue

Most domestic revenue collected in Tanzania is in the form of tax revenue, which accounted for 92 percent of all domestic revenue collected by the central government. The funds are collected by the TRA, an executive agency under the Ministry of Finance and Planning (MOFP) that collects major taxes including income tax, VAT, and import and excise duties. The MOFP and other ministries are responsible for collecting non-tax revenue. External assistance comprises grants and loans from multilateral and bilateral agencies for use mainly in financing the government's development spending.

In 2015/16, the government targeted the collection of domestic revenue worth TZS 14,214.2 billion, of which TZS 12,330.5 billion was tax revenue and TZS 1,870 billion was non-tax revenue. In the first half of 2015/16, domestic revenue amounted to TZS 6,794.3 billion, equivalent to 97 percent of the target. Tax revenue accounted for TZS 5,983.6 billion of domestic revenue, or 98 percent of the target for the period, while non-tax revenue reached TZS 611.4 billion, or 123 percent of the target.

Taxes on domestic goods and services over the same period were 90.9 percent of the estimate due to both policy and administrative measures that included a crackdown on and collection of back taxes through a block management system and audits. Yet underperformance in tax collection for domestic goods and services was blamed on the non-realization of VAT and excise duty from the telecommunication sector, power generating companies and beer manufacturers.

2.2. Structure of Taxation in Tanzania

Revenue generation from the taxation of individuals and businesses is a crucial stream of income for government. Tax revenue funds infrastructure development such as roads, railways, a stable power supply and clean drinking water. All development projects should complement each other and combine to create a business-friendly environment, which in turn spurs economic growth. Tax revenue collected by the government is a significant factor in economic development; as a popular saying goes, "What the government gives, it must first take away." Higher government spending normally means a reduction in private spending since the economic resources available to society are limited. Taxation is a way to transfer resources from the private to the public sector, but other methods (e.g., printing more money or borrowing) allow the government to pay for goods and services it provides. Many taxpayers still find it difficult to comply with their tax obligations, despite that securing tax revenue is crucial to a nation.

A tax system reflects the economic structure of the system's country. The tax structure of Tanzania reflects fundamental characteristics of its economy. The government collects about US$6 billion in tax revenues per year, which is equivalent to around 12 percent of GDP. This covers only 75 percent of the government's expenses as other funding sources such as foreign aid is declining or limited such as borrowing and financing from the private sector.

2.2.1. Type of Taxes in Tanzania

The Tanzanian tax system has two main categories of taxes: direct and indirect. Direct taxes are imposed directly on people's income from employment, business

entities, ownership of property or investment. The impact and responsibility of the tax falls on the same person; that is, the burden cannot be shifted to someone else (e.g., corporate tax, pay as you earn, withholding, individual, rental, gaming and other direct taxes). Indirect taxes are based on consumption like excise (domestic), and value-added tax (VAT). The legal incidence of the tax falls on the trader who acts as a collection agent of the government, while the effective incidence falls on the final consumer of goods or services who eventually pays the tax.

2.2.2. Direct Taxes

Direct taxes are levied directly on people's income from employment, business, ownership of property or investment. They include income and corporate tax, pay as you earn (PAYE), skill development levy (SDL), individual, withholding, rental and gaming tax. Direct tax collection for domestic revenue in Tanzania rose from TZS 3,968.2 billion in 2014/15 to TZS 4,865.1 billion in 2013/14.

2.2.2.1. Pay As You Earn (PAYE)

This is a tax in which a certain amount from an employee's gross pay is deducted, namely a withholding tax on the taxable income of an employee. Under this system, an employer is required by law to deduct income from an employee's taxable salary or wages. The marginal tax rate for individuals in Tanzania was reduced in 2016/17 from 11 percent to nine percent. <Table 2-1> shows the monthly taxable rate for individuals on the Tanzanian mainland. The legal minimum monthly income of TZS 170,000 per individual is not subject to tax. <Table 2-1> shows individual monthly income for residents of the Tanzanian mainland.

〈Table 2-1〉 Tanzania Income Tax Rates 2016/17 (Resident Rates – Mainland Tanzania)

Taxable income (TZS) per month		Rate (%)
Over	Not over	
0	170,000	-
170,000	360,000	9% of amount exceeding TZS 170,000
360,000	540,000	TZS 17,000 plus 20% of amount exceeding TZS 360,000
540,000	720,000	TZS 53,100 plus 25% of amount exceeding TZS 540,000
720,000	And above	TZS 98,100 plus 30% of amount exceeding TZS 720,000

Source: Tanzania Revenue Authority.

2.2.2.2. Skills and Development Levy

The skills and development levy (SDL) is collected by the Tanzania Revenue Authority (TRA) under the Vocational Education Training Act and Income Tax Act. The SDL is charged based on the gross pay an employer pays to an employee with the purpose of providing skills to workers that employers need. Agricultural employment is exempt from SDL. Gross compensation includes salary, leave pay, payment in lieu of leave and subsistence allowance.

2.2.2.3. Individuals

Individual income tax is applied to sole traders and salaried workers who are taxed at progressive rates from the lowest of 11 percent to the highest of 30 percent. The applicable rate for a non–resident is 20 percent charged on overall income. This tax is levied on individual incomes earned from business and requires urgent attention as it appears stagnant due to its marginal contribution. Despite its considerable potential for growth, this sector's contribution to government revenue in Tanzania remains low.

2.2.2.4. Withholding Tax

A withholding tax, also known as retention tax, is applied to specific payments including the income of an employee working for an employer, payment of an investment return, dividend, interest, natural resource payment, rent or royalties in form of service fee and contract payment and payment for the supply of goods to the government and its institutions.

According to the Income Tax Act, withholding tax is divided into two major categories: final and non-final.

Final withholding taxes do not allow the withholdee to claim any tax credit when calculating income tax payable for a year of income. Non-final withholding taxes allow the withholdee tax credits of an amount equal to the tax treated as paid for a year's earned income. <Table 2-2> shows the withholding tax rates charged to residents and non-residents.

〈Table 2-2〉 Withholding Tax Rates

Description of payment	Rate for Resident	Rate for Non-resident
(i) Dividends from corporations listed on Dares Salaam Stock Exchange (ii) Dividend from one resident corporation to another in which corporation receiving dividend holds 25% or more of shares	5% 5%	5% N/A
Dividends from other corporations	10%	10%
Interest	10%	10%
Royalties	15%	15%
Other withholding payments from investment returns.	15%	15%
Rental income	10%	15%
Technical services fees (mining)	5%	15%
Transportation (Non-resident operator/charterer without permanent establishment)	N/A	5%
Insurance premium	0%	5%
Natural resource payment	15%	15%
Service fees	5%	15%
Directors fee (Non-full-time directors)	15%	15%
Commission to agents paid by service providers on money transfer through mobile phones	10%	10%
Payments for goods supplied to government and its institutions by anyone	2% of Gross-payment	N/A

Source: Tanzania Revenue Authority.

2.2.2.5. Rental Taxes

Despite the high potential of the real estate subsector as a source of tax revenue, collection of individual rental taxes remains low mainly due to low level of compliance, which reflects the existence of loopholes in tax legislation and administration resulting in evasion, especially outside the large taxpayer group. According to the TRA, the government set rental rates at 20–30 percent below the property rentals charged by National Housing Corp. (NHC), Tanzania's largest landlord.

Findings indicated that many contracts signed between landlord and tenant for renting residential and/or commercial premises understate the rent paid. The TRA was also found to lack the legal basis to reject the amount on the contract since such contracts are witnessed by lawyers and, in certain cases, local government officials.

2.2.2.6. Corporate Tax

This tax is levied on all corporate taxable profits, accruing to all corporate earnings from business in Tanzania. This area requires greater attention for boosting revenue collection from direct taxes. Private investment in Tanzania has shown a high growth and the nation has seen significant investment inflow and increased domestic investment, yet the returns earned from these achievements have not translated into better revenue performance. The corporate tax rate in Tanzania is 30 percent.

<Table 2-3> shows the collection of a variety of direct taxes for domestic revenue on the Tanzanian mainland. Collection of direct taxes more than doubled from TZS 1,839.9 billion in 2010/11 to TZS 4,865.1 billion in 2015/16, showing an improvement in the collection of direct taxes in recent years.

〈Table 2-3〉 Revenue Collection for Direct Taxes from 2011/12 to 2015/16

(Unit: TZS bln)

TRA (Main land)	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Direct taxes	1,839,929.20	2,471,508.90	3,149,417.50	3,968,274.40	3,940,821.10	4,865,115.70
PAYE.	928,468.90	1,129,468.70	1,395,608.00	1,626,536.90	1,750,804.80	2,246,776.60
SDL	120,006.60	138,901.00	155,267.20	168,672.70	216,119.40	261,729.10
Individuals	58,402.80	65,768.30	69,909.00	87,409.30	101,881.90	141,801.20
Withholding tax	142,110.10	279,425.70	382,932.00	514,628.40	592,916.00	704,573.10
Rental tax	33,037.50	57,370.90	68,898.20	61,373.40	64,422.30	83,601.80
Gaming tax	4,057.00	3,302.60	8,861.70	7,185.50	10,245.80	18,987.00
Corporate taxes	537,561.60	779,855.40	1,039,725.00	1,483,946.40	1,182,730.00	1,379,736.20
All other direct taxes	16,284.70	17,416.20	28,216.50	18,521.80	21,700.90	27,910.70

Source: Tanzania Revenue Authority.

2.2.3. Indirect Taxes (Consumption Taxes)

Indirect tax is based on consumption and categorically divided into excise (domestic), VAT on domestic products and services and imports, other domestic taxes and charges, taxes on international trade, and import and excise duties.

2.2.3.1. VAT on Domestic Products and on Domestic Service

VAT is a consumption tax charged on taxable goods, services and immovable property used in any economic activity whenever value is added at each stage of production and the final phase of sale. VAT is charged on both domestically produced goods and services and imports and by persons registered to do so only. The scope of VAT application is any supply of goods, services and immovable property used in any economic activity on the Tanzanian mainland where it is a taxable supply made by a taxable person over the course of economic activity. The import of a taxable supply from any place outside the mainland shall be charged VAT, and normal customs laws and procedures shall apply. VAT is chargeable on the taxable supplies of goods and services at the rates of 18 percent for standard-rated supplies and zero percent for exports of goods and services.

2.2.3.2. Excise Duty

Excise duty is charged on specific goods and services manufactured domestically or imported charged at both specific and ad valorem rates. Items with specific rates include beverages such as soft drinks, spirits, wine, beer, mineral water, fruit juice, recorded DVDs, CDs and audio tapes, cigarettes, tobacco, petroleum products and natural gas. Services with specific rates include money transfer, electronic communication, pay-per-view TV, motor vehicles, import of furniture, plastic bags, specific aircraft, select cases, firearms, cosmetics and medicine. The ad valorem rates are 0, 5, 10, 17, 15, 20, 25, 30 and 50 percent.

2.2.3.3. International Trade Taxes

The TRA introduced the program Authorized Economic Operation (AEO) for promoting faster customs clearance within the East African Community (EAC). The AEO enables compliant traders to benefit from preferential treatment at the regional level throughout the cargo clearance process, and seeks to enhance trade facilitation and promote partnership between customs and business per the World Trade Organization's SAFE framework of standards. AEO is defined as an individual, business entity or company conducting international trade and duly authorized by the customs commissioner to do business with customs agents under special arrangements.

The categories are imports, exports, clearing and forwarding agents, transporters, manufacturers (engaged in imports and exports) and bonded warehouse operators.

2.2.3.4. VAT on Imports and Exports

VAT on imports and exports of goods is administered by customs offices on behalf of the TRA. The procedures for customs "clearance" entry or "declaration" at custom offices are the same or similar for VAT excise duty and tariffs or customs duty. <Table 2-4> shows the types of indirect taxes collected from 2010/11 to 2015/16. The amount of indirect tax collected jumped from TZS 3,649.3 billion in 2010/11 to TZS 8,381 billion in 2015/16. The contribution of revenue collected as consumption taxes was far higher than any other indirect tax.

〈Table 2-4〉 Revenue Collection for Indirect Taxes from 2010/11 to 2015/16

(Unit: TZS bln)

TRA (main land)	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Indirect tax	3,649,338.40	4,233,720.00	4,909,495.80	5,936,477.30	6,744,838.40	8,381,000.10
Consumption tax	1,152,114.50	1,429,040.80	1,715,778.00	2,064,333.70	2,337,642.50	2,709,299.60
Excise (domestic)	326,279.20	449,958.50	560,479.10	747,131.10	825,775.20	868,620.10
Aggregate VAT	825,835.30	979,082.30	1,155,298.90	1,317,202.40	1,511,867.20	1,840,679.40
VAT domestic products	304,886.90	383,815.70	302,331.00	343,163.80	405,188.40	460,710.80
VAT domestic services	520,948.40	595,266.60	852,968.00	974,038.50	1,106,678.80	1,379,968.60
Other domestic taxes & charges	140,489.80	161,210.30	200,826.00	226,648.80	255,618.20	295,517.90
International trade tax	2,356,734.10	2,643,468.90	2,992,891.80	3,645,494.80	4,151,577.70	5,376,182.70
Import duty	489,010.50	546,334.90	610,865.40	766,706.30	910,936.80	1,344,286.60
Excise duty	614,293.40	583,606.00	697,393.40	761,879.10	916,946.00	1,275,775.10
VAT on Imports	905,610.80	1,082,917.70	1,213,436.80	1,329,712.00	1,542,962.60	1,727,172.50

Source: Tanzania Revenue Authority.

2.3. Overview of Non Tax Revenue

Non-tax revenue refers to the fees, charges and levies collected by the government not generated from taxes. These include, but are not limited to, contributions and dividends from public and statutory corporations, revenues from investment funds and the sale of government assets, fines, fees for permits or licenses, user charges and voluntary contributions. Non-tax revenue is an important component of the domestic revenue base.

2.3.1. Structure of Non Tax Revenue

Previously, non-tax revenues were collected by the Ministry of Finance and Planning and other ministries. From 2016/17, however, the TRA was assigned to oversee and collect non–tax revenue including property tax. The decision was based on the tax authority's experience in revenue collection and national coverage as well as on lessons learned from other African countries like Ethiopia and Rwanda.

The government initially used a retention program in collecting non–tax revenue under an arrangement that allowed an institution to retain part of the revenue collected. This arrangement consistently affected the collection of government revenue into the consolidated fund, while benefiting few institutions. So from July 1, 2016, the government ruled that all revenue would be collected and remitted to the consolidated fund or disbursed to each institution based on the approved budget. Non-tax revenue is collected from public entity dividends, the treasury, ministries and regions, appropriation in aid, TRA Non-Tax and Local Government Authority (LGAs) Own sources.

2.3.2. Local Government Authorities (LGA)

A local government authority is a part of government operating at the local level, functioning through a representative organ known as a council established by law to exercise specific powers within a defined jurisdiction.

2.3.3. Non Tax Revenue Collected by LGAs

The taxation system of Tanzanian local governments mainly originated from tax reforms made in fiscal 2003/04 and 2004/05. Prior to that, LGAs had considerable freedom to set their own revenue structures including establishing collection rates charged to various revenue sources. Since a local government had its own structure and collection rates, this made it difficult to precisely calculate the combined income of all local governments in the country. As a result, the Prime Minister's Office-Regional Administration and Local Government (PMO-RALG) in 2002 produced guidelines that rationalized and harmonized revenue sources (PMO-RALG, 2002).

2.3.4. Main Sources of LGAs Revenues

In Tanzania, local authorities can levy taxes, licensing fees and other charges. Councils, through their own powers, approve bye-laws (granted by the Act on Local Government Finances of 1982) to set their own revenue structures including setting collection rates charged to revenue sources. Revenue collection significantly varies by rural and urban LGA. In a rural LGA, the predominant revenue sources are (i) the agricultural produce cess and (ii) the livestock levy. In an urban LGA, the most productive revenue sources are (i) licenses, (ii) fees (including business licenses) and (iii) the city service levy. <Table 2-5> indicates the contribution of non-tax revenue by source. Revenue collection shows changes from 2011/11 to 2015/16; for instance, revenue from public entity dividends exploded from TZS 26,155 billion in 2010/11 to TZS 638,577 billion followed by revenue from ministries and regions and LGAs' own sources.

〈Table 2-5〉 Revenue Collection for Non-Taxes from 2010/11 to 2015/16

(Unit: TZS bln)

	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Non-tax revenue	284,709	545,406	242,839	572,809	705,462	638,577
Public entity dividends	26,155	207,352	23,739	110,014	161,234	285,105
Treasury	4,844	7,470	1,075	26,048	889	607
Ministries & regions	231,839	311,318	204,843	418,596	526,561	316,666
Appropriation in aid	-	-	-	-	-	-
TRA Non-tax	21,871	19,266	13,199	18,101	16,777	36,199
LGA own sources	118,206	157,042	103,055	315,228	360,084	201,009

Source: Ministry of Finance and Planning.

2.4. Challenges in Government Revenue Mobilization

2.4.1. Tax Revenue Mobilization

Many developing countries including Tanzania suffer from weaknesses when it comes to revenue collection through tax. This is because most of the people are too poor to pay tax or those with political and financial power do not wish to do so. A major impediment to domestic resource mobilization is a narrow tax base. A major factor that erodes the tax base is low compliance resulting from tax evasion.

To generate more tax revenue, the Tanzanian government must consider doing the following:

i. Broaden the tax base to include the informal sector in the tax net
ii. Tackle the issues of informality and cash economy
iii. Enhance fiscal integrity and accountability
iv. Use ICT
v. Consider tax incentives and exemptions
vi. Improve outreach
vii. Crack down on tax evasion and capital flight
viii. Ensure that all government revenue is duly collected and crack down on tax evasion and avoidance
ix. Raise the level of revenue yield to be commensurate with average yield

2.4.2. Non-Tax Revenue Mobilization

The government faces challenges in collecting non-tax revenue from public and statutory corporations monitored by the Treasury Registrar (TR). The main challenges include:

i. Inability to identify new revenue sources; evidence shows that many local authorities fail to implement their development projects and meet the service needs of residents because of fund shortages
ii. Low collection rates
iii. Poor awareness of local taxpayers
iv. Challenges in revenue outsourcing
v. Weaknesses in local revenue administration
vi. Central government's directives
vii. Too many taxes instead of a few productive ones

viii. Powerlessness felt by taxpayers in decisions on setting of tax rates or spending of tax revenues

ix. Failure to utilize available sources caused by lack of capacity (mechanism and skilled personnel) to collect enough revenue

2.5. Tax Collection Administration of Tanzania

2.5.1. The Collection of Taxes under Tanzania Revenue Authority

The primary task of a tax authority is collection of tax due from taxpayers under tax law without depressing economic activity. The Tanzania Revenue Authority (TRA) uses electronic fiscal devices (EFDs) to prevent noncompliance of sales and value-added tax (VAT).

Implementation of EFDs shall include the following groups:

i. Persons not VAT registered with a turnover ranging from TZS 14 million and above per year

ii. Traders doing business in prime areas identified on the basis of rent payable

iii. Traders dealing with selected sectors such as spare parts, hardware, mini supermarkets, petrol stations, mobile phone shops, sub-wholesale stores, bars and restaurants, pharmacies and electronic stores

2.5.2. What is Electronic Fiscal Device? (EFD)

An electronic fiscal device (EFD) is designed for use in business for efficient management control of sales analysis and stock control. It conforms to the requirements specified by law. Each business owner must issue a receipt or invoice for each sale and notify any changes or malfunction in machinery to the TRA within 24 hours.

2.5.3. WHY EFDs is Preferred?

i. Built-in fiscal memory inerasable by mechanical, chemical or electromagnetic interference

ii. Automatic self-enforcing issuance of daily "Z" report every 24 hours

iii. Automatic transmission of tax information to TRA

iv. Irreversible date mechanism

v. Issuance of uniquely identifiable fiscal receipt or invoice

vi. Usable as stand-alone device and configured into network

vii. Backup power lasting up to 48 hours, and external battery usable in areas with no electricity supply

viii. Automatic saving of configured data and records on permanent fiscal memory

ix. Tax memory capacity that stores data for at least five years or 1,800 daily transactions

x. Prevention of conflict during tax audit and assessment

xi. Simplification of objection and appeal process

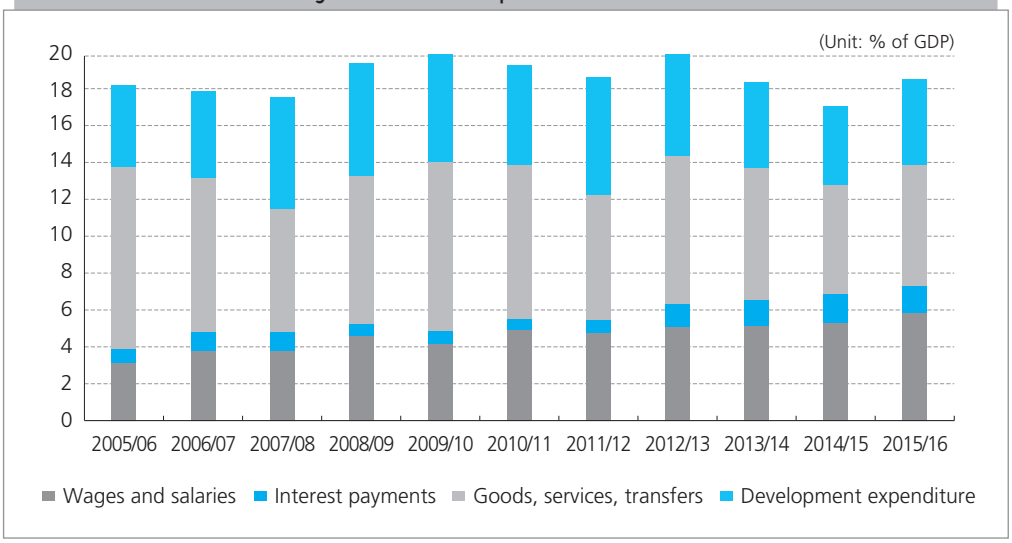
xii. Implementation of EFDs in tax collection in Tanzania has greatly assisted sealing loopholes in tax evasion. The system also raised tax compliance. Though the system has yet to be fully institutionalized in the TRA, the tax authority still faces resistance to change from both internal and external customers. The TRA has received numerous complaints from businesses that the EFD system hinders the use of the machine, though it did boost tax collection from businesses in Tanzania. The problems cited include regular breakdown of devices, fairness of estimated tax from the perspective of taxpayers, lack of education on the EFD use, machine maintenance and under taxing of certain traders

2.6. Overall Features of Expenditure and Public Debt of the Tanzania Economy

2.6.1. Recent Trend of Expenditure

Tanzania's fiscal expenditures have accounted for a stable 16–20 percent of GDP over the last 10 years. Looking at government spending as percentage of GDP, much was spent on payroll and interest. In contrast, expenditures for development and goods and services have been kept under control.

[Figure 2-1] Fiscal Expenditures of Tanzania



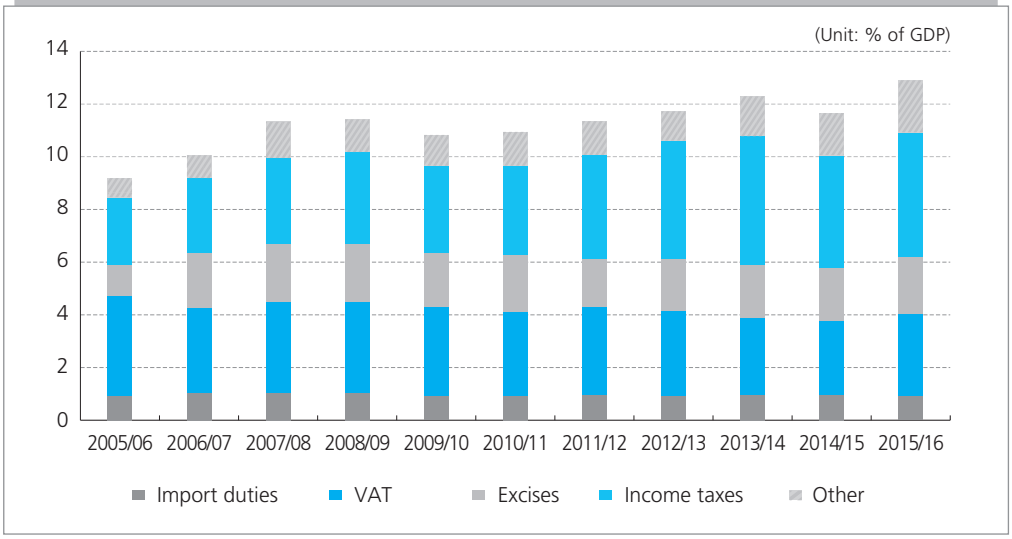
Source: IMF (2017).

2.6.2. Recent Trend of Revenue

The fiscal revenue of Tanzania has ranged between 10–14 percent of GDP over the last 10 years. The amount of income tax has been growing, but VAT, import duties and excise taxes have changed little. The shares of payroll and interest are growing but those of development and government consumption are not. Room for discrete fiscal policy might also be small. The government should thus exercise more prudence in devising and implementing fiscal policy toward development considering its smaller fiscal space.

On the mobilization of tax revenue, the government needs to consider the extension of VAT since the share of consumption tax including VAT is constant or sometimes deteriorating. Mobilization of more VAT revenues requires consideration by raising the number of VAT taxpayers or decreasing those exempt from VAT.

[Figure 2-2] Fiscal Revenue of Tanzania

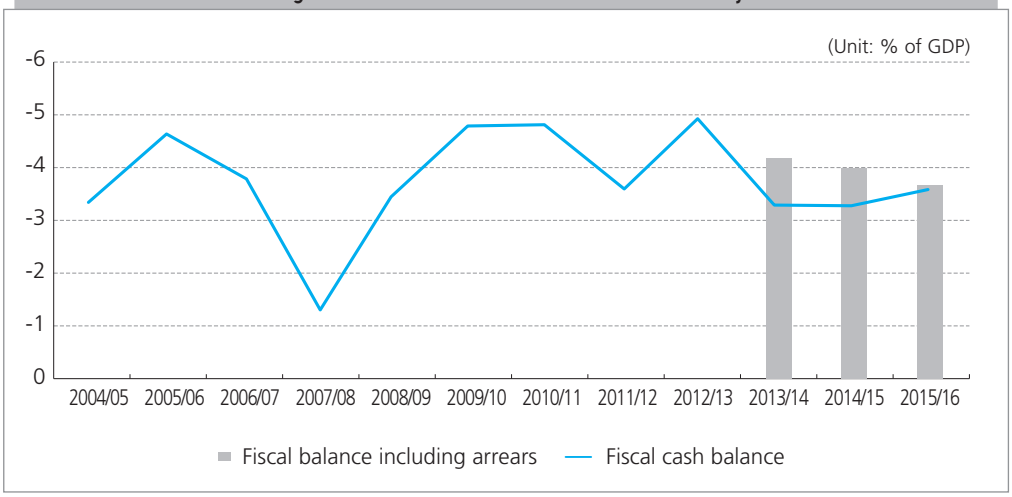


Source: IMF (2017).

2.6.3. Recent Trend of Fiscal Balance

Tanzania's fiscal deficit has remained around four percent of GDP since 2007/08, which reflects that fiscal spending has outpaced fiscal revenue. This trend is expected to continue for the time being so that the Tanzanian economy can develop more, giving the government yet another reason to secure stable revenue to support its development plans.

[Figure 2-3] Fiscal Balance of Tanzania Economy



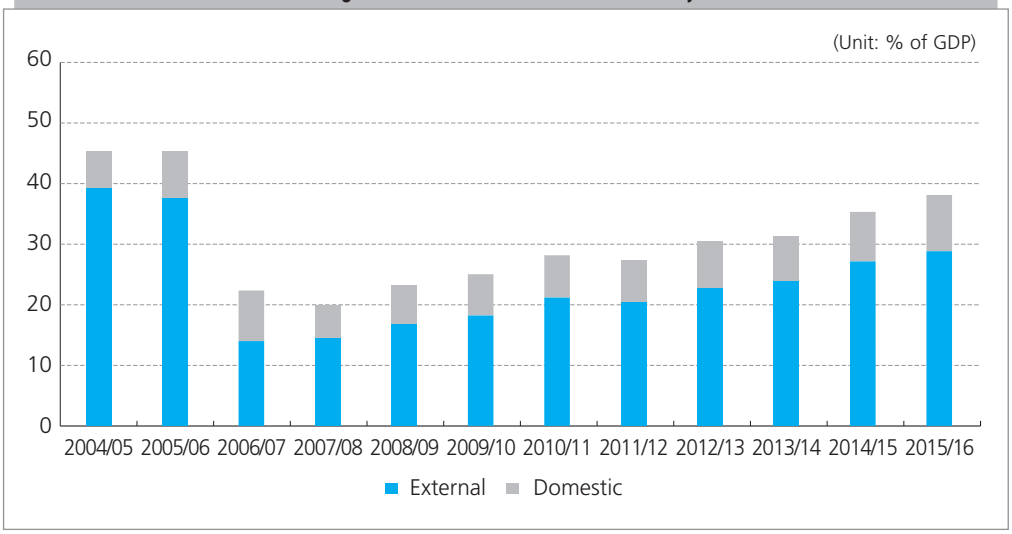
Source: IMF (2017).

2.6.4. Recent Trend of Debt

Tanzania's chronic fiscal deficit has consequently led to rising debt in the economy and is expected to continue for the time being due to the chronic fiscal deficits. One feature of the debt structure in the economy is that the country's heavily reliance on external borrowing since domestically generated revenue is insufficient and the Tanzanian loan market remains underdeveloped. The problem of rising interest payments is linked to rising debt, especially external debt.

Serious government efforts are thus needed to make expenditure policy more productive to curb rising debt.

[Figure 2-4] Debt of Tanzania Economy



Source: IMF (2017).

2.7. Conclusion

The Tanzanian government, for ensuring effective collection of domestic revenue for 2016/17 seeks to minimize unproductive tax exemptions, boost the application of electronic systems in revenue collection and widen its revenue base, as well as push through prudent fiscal reforms that will tap new revenue sources and reduce leaks. This will eventually allow public funding of many national development projects of high impact on an independent basis without relying more on external aid.

Evidence has shown that external financing sources, which are normally derived from development partners and through borrowing arrangements, are unreliable in both timing and amount. The conclusion is thus that the substantial financial

needs of the government should be met with domestic revenue. Tanzania, like other developing countries, needs to aggressively mobilize domestic revenue. The country's tax authority TRA, however, should continue educating taxpayers on the government's need to collect taxes to raise voluntary tax compliance and lower the overall cost of tax administration.

A capacity-building program conducted in collaboration with development partners seeks to raise staff skills, educate taxpayers, and set up more accessible and transparent payment facilities to minimize revenue leak. The program can cover key areas such as revenue mobilization programs, a crucial factor in raising revenue collection.

The government, however, needs external support to strengthen the use of electronic systems in revenue collection; the Tanzania Revenue Authority also needs ICT assistance in the collection of non-tax revenues including property tax, fees, levies and charges formally being collected by ministries, LGAs and regulators. From 2016/17, the government has ordered the TRA to collecting non-tax revenue and local government taxes. The Ministry of Finance and Planning needs to strengthen its negotiating capacity for oil and gas contracts and management of resources from this sector, and this is possible through external support from experienced countries.

3. Korea Experience to Mobilize Tax Revenue

3.1. Feature of Revenue Policy in 1960s

The tax structure of the Republic of Korea's economy after the Korean War (1950–53) was oriented toward indirect tax. After its first five-year economic development plan was launched in 1962, the government faced growing financial needs to support development activities. It thus exploited items subject to indirect tax to minimize tax resistance by the people. Government revenue mainly relied on indirect tax revenue as the latter's share out of all tax receipts was considerably large. For example, excise tax revenue became a major source of government revenue in the 1960s as shown in <Table 2-6>.

〈Table 2-6〉 Share of Indirect Tax Revenue by Item in 1960s

(Unit: %)

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Income tax	13.7	21.3	24.1	29.5	27.7	29.0	29.8	30.4	31.9	29.8
Corporate tax	9.5	9.4	12.1	14.1	13.5	15.5	15.3	15.7	15.2	14.9
Inheritance & gift tax	0.2	0.1	0.3	0.3	0.3	0.6	0.5	0.4	0.4	0.5
Registration tax	1.6	2.3	2.7	3.1	3.2	2.7	2.9	2.6	2.6	2.5
Education tax	8.5	1.5	0.1	0.0	-	-	-	-	-	-
Land tax	11.6	0.0	-	0.0	-	-	-	-	-	-
Business tax	5.9	9.1	10.3	11.1	10.4	10.4	11.1	11.2	10.6	10.9
Liquor tax	7.0	11.7	11.2	10.0	9.0	9.1	7.8	7.1	7.4	7.7
Excise tax	27.6	21.9	15.3	11.3	16.7	14.8	14.8	14.2	14.0	11.2
Petroleum tax	-	9.0	9.2	6.7	7.5	5.2	4.5	7.3	6.8	7.5
Electricity & gas tax	2.8	3.4	3.3	3.3	3.9	3.2	2.8	2.6	2.4	2.5
Toll tax	2.1	3.2	3.7	3.6	2.9	3.9	4.7	4.3	4.5	4.7
Entrance tax	1.0	1.6	1.8	2.0	1.7	1.5	1.6	1.4	1.5	1.6
Stamp tax	2.2	3.1	3.2	2.9	1.8	2.1	2.2	1.7	1.4	0.6
Other tax	4.2	0.7	0.4	0.4	0.2	0.5	0.7	0.5	0.5	1.1
Tax in previous years	1.9	1.7	2.3	1.7	1.2	1.5	1.2	0.5	0.8	0.7

Source: KIPF (2012).

Despite the adoption of indirect tax items, the government had to rely more on foreign loans than tax revenue. The gap between the rates of total investment and total domestic savings was financed by external borrowings (see Table 2-7).

〈Table 2-7〉 Economic Indicators in 1960s

(Unit: %)

Year	Growth rate	Total investment rate (investment / GNP)	Total domestic savings rate (domestic saving / GNP)
1957	7.6	14.0	13.9
1958	5.5	11.8	12.8
1959	3.8	10.4	10.8
1960	1.1	10.0	9.0
1961	5.6	12.0	11.7
1962	2.2	11.8	11.0
1963	9.1	17.0	14.4
1964	9.6	13.2	14.0
1965	5.8	14.1	13.2
1966	12.7	20.4	16.6
1967	6.6	20.9	15.4
1968	11.3	24.9	18.2
1969	13.8	27.9	21.4

Source: KIPF (2012).

The size and composition of total resource financing to support domestic investment in the 1960s are presented in <Table 2-8>.

〈Table 2-8〉 Size and Composition of Financing in 1960s

(Unit: KRW 100 mln, %)

Year	Tax revenue		Other revenue		Foreign aid		External borrowing		Total
	Size	Composition	Size	Composition	Size	Composition	Size	Composition	
1957	146	32.1	75	16.5	225 (48)	49.5	9	2.0	455
1958	143	30.0	66	13.8	246 (48)	51.6	22	4.6	477
1959	216	47.5	44	9.7	189 (53)	41.5	6	1.3	455

〈Table 2-8〉 Continued

(Unit: KRW 100 mln, %)

Year	Tax revenue		Other revenue		Foreign aid		External borrowing		Total
	Size	Composition	Size	Composition	Size	Composition	Size	Composition	
1960	250	51.5	59	12.2	168 (53)	34.6	8	1.6	485
1961	232	37.8	135	22.0	241 (160)	39.3	6	1.0	614
1962	282	30.3	338	36.3	287 (150)	30.8	25	2.7	932
1963	311	40.9	181	23.8	263 (150)	34.6	5	0.7	759
1964	374	47.2	139	17.5	280 (150)	35.3	-	-	794
1965	546	51.8	148	14.0	361 (185)	34.2	-	-	1,055
1966	876	57.0	277	18.0	384 (259)	25.0	-	-	1,538
1967	1,299	65.1	317	15.9	380 (246)	19.0	-	-	1,996
1968	1,943	70.4	481	17.4	334 (194)	12.1	-	-	2,758
1969	2,628	69.9	893	23.8	239 (206)	6.4	-	-	3,760
1970	3,347	75.1	874	19.6	237 (189)	5.3	-	-	4,459

Source: KIPF (2012).

<Table 2-9> presents the tax-to-GDP ratio. The third and fourth columns show the tax-GDP-ratio by tax revenue of the central and local governments. Note that the social contribution is not considered in these statistics since the Republic of Korea had no social security system such as national pension until 1986.

〈Table 2-9〉 Tax-to-GDP Ratio in 1960s

(Unit: %)

Year	Tax-to-GDP ratio [1)]	Central gov't	Local gov't
1960	12.2	11.2	0.9
1961	9.8	8.9	0.9
1962	10.7	9.2	1.5
1963	8.7	7.2	1.5
1964	7.1	5.9	1.2

〈Table 2-9〉 Continued

(Unit: %)

Year	Tax-to-GDP ratio [1)]	Central gov't	Local gov't
1965	8.7	7.3	1.4
1966	10.9	9.3	1.6
1967	12.0	10.9	1.1
1968	14.1	12.8	1.2
1969	14.7	13.5	1.2
1970	14.9	13.7	1.2

Note: 1) Nominal GDP.

Source: National Tax Service, 『National Statistical Yearbook』.

<Table 2-10> presents the composition of the Republic of Korea's government tax revenue in the 1960s. Such revenue consisted of domestic and customs tax revenue, profits from government-exclusive sales and local tax.

〈Table 2-10〉 Composition of the Government Tax Revenue in 1960s

(Unit: KRW100 mln)

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Tax revenue	293	282	377	433	510	695	1,107	1,530	2,300	3,137	3,981
Internal tax	198	179	214	244	289	418	705	1,038	1,564	2,181	2,838
Customs tax	52	53	68	67	85	128	180	254	379	447	509
Gov't profits exclusive sale	23	26	42	48	45	36	82	100	164	243	301
Local tax	21	23	52	73	90	112	159	138	193	266	332

Source: KIPF (2012).

3.2. Feature of Revenue Policy in 1970s

In 1970, the government switched its attention to strengthening tax progressivity for more flexible collection of taxes. The direct tax-based system, however, had numerous problems in generating domestic capital and promoting stable private

consumption due to high statutory tax rates. So the government in 1971 decided to focus its tax policy again on indirect tax. To set up a more efficient tax system from a long-term perspective, the ensuing tax reform was based on long-term horizon tax revenue forecasting.

As part of its emphasis on generating revenue from indirect taxes, the government raised taxes on luxury goods rather than non-luxury goods and enforced stricter administration of tax collection. These measures raised the contribution of indirect tax revenue to overall tax revenues, which were part of preparation for the introduction of the value-added tax (VAT) to the economy.

VAT was adopted in 1977 to support sustainable economic growth by encouraging exports and investment. At that time, eight types of indirect tax, whose terms were complicated and convoluted, were integrated into VAT and special consumption tax: business, textile, excise, oil, entrance, electricity and gas, passage and restaurant. The business tax enjoyed the largest share of tax revenue among the eight and exercised great influence over VAT's introduction.

〈Table 2-11〉 Economic Indicators in 1970s

Year	Nominal GNP		Growth rate	Total investment rate (investment / GNP)	Total domestic savings rate (domestic saving / GNP)	Exports (US$100 mln)
	Total (US$100 mln)	Per capita (US$)				
1970	81	255	7.6	25.4	17.4	8.4
1971	95	291	10.4	26.0	15.3	10.7
1972	108	322	6.5	21.3	17.0	16.2
1973	138	404	14.8	25.3	22.8	32.3
1974	194	559	9.4	31.9	21.5	44.8
1975	216	607	7.3	28.7	19.1	50.8
1976	298	825	13.5	26.6	24.7	77.2
1977	382	1,043	11.8	29.5	28.2	100.5
1978	535	1,443	10.3	32.6	30.6	127.1
1979	640	1,693	8.4	36.7	29.7	150.6

Source: KIPF (2012).

〈Table 2-12〉 Fiscal Balance in 1970s

(Unit: KRW tln, %)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Fiscal balance	0.0	-0.1	-0.2	-0.1	-0.3	-0.5	-0.4	-0.5	-0.6	-0.4
Pct. of GDP	-1.0	-2.3	-4.6	-1.6	-4.0	-4.6	-2.9	-2.7	-2.5	-1.4

Source: KIPF (2012).

〈Table 2-13〉 Trend of Government Tax Revenues in 1970s

(Unit: KRW100 mln)

	1971	1972	1973	1974	1975	1976	1977	1978	1979
Total	4,929	5,229	6,526	10,217	15,498	23,133	29,593	40,955	53,607
Internal tax	3,555	3,743	4,391	7,180	10,123	13,705	16,752	22,525	30,375
Customs tax	522	591	824	1,267	1,810	2,755	3,859	6,464	7,323
Defense tax	-	-	-	-	622	2,687	3,416	4,733	6,319
Profits from gov't-exclusive sale	454	429	570	690	1,355	1,780	2,200	2,800	3,600
Local tax	398	466	741	1,080	1,598	2,206	3,366	4,433	5,990

Source: KIPF (2012).

〈Table 2-14〉 Trend of Internal Tax Revenues in 1970s

(Unit: %)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Income tax	29.8	30.3	27.9	28.2	22.9	19.6	23.3	21.1	20.8	20.2
Corporate tax	14.9	15.9	14.6	11.3	15.4	12.9	17.5	14.0	15.9	16.2
Inheritance tax	0.5	0.6	0.4	0.4	0.4	1.1	0.7	0.6	0.4	0.2
Registration tax	2.5	2.3	3.2	4.9	4.3	3.3	0.9	-	-	-
Asset reevaluation tax	0.2	0.4	0.4	0.2	0.3	0.5	0.6	0.5	0.3	0.3

〈Table 2-14〉 Continued

(Unit: %)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Anti-real estate speculation tax	0.9	0.7	0.2	0.1	0.2	0.2	-	-	-	-
VAT	-	-	-	-	-	-	-	14.4	37.1	35.8
Special consumption tax	-	-	-	-	-	-	-	6.0	14.5	16.0
Liquor tax	7.7	7.8	7.5	7.8	7.4	8.0	6.8	7.4	8.6	8.8
Telephone tax	-	-	-	-	0.7	1.0	1.0	1.2	1.0	1.0
Business tax	10.9	10.7	13.0	13.6	13.5	19.6	19.1	12.4	-	-
Petroleum tax	7.5	8.9	9.3	8.5	14.4	10.5	10.4	6.1	-	-
Excise tax	11.2	9.8	9.8	11.4	11.1	11.6	12.1	7.9	-	-
Passage tax	4.7	4.8	4.8	5.0	2.0	1.7	1.6	0.9	-	-
Textile tax	3.8	2.8	2.8	1.8	1.9	2.2	3.9	2.6	-	-
Electricity & gas tax	2.5	2.3	2.3	2.8	1.2	0.5	0.4	1.0	-	-
Entrance tax	1.6	1.4	1.4	1.4	1.3	1.0	0.8	0.4	-	-

Source: KIPF (2012).

3.3. Naive Comparison of Tanzania and Korea

Per capita GDP in Tanzania in 2015 was US$879, close to that of the Republic of Korea in 1976. Though Tanzania's figure is quite low compared to that of the Republic of Korea, the tax-to-GDP ratio of the Tanzanian economy is not that far off at 17.1 percent; the Republic of Korea's ratio was 19.5 percent in 2016. This means Tanzania might have less room to mobilize more tax revenue despite the Tanzanian government's intent. A key issue Tanzania should pay attention to and work on is the negative effect of its informal sector on its economy. Effectively managing the sector and keeping it under control could prove instrumental in broadening the government's tax revenue.

〈Table 2-15〉 Comparison of per Capita GDP

(Unit: US$)

Republic of Korea				Tanzania	
Year	GDP per capita	Year	GDP per capita	Year	GDP per capita
1953	66.0	1976	831.0	1989	184.3
1954	69.0	1977	1051.0	1990	172.1
1955	64.0	1978	1452.0	1991	193.8
1956	65.0	1979	1713.0	1992	174.0
1957	73.0	1980	1703.0	1993	155.7
1958	80.0	1981	1870.0	1994	159.9
1959	81.0	1982	1977.0	1995	180.8
1960	79.0	1983	2179.0	1996	217.5
1961	84.0	1984	2390.0	1997	250.7
1962	90.0	1985	2456.0	1998	297.5
1963	103.0	1986	2804.0	1999	301.2
1964	106.0	1987	3512.0	2000	308.4
1965	108.0	1988	4692.0	2001	306.2
1966	128.0	1999	10,404.0	2002	310.2
1967	145.0	2000	11,951.3	2003	325.6
1968	174.0	2001	11,257.3	2004	348.1
1969	216.0	2002	12,787.0	2005	446.2
1970	253.0	2003	14,215.9	2006	475.9
1971	290.0	2004	15,931.0	2007	533.2
1972	324.0	2005	18,654.0	2008	657.7
1973	406.0	2006	20,901.3	2009	665.3
1974	562.0	2007	23,102.9	2010	708.5
1975	615.0	2008	20,464.8	2011	740.4

〈Table 2-15〉 Continued

(Unit: US$)

Republic of Korea				Tanzania	
Year	GDP per capita	Year	GDP per capita	Year	GDP per capita
2009	18,346.3	2013	25,993.4	2012	827.5
2010	22,147.4	2014	27,982.5	2013	909.3
2011	24,159.8	2015	27,213.5	2014	957.9
2012	24,445.1	-	-	2015	879.0

Source: Author calculated these figures based on data from Tanzania's National Bureau of Statistics and Statistics Korea.

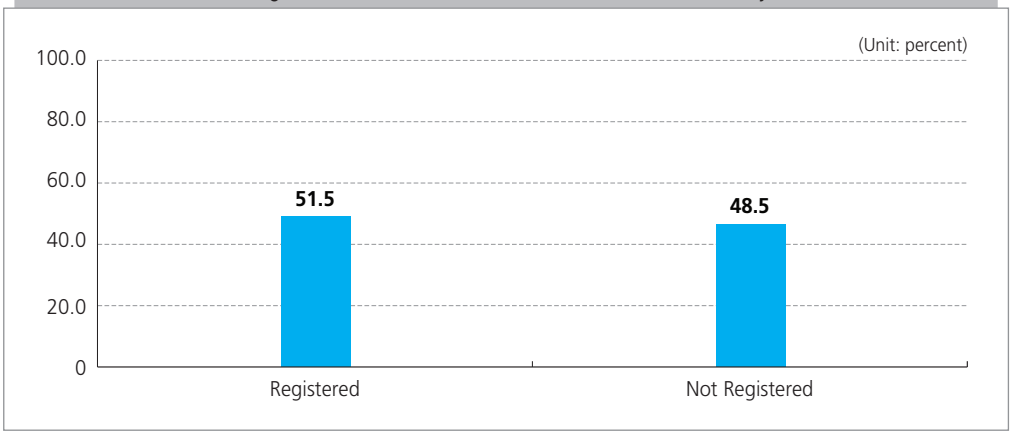
〈Table 2-16〉 Comparison of Tax/GDP Ratio

(Unit: pct. of GDP)

Year	Korea	Year	Tanzania (including grants)
1960	11.2	-	-
1961	8.9	-	-
1962	9.2	-	-
1963	7.2	-	-
1964	5.9	-	-
1965	7.3	-	-
1966	9.3	-	-
1967	10.9	-	-
1968	12.8		
1969	13.5	2014/15	14.0
1970	13.7	2015/16	14.9 (prel.)
2016	19.5	2016/17	17.1 (proj.)

Source: Author calculated these figures based on IMF data (2017), Tanzania's National Bureau of Statistics, Statistics Korea and Ministry of Strategy and Finance, Republic of Korea.

[Figure 2-5] Informal Sector in the Tanzania Economy



Source: National Bureau of Statistics (2015), Tanzania.

4. Policy Suggestion to Broaden Tax Base: Cash Receipt System (CRS)

In addition to the introduction of classifications for indirect taxation, the government launched the National Tax Service (NTS) to oversee the administration of tax collection. The tax authority helped detect hidden income sources, allowing the government to broaden its tax base without taxing more items.

Based on the Republic of Korea's experience, the cash receipt system (CRS) is recommended to Tanzania for broadening its tax base. Detection of hidden cash transactions in the formal economy will face no political opposition. Existing information and communication technology (ICT) in Tanzania can also be used, or at least related technology can be developed while trying to introduce the CRS. This system is thus recommended for Tanzania over any other tax-related measure to encourage economic growth.

4.1. What is CRS?

Under the CRS, a consumer pay cash at a store for a good or service and asks for a cash receipt; the cash transaction is then automatically notified to the NTS. This system debuted in 2005 to better track the cash sales of independent stores and businesses.

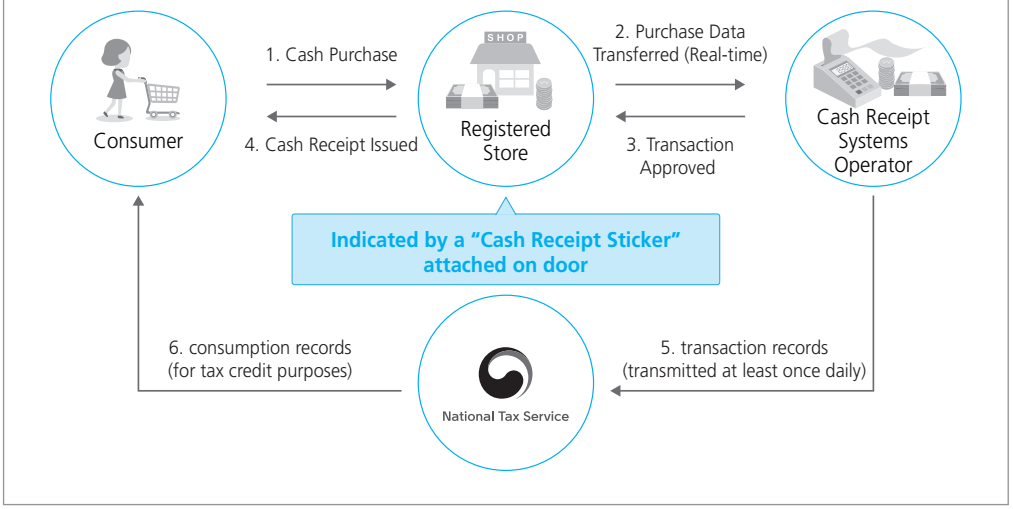
i. A consumer goes to a store equipped with a device that issues cash receipts (called a "registered store"), pays cash for an item and provides his or her

cell phone number, various cards like credit or debit or resident ID number for personal identification purposes

ii. The store enters the number in the device, which sends in real time the buyer's identification and cash purchase record to a CRS operator, who then approves a cash receipt to be issued by the store.

iii. The CRS operator then sends the data collected from stores to the NTS over an exclusive line at least once daily to track taxable income.

[Figure 2-6] How Does the CRS Work?

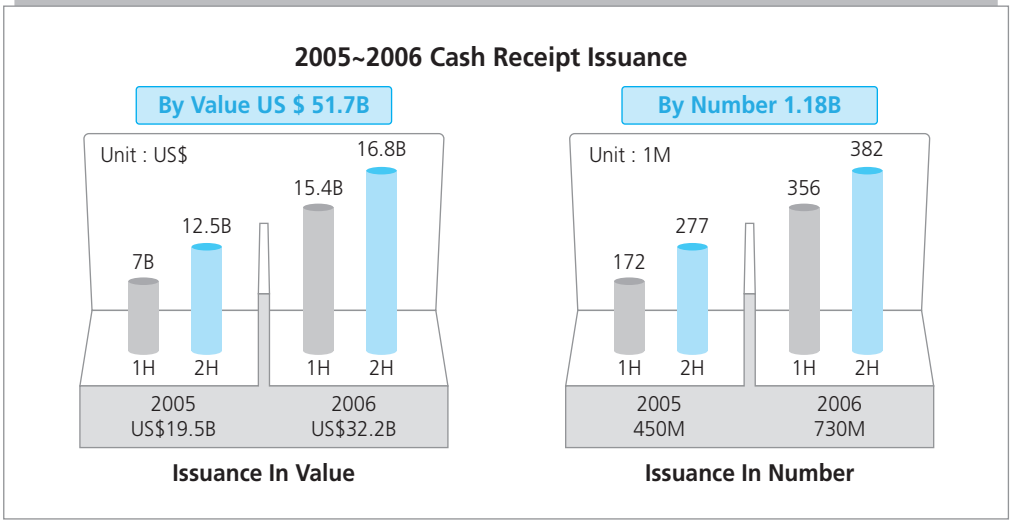


Source: NTS (2007).

4.1.1. Background and Outcome

Due largely to a government policy promoting the use of credit cards started in 2000, the share of credit cards as a percentage of private consumption grew from 12.3 percent in 1998 to as high as 41.7 percent in 2004, contributing to better tracking of taxable income. Despite this development, the amount of cash transactions remained high and posed a major obstacle to detecting income earned by the self-employed. The CRS was devised as a way of building a new tax infrastructure that could better expose taxable income.

[Figure 2-7] Outcome of CRS



Source: NTS (2007).

4.2. Considerations for the Introduction of CRS

4.2.1. Mandating Registration

Business-to-business (B2B) entities were initially the first to register as ''cash receipt issuers" for business-to-consumer (B2C) operations like food and beverages, lodging and services.

In the early stages of CRS implementation, registration was voluntary. From July 2007, however, a business with gross revenue of a designated amount or greater or in specified industries was required to register as a cash receipt issuer (or registered store).

4.2.2. Issuance Threshold

Following a review of network cost, effective tax rate, operational efficiency and social payment customs, the amount of KRW 5,000 (US$5.26) was determined as the minimum spending required for a cash receipt. Though the country no longer needs an issuance threshold, it is necessary in the initial stage of CRS implementation.

4.2.3. Incentives for Issuers and Consumers

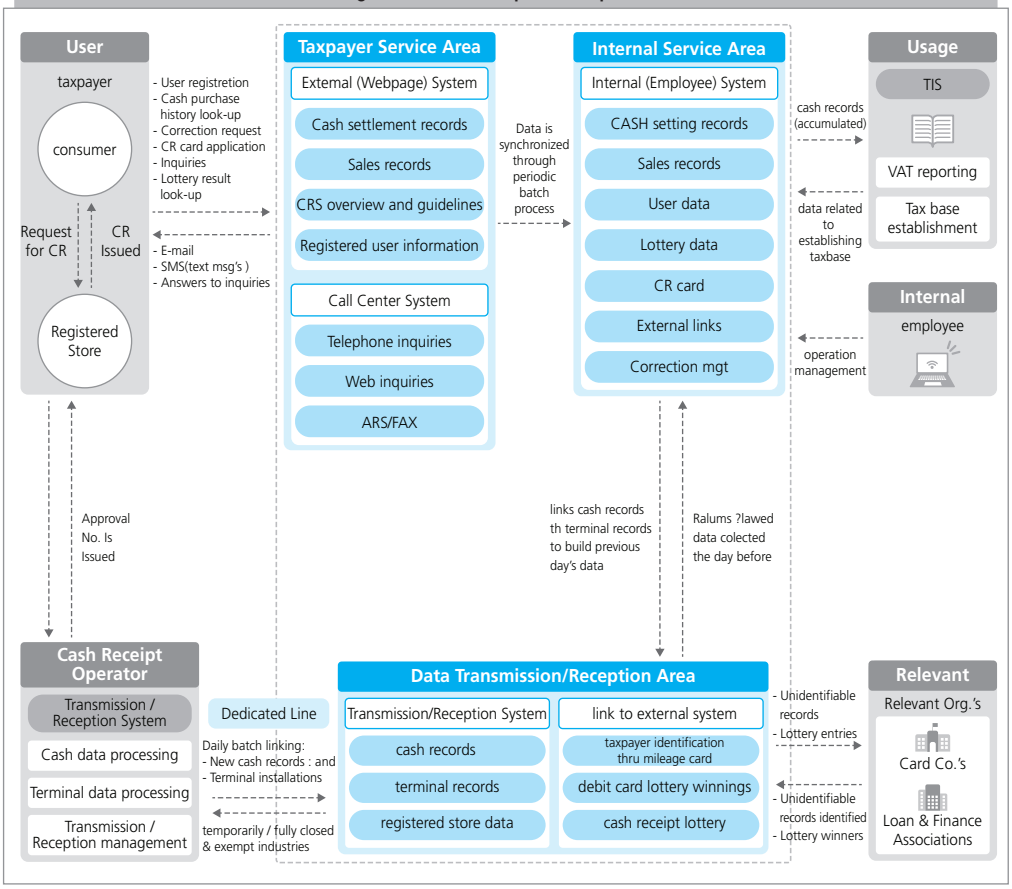
Both the seller and buyer have tax incentives to participate in the CRS. Stores can qualify for a VAT credit of one percent of the combined amount of cash receipts

issued as well as income tax credit. Consumers can get an income tax deduction for cash purchases exceeding a certain amount and automatic entry to a monthly lottery draw.

4.2.4. IT System

The ICT infrastructure behind the CRS comprises 35 servers, 170 copies of 21 software versions and 110 sets of 12 types of equipment. The system relays cash transaction data between the NTS and the CRS operator. The data is then stored and delivered to the system user, NTS employee and call center representative.

[Figure 2-8] Conceptual Map of CRS



Source: NTS (2007).

4.2.5. Terminal Installation

By providing free of charge chips that enable a credit card terminal to issue cash receipts, the CRS minimized the cost burden of issuers by not requiring new

terminals. Real estate agents and private education facilities typically have too few transactions to consider installing a CRS device. To lighten the cost of purchasing something they will use infrequently, the NTS offers a service in which cash receipts are issued online.

[Figure 2-9] Combine Some Chips with Credit Card Terminal for CRS

Source: NTS (2007).

4.2.6. Proper Identification

A business registration number is used as a unique identifier for tracking a store owner's overall sales for which cash receipts are issued. For consumers, a resident ID or mobile phone number or cards like credit, debit or cash receipt are used for identification for consumer purchases.

[Figure 2-10] Cash Receipt Card

Cash Receipt-Purpose Identification Card

Source: NTS (2007).

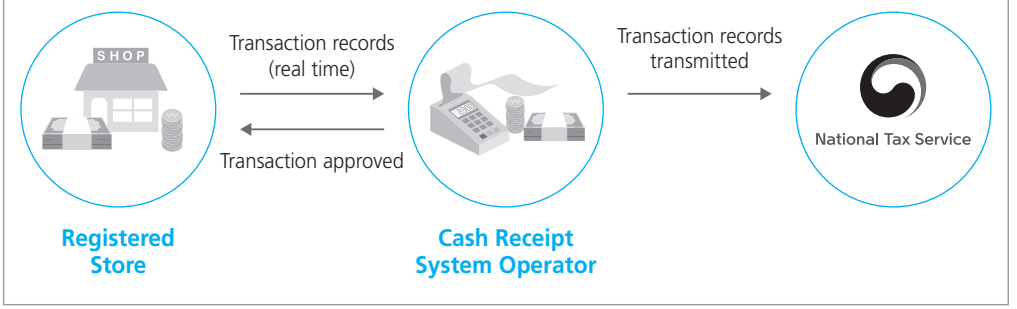
4.2.7. CRS Operator

A CRS operator relays cash receipt issuance records from the store to the NTS. The existing credit card network is used for transmitting records of cash transactions. A

CRS operator is selected through an open bidding among network operators (e.g., telecommunications or automatic funds transfer operators or POS providers).

Cash transactions recorded on the store terminal are sent in real time to the CRS operator through the credit card network. The CRS operator then collects the data and sends them to the NTS daily over a dedicated line linked directly to the tax authority. An extra charge is added only for the installation and use of the dedicated line.

[Figure 2-11] Operation of CRS



Source: NTS (2007).

4.2.8. Pilot Run

Once the ICT system enabling the CRS was completed in late October 2004, department stores, large discount chains and other retail outlets with heavy customer traffic were selected for a pilot run of the system. Testing covered how all the components came seamlessly together, from when a consumer is issued a cash receipt at the point of sale to when data are sent from the store to the CRS operator and then on to the NTS. Then the data went back again to close the loop at the consumer level, when the buyer logs on to the internet to view past purchases and sees who won the lottery.

4.2.9. Increasing Consumer and Business Awareness

All forms of advertising and marketing were used to promote use of the CRS in the Republic of Korea, from nationwide street campaigns and how-to sessions to mass media ads on TV, radio, cyberspace and promotional video clips. The CRS' performance in the first year was analyzed, for instance, by age, gender and region to customize promotion for a variety of demographic segments.

To lower the cost for a store owner, instead of making stores purchase a CRS terminal, a free chip was developed for installation in a credit card terminal and

enabling the issuance of cash receipts. Those refusing a CRS chip were identified for administrative guidance by the NTS. All credit card terminals now come with the cash receipt function.

A CRS card for use exclusively for personal identification for cash receipt purposes is distributed to consumers free of charge, though most buyers simply enter their cell phone numbers for faster issuance of receipts and more convenience.

Certain business owners have no or few records of cash receipt issuance because of their reluctance to disclose their real cash income. NTS staff visited such stores to provide practical administrative guidance, including recommending issuance and showing them how cash receipts are issued. Many channels were put into place that allow consumers to individually report registered stores that refuse to issue cash receipts. Businesses reported as refusing to issue cash receipts are subject to NTS actions of varying degrees, ranging from receiving simple administrative guidance to being asked to provide a business activity statement and/or revised return and undergoing a tax audit.

4.3. Conclusion

The cash receipt system (CRS) will help broaden Tanzania's tax base since it enables the government to detect cash transactions between consumers and the self-employed. A crucial element of this system is tax incentives for both stores and consumers in the initial stage of implementation. Such incentives can effectively induce both consumers and sellers to participate in the CRS. Before the system's implementation, information on cash transactions was the exclusive domain of sellers but thanks to the CRS, such data are shared by the consumer, seller and government. Moreover, related technology should be developed to implement the CRS, and its implementation will give Tanzania a chance to develop its ICT to a higher level.

Yet Tanzania might not be ready to implement the CSR right away. One major hurdle is the country's lack of social security or national ID numbers to identify taxpayers doing cash transactions. An answer to this problem is mobile phone numbers, as about 20 percent of transactions in the country's urban areas are done via mobile phone. Thus gradual implementation of the CRS is recommended from urban to rural areas. At the same time, the government should introduce a personal identification system such as a social security or resident number to require individual identification for social welfare, public health and tax purposes.

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2016/17 Knowledge Sharing Program with Tanzania:
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Industrial Research for Sustainable Industrialization

Chapter 3

Strengthening Industrial Research for Sustainable Industrialization

Strengthening Industrial Research for Sustainable Industrialization

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Summary

This study analyzed the experiences of think tanks in the Republic of Korea in helping and boosting the growth of the country's industrial technology. The three institutions targeted in this study were TIRDO (Tanzania Industrial Research and Development Organization), TEMDO (Tanzania Engineering and Manufacturing Design Organization), and CAMARTEC (Centre for Agricultural Mechanization and Rural Technology). This study first performed an overview of Tanzania and the three institutions then did a survey of the perceptions of staff on the roles of their institutions. Among the common challenges cited in the poll at the institutions were insufficient budget and human resources, outdated facilities, weak link with the private sector and between supply and demand, and lack of technology transfer systems.

A country lacking institutions that provide technical support to industry to enhance efficiency and upgrade technology simply cannot industrialize. The Tanzanian government thus seeks to give its industrial think tanks a shot in the arm. The Republic of Korea has a benchmark that Tanzania can emulate: Korea Institute of Industrial Technology (KITECH).

The Republic of Korea's specific experiences, especially KITECH's strategies and actions, can serve as best practices for Tanzanian industrial think tanks. The biggest difference between think tanks in both countries was found to be the degree of staff

enthusiasm stemming from incentives. So this study elaborated on KITECH's policies and efforts to link think tanks with industries in relation to the suggestions made to the Tanzanian think tanks. KITECH's policies and practices mentioned in this report include the technology transfer process, SME contact center, partner company system, technology community, field partnership, open lab, regional business incubation center and globalization support. Elaboration is also provided on KITECH's human resource management of researchers and incentive programs.

The study's five recommendations for action plans for Tanzania are:

1) SME partner systems: Each technical staff member or researcher of a think tank needs to form long-term relationships with partner SMEs. Just as KITECH researchers have at least five SME partners, Tanzanian counterparts need a certain number of similar partners and handle all processes required for their growth. Such a long-term relationship will boost staff responsibility and result in continuous support from institutions to SMEs. At the same time, an incentive program can be made possible if the technical staff forms partnerships with SMEs.
2) Incentives for institutions: KITECH researchers clearly understand that SME success directly or indirectly leads to substantial financial benefits. Such researchers are thus eager to help their partner SMEs. Tanzania needs to offer similar incentives. On top of basic salary, incentives are needed to motivate technical staff to actively help SMEs. The first step in this process, however, is assessment of a research institution's financial condition. The budget of a Tanzanian think tank is far from enough to set up the incentive system. So the government needs to earmark more funds for this from the beginning.
3) Autonomy of think tank operations: Regardless of changes in cabinets or administrations, research institutions require independence and consistency in operations. For that purpose, a control tower for the three research institutions should be clearly defined.
4) Educational function needed: Tanzania can benchmark the Republic of Korea's University of Science and Technology (UST) model. The UST is a graduate school, with students pursuing master's degrees and Ph.Ds. working for and studying at research institutes. Researchers with doctorates can serve as advisers to students. Think tanks with this type of educational function could prove effective in Tanzania. Graduate students are encouraged to work for or are linked to jobs at TEMDO, TIRDO or CAMARTEC under certain agreements. This can help Tanzania in two ways. First, it helps raise the quality of education and lead to a curriculum focused on field and industry. Second and more importantly for research institutions, the model can alleviate labor shortages.

5) More cooperation among the three institutions: A control tower is needed to promote cooperation and coordination among the three institutions. If this is too difficult to do over the short term, Tanzania can organize a council for such institutions that helps them share strategic goals and research plans. Pooling of resources merits serious consideration. Another method of good cooperation is regional specialization. Since TIRDO and TEMDO are in different regions, regional specialization as practiced by KITECH can be considered.

1. Introduction

1.1. Research Background and Objectives

Tanzania's economic performance since 2006 has steadily grown under its economic liberalization policy. This is seen through steady improvement in the performance of macroeconomic policy targets based on reforms implemented since 2006. Consistent GDP growth provides an opportunity for wealth creation and more resources for strategic investment in high growth activities and enhanced global competitiveness. The latest driver of growth is the service sector, which contributes 49.5 percent of GDP followed by agriculture with 23.7 percent and industry with 10.5 percent.

Tanzania has the high ambition of becoming a middle-income country, but remains hampered by low manufacturing growth; the sector accounts for just 10.5 percent of the country's GDP. Precedents elsewhere in the world show that steady GDP growth to a level sufficient enough to raise an economy to middle-income status is achievable only through a vibrant manufacturing sector, which in turn is supported by productive think tanks.

The Tanzanian Ministry of Communication, Science and Technology recently received preliminary recommendations from the KSP 2015/16 under the project "Enhancing the Contribution of Science, Technology and Innovation in National Economic Development." The recommendations for Tanzania included achievement of rapid industrialization needs to strengthen its research institutions. The report's recommendations, however, are too general per the scope of the KSP program, which was aimed at identifying general problems affecting the national innovation system.

Based on its previous KSP, Tanzania needs to collaborate with the Republic of Korea in conducting a diagnostic study on industrial think tanks in Tanzania. This

choice is based on Tanzania's decision, through its new five-year development plan, to focus more on building multiple industries with emphasis on manufacturing and value-added agricultural produce.

1.2. Methodologies and Scope

This study sought to share the experiences of think tanks in the Republic of Korea in helping and boosting the growth of industrial technology. In other words, specific recommendations will be given for boosting the capacities of industrial research institutes in Tanzania.

The three research institutions with the biggest R&D contributions to Tanzania's industrialization are TIRDO (Tanzania Industrial Research and Development Organization), TEMDO (Tanzania Engineering and Manufacturing Design Organization) and CAMARTEC (Centre for Agricultural Mechanization and Rural Technology).

TIRDO is a multi-disciplinary R&D institution established by an Act of Parliament No. 5 of 1979; it became operational on April 1, 1979. Its mandate is assisting the Tanzanian industrial sector by providing technical expertise and support services to upgrade the sector's technology base. Other mandates include performing applied research for the development of suitable technologies and adding value to indigenous resources through industrial processing.

TEMDO is an applied engineering R&D institution established through an Act of Parliament No. 23 of 1980 and went online in July 1982. Its mandate is helping the country's industrial sector by providing technical expertise and support services in engineering and manufacturing design to upgrade the sector's technological base.

CAMARTEC is a government-run organization established by an Act of Parliament No. 19 in November 1981; its official launch was in July 1982. The center is responsible for applied R&D, promotion, adaptation, adoption and dissemination of appropriate technologies in agricultural mechanization and rural technology.

The Tanzanian government, recognizing the key role of industry and manufacturing in building a knowledge-based economy, has started a five-year development plan (2017–22) and Development Vision 2025. Through both plans, the government is committed to working toward industrialization as clearly demonstrated by its steps taken including the opening of export processing zones (EPZs) and assessment of all privatized industries to assist in improving production. Moreover, the introduction of tax incentives seeks to attract domestic and foreign

investors to Tanzania's manufacturing sector. Manufacturing's share of the country's exports is expected to rise from 23 percent to 40 percent by 2025, and the sector's share of overall employment to increase from the current 3.l percent to 15 percent by 2025. The contribution of manufacturing to GDP is expected to more than double from seven percent to 15 percent by 2025.

The Tanzanian government acknowledges that a country cannot industrialize without institutions providing technical support to industry for enhancing efficiency and upgrading technology. Given Tanzania's plan to invigorate its industrial think tanks, the Republic of Korea offers a prime model for Tanzania to emulate: Korea Institute of Industrial Technology (KITECH).

The basic scope of this study was introducing the Republic of Korea's specific experiences (KITECH is perhaps the prime model for Tanzania to benchmark in this respect) as best practices for Tanzania's industrial research sector. The Republic of Korea's historical experiences and strategies (especially the early stages) are shared; its policies and efforts to link research institutions with industries need further review in relation to suggestions made for Tanzanian think tanks.

Considering that agriculture dominates the Tanzanian economy, direct or individual application of KITECH's strategies to Tanzanian research sector might not be possible. The first step is thus an assessment of Tanzanian research institutions (Section 2) and the perceived needs of technical staff based on the Republic of Korea's experience (Section 3). After presenting these analyses, this study will introduce the strategies and tactics of KITECH and the Republic of Korea government to promote industrial technology and help SMEs (Section 4). Next (Section 5) is suggestions of specific strategic actions Tanzanian research institutions need to adopt based on the Republic of Korea's best practices as well as the situations facing the Tanzanian institutions. Section 6 will conclude this study.

2. The Current Status of Tanzanian Industrial Research Institutions

2.1. Introduction

Generally, Tanzania fully recognizes the importance of research in national economic development. Soon after the nation gained its independence, the government started investing in research activities. The country has an estimated 77 R&D institutions comprising those in agriculture (seven with 13 stations), livestock (two with 9 stations), fisheries (one with three stations), energy and industry (six), natural

resources (two), health (four with 10 stations) and institutions of higher learning (55). Among the country's six R&D institutions specializing in industry and energy are the top three of Tanzania Engineering and Manufacturing Design Organization (TEMDO), The Centre for Agricultural Mechanization and Rural Technology (CAMARTEC), and Tanzania Industrial Research and Development Organization (TIRDO).

The private sector, however, has had limited involvement in research activities over the years. Only recently have a few privately run think tanks started operations: Research for Poverty Alleviation (REPOA), Ifakara Health Institute (IHI), Tea Research Institute of Tanzania (TRIT), Tanzania Coffee Research Institute (TACRI) and Tanzania Technology Development Organization (TaTEDO), in addition to private universities.

Coordination and Management of the R&D System

The Tanzanian Ministry of Education, Science and Technology (MEST) coordinates R&D activities in the country. Other ministries, however, oversee the same activities in their respective sectors. The Tanzania Commission for Science and Technology (COSTECH), which was established by an Act of Parliament No. 7 of 1986 (CAP 226 R.E. 2002), is the principal advisory organ to the government on all scientific research, technological development and coordination of research activities in the country under the MEST.

2.2. Overview of Industrial Research Institutes in Tanzania

Tanzania has three R&D institutions specifically for industrial development that each have a specific legal mandate: Tanzania Engineering and Manufacturing Design Organization (TEMDO), The Centre for Agricultural Mechanization and Rural Technology (CAMARTEC), and Tanzania Industrial Research and Development Organization (TIRDO).

2.2.1. Tanzania Engineering and Manufacturing Design Organization

TEMDO is an applied engineering R&D institution established through an Act of Parliament No. 23 of 1980 and started operations in July 1982. TEMDO, like its two sister institutes, is under the Ministry of Industry and Trade.

TEMDO has a broad mandate of conducting R&D and delivering competitive engineering and manufacturing knowhow and R&D services to the industrial sector. Specifically, its mandate includes:

i. Designing and promoting design of products and processes for Tanzanian industry in accordance with the government policy toward national industrial development
ii. Adapting foreign designs of machinery and equipment to suit conditions of manufacturing, use and maintenance
iii. Designing tools, dies, jigs and fixtures required by the industrial sector
iv. Offering technical extension services including training aimed at upgrading the skills of technical personnel at all levels and establishments in the country and enabling industry to produce products or processes for mass marketing
v. Assisting the industrial sector, either alone or with other bodies, in solving production bottlenecks for raising productivity, capacity utilization and quality of products
vi. Providing relevant information and advice to the industrial sector on production, purchase and supply, quality control, marketing and other related areas
vii. Identifying and conducting short courses within the organization's competence and capacity levels and cooperating with other institutions in the implementation of such courses
viii. Giving on-the-job training to engineers in design, production engineering, foundry technology, tools, dies, presswork, specialized welding, design, draftsmanship and machinery maintenance and for industrial electricians and electronic technicians
ix. Offering consulting services in engineering, design and other technical tasks
x. Acting as the national link with other international institutions performing activities related to the organization's functions

2.2.1.1. Human Resources at TEMDO

TEMDO has a staff of 50 comprising thirty (30) technical personnel (professional engineers, technicians, draftsmen and artisans) and twenty (20) administrative workers.

2.2.1.2. Outputs and Their Uses in Industries for the Last 5 Years

Over the past 30 years, TEMDO has offered services to small and medium enterprises (SMEs), especially those in plant and equipment manufacturing. A few of its successful products include:

i. Seed oil extraction and processing plants and equipment

ii. Palm oil extraction and processing plants and equipment
iii. Grain and seed dressing machines
iv. Centrifugal pumps for irrigation and industrial applications
v. Mobile tractor PTO-driven saw mills
vi. Grain processing machines
vii. Milk processing plants and equipment
viii. Honey processing equipment
ix. Fruit processing plants and equipment
x. Biomass briquetting plants and equipment
xi. Chicken abattoir
xii. Clay brick extruding plant
xiii. Medical waste incinerators
xiv. Peanut butter factory
xv. Machinery for producing leather products

The major projects for technical support undertaken by TEMDO over the past five years include:

i. Spare parts survey and preparation of drawings for Tanzania Portland Cement Co., Ltd. of Dar es Salaam; Tanzania Cordage Industries of Tanga; Tanzania Breweries Ltd., Arusha Plant, (1992, 1994, 1996, 2003/04)
ii. Design, construction, installation and commissioning of an aluminum furnace for Aluminum Africa Ltd. (ALAF) of Dar es Salaam (1995)
iii. Design, manufacturing and commissioning of a 70-ton special purpose hydraulic press for TPC Ltd. of Moshi (1995)
iv. Feasibility study on the construction of a factory for coffee husks briquetting for Tanganyika Coffee Curing Co., Moshi Tanzania (2000)
v. Design, fabrication and installation of air duct systems for Serena Hotels (1999, 2000, 2001)
vi. Design, fabrication and installation of malt screw conveying systems for Tanzania Breweries Limited Maltings Plant, Moshi (2000, 2001)
vii. Design, manufacturing and installation of a pneumatically operated kiln inlet sealing mechanism for Tanzania Portland Cement Co., (2001/02 and 2003/04)
viii. Design of punching and bending tools for manufacturing of cane wagon bumper brackets for TPC Ltd. of Moshi (2001)
ix. Design and manufacturing of a powder mixer for Continental Chemicals (2002) and UNILEVER of Ethiopia (2004)

x. Design, manufacturing, installation and commissioning of drying oven for traction motors and armatures for TAZARA – Mbeya (2006)

xi. Installation of ginnery machineries for Cargill (T) Ltd. at Lalago in Maswa (2006)

xii. Design, manufacturing and installation of fume extraction system for ABB Tanelec, Arusha (2006)

xiii. CAD and drafting services for Kilombero Sugar Co., Ltd. (2007)

TEMDO also offers training programs aimed at filling identified knowledge and skills gaps. It runs both general courses and tailor-made training programs designed to meet specific client industries or institutions. More than 40 general courses and customized training programs have been conducted for more than 600 engineers and technicians from industries and institutions.

2.2.1.3. TEMDO Challenges and Opportunities

The main problems facing TEMDO are:

i. Inadequate and outdated working facilities for industrial and technological development

ii. Overdependence on government funding leading to inadequate design and prototype development facilities

iii. Below-market value and constant erosion of TEMDO employee remuneration and incentive packages due to escalating inflation and economic woes

iv. Lower demand for TEMDO products due to availability of low quality and cheap plants and equipment because of trade liberalization

v. Wider market availability of low quality and lower cost plants and equipment because of trade liberalization reducing demand for TEMDO products

vi. Poor knowledge of TEMDO products and services by majority of stakeholders, resulting in low market growth

vii. Shortage of funds to undertake daily R&D activities

viii. Inadequate number of human resources)

ix. Poor system of technology transfers to end users

Opportunities:

i. Large potential of an untapped market for equipment, plants and technical services designed for use in Tanzania offer a great opportunity for TEMDO to expand within Tanzania and in neighboring countries

ii. ICT has also raised prospects for TEMDO to design affordable and customized equipment and plants
iii. Growth of health, safety and environmental awareness boosts demand for eco-friendly equipment and plants for environmental preservation and pollution control
iv. The emergence of an entrepreneurial mindset among the semi-skilled and skilled population, bureaucrats, NGOs, CBOs and other stakeholders has a positive effect on demand for TEMDO products and services
v. Globalization and increasing regionalization (e.g., EAC, SADC and NEPAD) allows TEMDO to partner up and collaborate with many stakeholders

2.2.2. The Centre for Agricultural Mechanization and Rural Technology

The Centre for Agricultural Mechanization and Rural Technology (CAMARTEC) is a state-run organization established by an Act of Parliament No. 19 in November 1981. Located in the Njiro area of Arusha Region in northwestern Tanzania, the center officially started operations in July 1982 with the duties of applied R&D, promotion, adaptation, adoption and dissemination of appropriate technologies in agricultural mechanization and rural technology.

CAMARTEC's functions per the center's charter are:

i. Promoting and conducting applied research designed to facilitate the design, adaptation and development of machinery and equipment suitable for use in agricultural and rural development
ii. Developing and manufacturing approved prototypes, components and agricultural technologies and evaluating their suitability for adaptation and use in rural agricultural production
iii. Developing and manufacturing approved prototypes, components and spare parts of agricultural machinery and equipment unavailable in large quantities in the country
iv. Adapting foreign designs of agricultural machinery and equipment to suit domestic conditions of manufacturing and maintenance for use in agricultural development
v. Testing all types of machinery and equipment intended for use in agricultural and rural development in Tanzania and releasing the results of all tests
vi. Creating and running short-term courses on practical training and providing further knowledge to villagers and other artisans in the use and maintenance of agricultural machinery and other appropriate technology, machinery and equipment

vii. Advising and providing support services to organizations and persons undertaking the extension and implementation of programs and projects resulting from the center's activities

viii. Offering consulting in the design, testing and other technical aspects of agricultural and other machinery and equipment for use in rural development

ix. Offering consulting on the marketing, financial and other managerial aspects of agricultural and rural development through the adaptation and use of appropriate technology

x. Providing information and advice to the agricultural sector on the design, production, marketing, supply, use and maintenance of agricultural and other appropriate technology, machinery and equipment

xi. Formulating and implementing projects and programs, designed to encourage or facilitate the establishment and development of village workshops and other facilities for rural production and maintenance

xii. Acting as the national link, with other national and international institutions performing activities related or like the center's functions

2.2.2.1. Human Resources at CAMARTEC

CAMARTEC has 70 permanent staff, 52 of whom are male and 18 female. Thirty-six are technical staff and 34 support staff (Table 3-1). Also, 33 members have an engineering background, three (3) of whom have a postgraduate engineering degree and five (5) are graduates (Table 3-2). A 2007 staff audit showed that the center had 71 staff, six (6) of whom were graduates and five (5) postgraduates (CAMARTEC, 2007). This shows a slight drop in the number of postgraduates and graduates, a rather unhealthy trend for the organization. In fiscal 1989/90, the center had about 170 permanent staff including 89 technical (CAMARTEC, 1990), registering a drop of 100 permanent staff between 1990 and 2016. According to long-serving CAMARTEC staff, a major loss of 120 employees happened in 1995 as they opted for early retirement. Over that period, an economic crisis in the Third World prompted the World Bank to introduce a structural adjustment program advising the Tanzanian government to reduce its workforce and that the bank would cover the cost of layoffs. As a technological institution to adapt, develop and transfer rural engineering technologies to communities, the center lacks an adequate number of professional staff to allow efficient responses to the needs of a significant proportion of rural Tanzanians. Especially lacking in number are engineering and other professional staff needed for handling planning, marketing and legal issues. The gender disparity is especially pronounced among engineering staff, who perform a core function for the center. And the majority of rural activities, which requires manual labor, is carried out by youths and women. Achieving a gender balance will imply a proper response to the needs of rural clients.

Other departments such as that of testing have just five (5) staff, three (3) of whom having standard seven education, one (1) with trade test and one with a graduate education. One of the center's functions is to conduct testing on all types of machinery and equipment for use in national agricultural and rural development and publish the results of all tests (URT, 1981). Just five staff regardless of education level cannot handle such a huge burden. So among the strategic forms of intervention to be undertaken include recruitment of a sufficient number of personnel so that CAMARTEC can fulfill its mandate. The decision to recruit will come after conducting a thorough human resource audit.

〈Table 3-1〉 Technical and Support Staff at CAMARTEC

Category	Male	Female	Total
Technical staff:	33	3	36
- Technologists	8	1	9
- Technicians	11	1	12
- Artisans	14	1	15
Support staff	19	15	34
Total	52	18	70

〈Table 3-2〉 Education Level of CAMARTEC Staff

Level of Education	Male	Female	Total
Engineering:	31	2	33
- Ph.D.	1	-	1
- Master of science	2	-	2
- Bachelor of science	4	1	5
- Diploma	3	-	3
- Trade certification	16	1	17
- Standard VII	5	-	5

〈Table 3-2〉 Continued

Level of Education	Male	Female	Total
Support staff:	21	16	37
- CPA 2 – 2	2	-	2
- Masters 5 1 6	5	1	6
- Advanced Diploma - 2	-	2	2
- Diploma	4	2	6
- Certificate	-	5	5
- Form IV	-	3	3
- Standard VII	10	3	13
Total	52	18	70

2.2.2.2. Linkages and Cooperation with Private Sectors in R&D

CAMARTEC closely works with stakeholders and groups of people who are either directly or indirectly linked to it. Such stakeholders and groups representing schools, NGOs, think tanks, institutions of higher learning , companies, prisons, cities, villagers, students, regional offices and all those with the same mission as the center or targeting the same type of people. Through such collaborations, CAMARTEC works with both Tanzanians and foreign nationals from countries like the Netherlands, Canada, the US, China, Poland, Brazil, Kenya, Uganda, India, the Republic of Korea and the UK. Subordinates from a few of these countries have often worked with CAMARTEC in many research projects.

2.2.2.3. Research Outputs and Their Uses in Industries for the Last 5 Years

CAMARTEC has developed and disseminated technologies including animal-drawn implements, ridger ploughs, cultivators, carts and energy-efficient stoves. The available information indicates that the center since its establishment has transferred various technologies as shown in <Table 3-3>.

〈Table 3-3〉 CAMARTEC's Transferred Technologies

Category	Technology	Quantity
Animal-drawn implements	CAMA ploughs	2,520
	Kifaru ploughs with or without planters	473
	Ridgers	270
	Cultivators	864
	Oxcarts	7,120
	Donkey carts	2,570
Processing machines	Oil pressing machines	2,719
	Forage choppers	104
Energy technologies	Community cooking stoves	1,500
	Improved cooking stoves	650
	Biogas plants	1,252
	Solar water heaters	36
	Solar cookers	45
Rural structure technologies	Cinvaram brick making machines	300
	Grain storage bins	53

CAMARTEC is focusing more on a program aimed at upscaling the use of biogas in rural areas. Through this program, institutions like schools, prisons, colleges and military have benefitted. Major projects in progress include:

i. The modified CAMARTEC design (MCD) bio-digester as well as the solid state digester (SSD) for dry areas

ii. Tractor project: The CFT is a four-wheel 16.4 KW (22Hp) small multi-use tractor intended to meet the requirements of farm power for small farms up to 25 acres

[Figure 3-1] CFT Small Multi-use Tractor

2.2.2.4. CAMARTECH Challenges

Despite the challenges facing CAMARTEC, progress has been made in the center's efforts toward improvement of production of appropriate and demand-driven technologies such as:

i. Production of more than ten (10) hand-operated hay balers
ii. Production of more than five (5) tomato seed extractor machines
iii. Improvement in forage choppers from big and expensive to smaller and chipper with improved forage output
iv. Development of two (2) animal-drawn planters for an organizations (BioRE) in Meatu
v. Development of two (2) power tiller-operated direct seeders in collaboration with farm mechanization and conservation agriculture for sustainable intensification (FACASI) project
vi. Improvement of more than ten (10) animal-drawn planters from Nandra Engineering to meet requirements of Morogoro Mechanization Center

The center also developed a tractor with the brand name CAMARTEC Fastruck (CFT) Model 221 as shown by the technology produced by the center. The tractor is designed to provide energy solutions for smallholder farmers with farms ranging in size between 0.9 and 3.0 ha and where the CFT will prove more economical and provide a wider range of uses than conventional tractors of 30 HP and higher available on the market. The CFT tractor was also designed with rural investors in mind; the versatile vehicle caters to smallholder farmers and rural communities that urgently need access to advanced agro-technology. By June 2010, the center had six tractors, conducted station tests and modified the tractors according to the collected views of stakeholders through demonstrations, field tests and surveys. CAMARTEC also obtained funds from COSTECH for additional production of CFT tractors.

Simultaneously, CAMARTEC took charge of improving the promotion of biogas digesters and continued advancing the technical aspects of biogas digester design and appliances with R&D, providing training and bio-slurry management. Its R&D activities were oriented to adapt to and improve the Chinese fixed dome design. CAMARTEC also introduced a sanitary biogas plant featuring integrated installation with composing toilets and septic tank treating human fecal waste to produce gas for cooking.

CAMARTEC also forged a strong partnership with the private sector in the production, distribution and use of CAMARTEC technologies. The center collaborated with a private company in the development of Tanzania's most advanced tractor. Initial production saw six units made and efforts are underway to finish the other 14. CAMARTEC has trained more than 800 private builders of biogas plants from around the country. More than 400 private contractors participated in the building of biogas plants from 2009–17, resulting in a larger number of biogas plants installed (institutional and domestic) in the country. CAMARTEC maintains close collaboration with these contractors.

The center has also enhanced its provision of services, especially in the biogas sector. The Tanzania Domestic Biogas Program (TDBP) has trained more than 800 private contractors, more than half of whom have maintained regular communication with the center. Over the past five years, the center has tested the following machines:

i. More than ten (10) riding tractor models from 2008–17
ii. More than eight (8) walking tractor models (power tillers) from 2008–12
iii. More than five (5) models of power tiller-operated direct seeders in collaboration with a FACASI project
iv. One rice transplanter
v. One tractor-operated (Elmi) planter

Regulations on the testing of agricultural machinery and rural technologies were developed and implemented. CAMARTEC also conducted training on subjects related to HIV/AIDS. Effective forms of contraception and methods to prevent sexually transmitted diseases like condoms were made available to staff at office bathrooms. Gender issues were also discussed. For example, efforts to alleviate the gender imbalance include equal opportunity employment, women's participation in management and meetings of workers' councils. Tanzanian women every year participate in RAAWU Women's Day. The designs of various technologies consider women and youth. The environmental issues under consideration include the development and improvement of eco-friendly technologies such as biogas, energy-efficient stoves, solar cookers and interlocking block machines. And the center participated in the planting of 240 trees at its headquarters and branch in Nzega.

Other challenges included:

i. Little application of agro-technology to crop processing, harvesting and planting
ii. Lack of attention to agro-technology challenges in weeding and applications of pesticide and fertilizer, and irrigation
iii. Failure to document technologies developed and research results
iv. Non-completion of 14 CFT tractor units as planned
v. Non-marketing and sale of six completed tractor units
vi. Failure to improve CFT tractor gearbox
vii. High initial investment in biogas units
viii. Few trained masons to implement plant construction contracts
ix. Weak customer knowledge of biogas technology (during feasibility study)
x. Conflict of interest in shift toward biogas
xi. Lack of testing regulations and power to get machinery dealers to bring machines for testing
xii. Lack of awareness among most stakeholders on what types of machines should be tested; just agricultural tractors being tested but no other agricultural machines
xiii. Tendency of certain customers to bring agricultural machines for testing only when they hear of a government tender announcement
xiv. Challenges in cross-cutting issues
xv. Lack of policy toward cross-cutting issues (HIV/AIDS, gender imbalance and environmental pollution)
xvi. No regular education on cross-cutting issues (HIV/AIDS, gender imbalance and environmental pollution)
xvii. No budget for cross-cutting issues

CAMARTEC is working hard to:

i. Promote implementation of applied research on agricultural mechanization, energy and rural technologies
ii. Develop and manufacture prototypes or adopt foreign designs of agricultural mechanization, energy and rural technologies
iii. Set standards, quality control and test procedures for agricultural machinery and rural technologies
iv. Evaluate and perform tests on agricultural machinery and rural technologies under established standards, quality control and test procedures
v. Provide technical support, training, marketing and consulting companies that promote uptake of agricultural machinery, energy and rural technologies

vi. Do what is necessary to facilitate proper and efficient implementation of center functions

2.2.3. Tanzania Industrial Research and Development Organization

Tanzania Industrial Research and Development Organization (TIRDO) is a multi-disciplinary R&D organization based in Dar es Salaam Region and established by an Act of Parliament No. 5 of 1979; it began operations on April 1, 1979.

TIRDO has the following key mandates:

i. Promote the implementation of applied research designed to facilitate the evaluation, development and use of domestic materials in industrial processes
ii. Research domestic and foreign industrial techniques and technologies and evaluate their suitability for adaptation and alternative use in industrial production in Tanzania
iii. Advise the government and companies engaged in industrial production on the adoption and adaptation of industrial production technologies
iv. Offer industrial production companies advisory technical services on the establishment of systems to control and regulate industrial processes to improve performance and avert or minimize industrial pollution

2.2.3.1. Human Resources

A common problem for most R&D institutions in Tanzania is shortage of qualified and trained personnel. <Table 3-4> shows the available workforce at TIRDO.

〈Table 3-4〉 Technical and Support Staff at TIRDO

Category	Male	Female	Total
Technical staff	16	18	34
Technicians	12	7	19
Support staff	21	10	31
Total	49	25	84

2.2.3.2. TIRDO Research output for the past 5 years

From 2011–16) TIRDO provided research and technical services (with some ongoing) to support industries per the organization's core function. Research and technical services in food processing and biotechnology, information and communication technology (ICT), fiber technology (textiles and leather) chemical analysis, environment and renewable energies were carried out. Studies were done on:

i. A greener system for cassava processing leading to zero waste for enhanced market access by small and medium entrepreneurs
ii. "Bioethanol and Biogas Potential of Wild Cassava, Manihot sp: Microbial and Process Conditions for Bioconversion." The purpose of this study was to characterize wild cassava species for bioenergy production
iii. Feasibility of bioethanol production from tubers of Dioscorea sansibarensis and Pyrenacantha kaurabassana
iv. Characterization of spent bleaching earth and improvement of biogas through supplementation of manure
v. Production of citric acid from two non-edible yam species of Dioscorea sansibarensis and Pyrenacantha kaurabassana
vi. Development of functional cooking oil through blending minor and conventional oils
vii. Utilization of Tanzanian oilseed meals in development of high protein foods and nutraceuticals ingredients
viii. Development of mushrooms rich in nutraceuticals folic acid (Coprinus cinereus)

2.2.3.3. Linkages and Cooperation with Private Sectors in R&D

As a research organization, TIRDO has formed relationships with stakeholders in a range of industries from academia to manufacturing and other research organisations and end users. Among academic institutions, universities in Tanzania have teamed up with TIRDO, which has concluded memorandums of understanding (MOUs) with Mzumbe University, Nelson Mandela African Institution of Science and Technology and Sokoine University of Agriculture. Collaboration is aimed at covering all aspects of academic, scientific and cultural activities in higher education, research and consulting as well as R&D linking academia and industry. Other MOUs cover specific research projects such as one run by Hubert Kairuki Memorial University, Guangdong Institute of Microbiology (China) and TIRDO on "capacity building for the commercial production of edible and medicinal mushrooms in Tanzania" and another between Ardhi University and TIRDO on "collaboration on establishing

offsite data backup to the parties and other joint programs." TIRDO also fosters relationships with universities in Denmark that facilitate prominent speakers visiting TIRDO to impart cutting-edge knowledge and research skills.

Industrial links, as a key feature of TIRDO, refer to the dissemination of research findings to stakeholders in industry as well as working in tandem with them to develop improved technologies suitable for their processes. Under this category, TIRDO formed links with KISOKA Co. (on the transfer of plastic recycling technologies), SONGAS LTD. (for the provision of services of non-destructive examination) and MZINGA Corp. (on smooth R&D, provision of technical services and commercial activities for industrial enhancement). TIRDO also works with the State Mining Corp. (to cover coal quality testing) and has direct relationships with both large corporations and SMEs to provide consulting. Several of these services are offered through investment and commercial banks that finance Tanzanian industry. TIRDO has thus concluded MOUs with banks such as TIB and CRDB.

TIRDO also has links with other research organizations nationally, regionally and internationally. One is Match Maker Associates (TZ). Under this collaboration, the two think tanks worked on the campaign "Vegetables for AU (VFA)" that was part of the Amsterdam Initiative against Malnutrition (AIM). TIRDO also has links to the National Development Corp. (NDC) and Tanzania Atomic Energy Agency (TAEC) (focusing on NDT and climate change). Since the early 1980s, Kenya Industrial Research and Development Institute (KIRDI) and TIRDO have had a working relationship that was updated in 2004. The aim of both think tanks is facilitation of the development and implementation of joint projects and sharing of research facilities and human resources. Another long-standing collaboration of TIRDO is with CSIR of India that started in 1995. Most recently, an action plan (2016–19) between the two organizations was initiated under the goals of capacity building, identification of niche research areas, and development of a comprehensive and detailed training program for science and technology.

A more recent connection was made between TIRDO and Tübitak Marmara Research Center (Turkey) to "strengthen, broaden and expand relationships within the scientific and technological communities in both countries." International organizations such as the U.N. Human Settlements Program (UN-Habitat) and U.N. Industrial Development Organization (UNIDO) also have links to TIRDO. UN-Habitat focused on energy efficiency in buildings under an East African program, while UNIDO sponsored projects within TIRDO.

2.2.3.4. TIRDO Challenges

Given its problems and challenges, TIRDO is conducting an in-depth analysis of its situation, prediction of potential scenarios, and analysis of bridges and barriers that could influence the organization's performance. This process includes thinking and learning about the nature and impact of uncertain and important driving forces and analysis of competitors. The environmental scan was conducted by using effective tools such as self-assessment, stakeholder analysis and viability assessment. It also analyzed and linked TIRDO objectives with national, regional and international policies and strategies such as Sustainable Development Goals, Millennium Development Goals (MDG), National Strategy for Growth and Reduction of Poverty (MKUKUTA), Agricultural Sector Development Strategy (ASDS), Rural Development Policy and Strategy, and Integrated Industrial Development Strategy and Master Plan. Analysis was done of a technique used to understand the organization's strengths and weaknesses and looking at how challenges can be solved in the organization. In the current context of its environment, TIRDO tries to uncover the opportunities to take advantage, and tries to understand its weaknesses. The framework also enabled TIRDO to know and analyze its competitors and craft strategies to enhance its competitive edge in R&D and impress stakeholders by giving them superior value.

TIRDO is also retraining its visionary and committed staff to achieve its set objectives; they are expected to lead TIRDO to the next level and its radical transformation into a customer-oriented R&D institution that performs continual innovation of cutting-edge knowledge and technologies, provides quality technical services and delivers superior value to targeted customers at reasonable cost. TIRDO also developed R&D activities tailored for the country and built a strong institutional innovation base (to tackle the gap between research and the market) that is expected to generate economic and social benefits. With few available resources, the institute devised policies toward human resources and administration, organizational processes, and redesign of workflow. TIRDO reduced the frequency of frustration regression elements by removing destructive conflicts while encouraging creative ones to challenge the status quo and work culture and promote the spirit of honest sharing of information, open communication, and trust between staff and management. TIRDO continually and equitably improves remuneration, employee recognition, and reward and incentive systems with significantly improved output.

Moreover, TIRDO's sufficient physical infrastructure like buildings and labs can:

i. Raise resources to rehabilitate and upgrade laboratories to international standards and accredit them
ii. Improve the maintenance and repair equipment and other support facilities for technical laboratories

iii. Invest in and deploy a modern ICT system to boost the availability of online and real-time information to solve real-time problems
iv. Initiate policy toward the introduction of ISO 9000 and ISO 14000 and the setup of quality and environmental systems

TIRDO has a strong and hardworking management team committed to implementing the organization's transformational changes and overcome challenges through the following plans:

i. Add a division of labor and responsibilities
ii. Offer a strategic direction and develop overarching programs
iii. Exercise the capacity to implement its agenda, strategic plan and mandate
iv. Devise and assess the implication of initiatives, strategies and plans
v. Effectively manage human resources
vi. Conduct fundraising and financial management

TIRDO is also strong in specialized competencies and capacities in select areas such as food technology, energy, environment and non-destructive testing. Its plans are to:

i. Upgrade the technical competence of staff and institutional capacities to existing and future levels of internationally recognized standards
ii. Persistently hawk new TIRDO frontiers, strategic plan and activities at home and abroad
iii. Raise TIRDO's presence and presentation in national, regional and international exhibitions
iv. Protect TIRDO's intellectual property by registering its trademarks and licensing products, names and symbols
v. Develop a customer relationship management system for TIRDO

On a large plot of land TIRDO owns in a prime area for expansion and investment, the organization will:

i. Develop underutilized land and complete unfinished buildings
ii. Devise short- and long-term plans for real estate development
iii. Create a real estate business plan
iv. Prepare pre-feasibility studies (of viability and risk analysis), design and project appraisal and develop plans on financing investment, operations and maintenance

Recently developed and emerging economies can thank technology transfers for most of their growth. So TIRDO has strategies for deploying technological

development and adoption; the types of technical services to be provided will be based on existing and emerging national policies and priorities and future customer needs and preferences. Focus will also go toward R&D streams of technologies and processes reflecting national interests based primarily on domestic resources that will increase gains in industrial production efficiency and, net benefits, and bring a great deal of customer delight and economic growth. To foster Tanzania's budding industrial sector, TIRDO will need substantial R&D intervention and support from the government to enable responses to its fast-changing microeconomic environment and ever-shifting market demands through the following courses of action:

i. Facilitate the development and transfer of all kinds of technology according to needs and in line with expected demand
ii. Directly participate in commercial ventures and entrepreneurial projects such as incubators, and create mechanisms to allow employees to take part in ownership
iii. Diversify delivered products and services per changing demand and customer preferences
iv. Revise business strategy and project portfolio to focus on strategic and adaptive R&D, provision of commercially viable technology platform programs and technical services, and training
v. Source and disseminate appropriate, efficient, adaptable and affordable industrial techniques and technologies, especially for agricultural SMEs and industries dealing with value-added products
vi. Advise and provide technical support, including business intelligence, to industrial SMEs and processing companies that need to upscale their facilities and expand their scale and scope of production and business capacities
vii. Start initiatives for advising and assisting industries on adopting eco-friendly technologies and processes and in applying ICT to enhance industrial processes and financial performance
viii. Devise viable and practical strategies and solutions for budgetary constraints TIRDO has faced over the last two decades
ix. Market TIRDO's excellence to promote interest from stakeholders and collaborating organizations

Despite the plans TIRDO has, problems and weaknesses exist in its legal framework, namely the TIRDO Act No. 5, which was prepared for Tanzania's government-led economy in the 1970s and 80s. In that regard, an immediate review of the outdated TIRDO Act is needed to keep up with the latest policies and strategies, domestic and international socioeconomic realities, fast-changing trends in science and technology, and getting TIRDO to adjust to continuing liberalization, privatization and globalization developments. Tanzania's institutional governance,

government policy, business culture, norms, rules, regulations and procedures are from the command economy era of the 1980s, so TIRDO must review its outmoded system of governance, policy, norms, general order, rules, regulations and procedures so that they are in line with the market environment and with ongoing reforms in the public sector. Also in the works are the introduction of good principles of corporate governance and monitoring for compliance. Due to the country's low capacity for the creation and management of knowledge and technology, TIRDO plans to identify, analyze and document the reasons for its discontinuity in its development path and the impact caused by low levels of initiative, creativity and innovation and by apathy, passivity, irresponsibility and lack of motivation.

The general challenges facing TIRDO include:

i. Shift in government-conducted research from the initial plan for a free service and generated R&D results as public goods to a cost-sharing system in which TIRDO plans to review outdated institutional policy, capacity, processes and procedures governing R&D to those that encompass cost sharing, free market elements and market-based incentives, and to ensure that future activities follow the triple rules of sustainable development: growth of TIRDO and financial performance, environmental conservation and achievement of national socioeconomic objectives
ii. Lack of major breakthroughs in coming up with novel ideas or translating ideas into tangible products and services; TIRDO plans to conduct an independent survey to identify the causes of low creativity and innovation among staff and devise appropriate remedies, as well as tie the survival and continuity of employment and staff promotion to secured projects and funding and their effective implementation

Other challenges include:

i. Inadequate and unreliable government funding
ii. Rapid progress in science and technology and diffusion of technological innovations
iii. Absence of a strong private sector that appreciates R&D contributions and can adopt domestic innovations, which is a major hurdle for technology transfers
iv. Fierce and rising competition in R&D among both domestic and international R&D institutions and individuals
v. Insufficient number of human resources
vi. Inadequate funding for R&D and other needs
vii. Weak link between supply and demand
viii. Poor network of technology developers

ix. Lack of exchange or relations with other organizations in technological development

x. Lack of technology transfer program or system

2.3. Conclusion

Tanzania's policy toward science, technology and innovation (STI) reflects the national commitment to transform the nation, through enhanced capacity and capability, into an industrial-based economy by harnessing and applying STI for building a knowledge-based society. The socioeconomic problems and challenges facing Tanzania can be overcome through more efforts toward initiating and supporting existing industries and industrial R&D. Despite the general achievements of industrial R&D, challenges remain like those mentioned earlier such as the inadequate use of a multi-disciplinary approach to researchers among industrial R&D institutes; lackluster appreciation of the socioeconomic aspects in R&D; and lack of emphasis on industrial research in the national research agenda despite the government's promotion of industrial economy. Other challenges include a poor mechanism for the development of human capital. And other issues related to extensive reforms implemented in other areas, such as those in the central and local government systems over the years, can explain the lack of commensurate change in industrial R&D.

The creation of these institutions was aimed at providing technological support to the industrial and energy sectors, but industrial support suffered a prolonged period of inadequate funding, and eventually lost their active links with the industrial sector they once supported. As a survival strategy, these institutions embarked on research activities of little relevance that merely aimed to support their own operating budgets. In certain cases, they took part in internationally funded research that did not necessarily focus on national priorities. Due to such challenges, the government seeks to progressively continue backing the industrial sector through technological development and commercialization and provide a good environment for technological development in the country. The problem is the constant government struggle to ensure consistent funding to implement planned activities in industrial R&D for Tanzania to achieve semi-industrialized status by 2025 as planned.

3. The Analysis of Tanzanian Research Institutions

3.1. Overview

Industrial R&D has received consistent attention from the Tanzanian government, as the nation focuses on developing an industrial economy. Six of the estimated 77 R&D institutions in the country focus on R&D in energy and industry and support the development of industrial research in the country. As mentioned earlier, the institutions face challenges like poor capacity, lack of focus, weak coordination, capacity gaps and inward focus (not targeting the market). Consequently, a few notable research results have come at the institutional level, but a mere few have been of market quality to warrant patenting or production into useful items, let alone the founding of spin-offs and new technology enterprises (SoEs and NTEs) typical of mature STI systems in other countries. Financing of these R&D institutes in Tanzania is low and comes predominantly from the government budget, and to a less but significant extent from development partners and international aid agencies and least of all from the private sector. A survey conducted on industrial R&D institutions showed such challenges. This chapter will briefly cover such a survey, the methodology used and analysis of the results.

3.2. Methodology

3.2.1. Key Concepts

The survey design tool was a questionnaire sent to three of the country's six industrial R&D institutions. The purpose was to collect information on domestic R&D and share the experiences of industrial think tanks in the Republic of Korea, especially Korea Institute of Industrial Technology (KITECH), for helping and boosting industrial technology in Tanzania. For that purpose, data on the situations and needs of Tanzanian industrial think tanks from the perspective of Tanzanian industrial researchers were needed. Questionnaires were distributed and filled out by respondents at each of the three institutes: Tanzania Engineering and Manufacturing Design Organization (TEMDO), Tanzania Industrial Research and Development Organization (TIRDO), and the Center for Agricultural Mechanization and Rural Technology (CAMARTEC).

The survey collected data mainly on R&D activities the three institutes performed, the perception of respondents of the institution, and their thoughts on Tanzania's industrialization and benchmarking of the Republic of Korea's research institutes. The survey also asked for the following background information on the respondents:

i. Name of organization
ii. Name of department or division
iii. Highest education level completed (bachelor's, master's or Ph.D.)
iv. Major studied
v. Number of years at the organization
vi. Description of major tasks (scope of work and areas and/or industries handled)

3.2.2. Survey Design

The sampling frame for the survey was the list of registered industrial R&D institutions owned by the government, private sector or non-governmental organization (NGO) renowned for conducting industrial research in the country.

3.2.3. Background Information and Field Work

Given the nature of the questionnaire and the kind of data and information required, a detailed background of the survey and project were required to obtain the targeted information. This was also to ensure that the respondent had a basic understanding of the key concepts of R&D information to be collected and the questionnaire to get relevant information. Field work was done by both consultants from the Republic of Korea and Tanzania. The survey was performed where the three R&D institutions are based: Dar es Salaam and Arusha.

3.3. Data Processing and Analysis

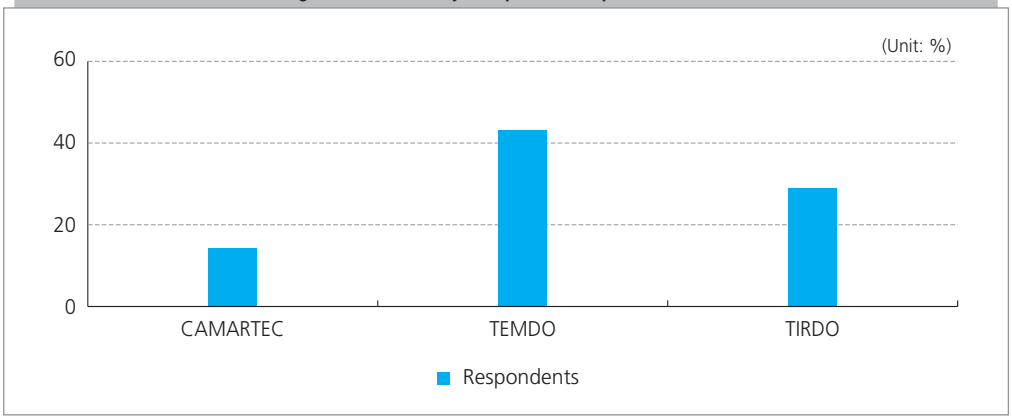
All collected questionnaires were submitted to consultants for cleaning and correcting anomalies in the responses. Questionnaires with problems were carefully examined and communicated to the corresponding researchers for clarifications and corrections, if any. Even if a questionnaire was incomplete, it was included in the analysis when possible. The analysis was done using Microsoft Excel and Origin Pro 8, and the results were summarized in formats such as tables, charts, graphs and descriptions.

3.3.1. Response Rate

Three institutions were the subjects of the survey and visits. Yet over the course of the survey, a few of them were found to not conduct research regularly, especially over the past five years. Some were also doing consulting. The number of respondents per institution is shown in [Figure 3-2]. TEMDO accounted for 48 percent

of the staff responses, CAMARTECH 19 percent and TIRDO 34 percent. The survey exclusively targeted researchers at each institution, with all three institutes suffering from a shortage of researchers.

[Figure 3-2] Survey Respondents per Institution

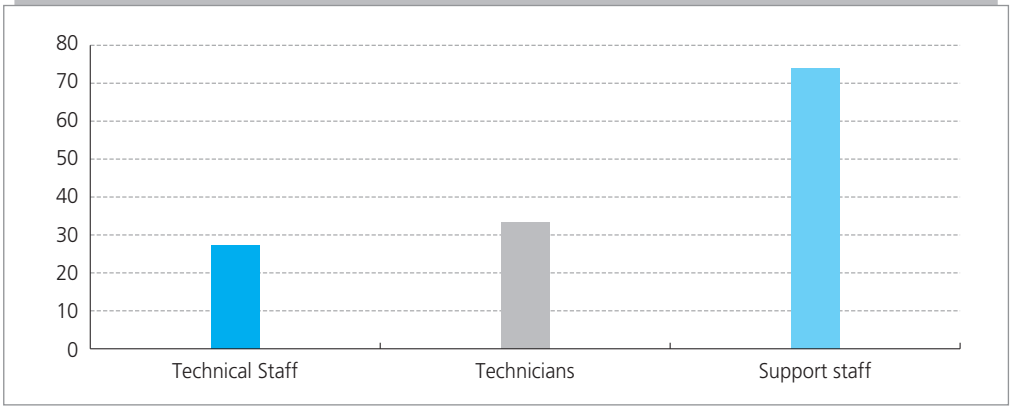


3.4. Survey Results

3.4.1 Respondents' Background

The main observation found from data on respondents' backgrounds was shortage of technical staff at all three institutions, though support staff were a bit larger in number (Figure 3-3). Few technical staff had a master's degree or Ph.D., especially at CAMARTEC. TEMDO had far more staffs than TIRDO or CAMARTEC, but most merely had certificates and diplomas in technological development. In addition, most of the staff had worked at their respective institutions between five to 30 years, meaning few were new.

[Figure 3-3] Staff Distribution of All Three Institutions



The majority of the technical staff provided consulting to manufacturing industries, design of equipment and machinery, process designing and training to people from a variety of industries, and an individual interested in upgrading his or her skills. Other activities done by staff, especially those in administrative positions, included coordination and promotion of research activities, strategic planning, project development and technical support.

3.4.2. In-depth Analysis on Perceived Problems of Research Institutes

3.4.2.1. Perceptions on the Research Institute

The perception of the respondents clearly showed that they understood the mandates of their institution, but the challenges they faced took them away from their duties per stipulated mandates. The challenges included:

i. Insufficient number of human resources
ii. Poor basic infrastructure and workshop facilities
iii. Few able engineers and technicians
iv. Weak links with industries
v. Weak links with technology developers
vi. Weak links with institutions responsible for technology promotion
vii. Poor incentive system

Despite such challenges, the three institutions had the following strengths: specification of institutional mandates, government funding support, qualified personnel, linkages with institutions in and out of the country, and workshop facilities.

3.4.2.2. Research Outputs (or Technologies) of Institutes for the Last 5 Years

This section shows the number of technologies and research output produced by each institution, though a few of the technologies had not been developed over the past five years. Respondents also said several technologies were almost the same from that of other institutions, showing duplication of technologies. Duplicated technologies included those of oil extraction, ploughs, solar energy and cooking stoves. Most of these technologies are listed in Chapter 2.

The strategies required for institutions to better perform their mandates as leaders of Tanzanian industrialization were listed by the respondents. Their suggestions included:

i. Government support for institutions through more funding for R&D and other areas

ii. Strengthen links with industries in and out of Tanzania where possible
iii. Better maintenance of lab equipment and supply or purchase of more modern equipment
iv. More qualified and sufficient human resources
v. Development of demand-driven technologies
vi. Regularly assessments of technological needs
vii. Incentives to raise staff performance

3.5. Respondents' Thoughts on the Industrialization of Tanzania

The survey found that TIRDO, TEMDO, and CAMARTEC plan to establish an industrialization base for Tanzania and provide technological services to a range of industries. They were required to provide examples or case studies of success (or failure) that contributed to the development of industrial production or technology in the private sector. The list of successful case studies included:

i. Plastic recycling technology
ii. Food processing technologies
iii. Welding technologies
iv. Quality assurances for food processing technologies
v. Environmental and energy auditing services
vi. Growth of oil extraction industries
vii. Technologies to support industries like TBL
viii. Development of solar and wind power

The main reasons for case studies of successful technological development were adequate funding supply though human resources undergoing periodic training and the availability of lab equipment. Other factors were links with industries and collaboration between domestic and foreign partners and industries.

The survey results found that the following industries should be served by these research institutions for faster and more efficient industrialization in Tanzania:

i. Agriculture-based industries because of their potential impact on the majority of Tanzanians and boost economy
ii. Livestock and fisheries including dairy and meat processing since raw materials are available in bulk
iii. Metals to support development of SMEs

3.6. Benchmarks from Korean Research Institute

Below are the areas of interest respondents expressed if they had the chance to visit a leading industrial research institute in a developed country:

i. Mode of support to MSEs and industries
ii. Technical capability of institutions and how it was achieved
iii. Model of government support for R&D
iv. Best way to make an institution lead R&D of technology
v. Technology transfer and commercialization

Respondents were told that Korea Institute of Industrial Technology (KITECH) has played a crucial role in the Republic of Korea's economy's industrialization over the last 30 years. In relation to routine works at Tanzania's research institutes, the best practices to learn from KITECH's experience should be:

i. Formation of strong links with industries
ii. Mode of research funding
iii. Incentives for staff
iv. SME content center module
v. Technology committee module

Other suggestions obtained from the survey were forming strong relationships and collaboration between KITECH and industrial R&D institutions in Tanzania.

4. An Industrial Research Institute in Korea and its Executions

4.1. Korean Government's Policies and Efforts[1)]

The Republic of Korea legislated the Act on Science and Technology Promotion in 1967 to set up a comprehensive policy and planning for science and technology promotion and contribute to industrial development. Another aim was improvement of national living standards through an implementation system specifying articles on provision of financial measures.

This law specified activities the government should take to promote national capacity in science and technology. Most of all, the head of the powerful Economic

1) Please refer to STEPI (2016) for more details.

Planning Board (EPB) received the authority to devise a long-term master plan for science and technology development in the context of the long-term economic development plan, then coordinate and manage concurrent business. The act also stipulated the formation of Science and Technology Promotion Committee to advise the EPB head; this body was to be composed of 12 science and technology experts.

The EPB head was also assigned to come up with a plan on human resource development that could be a guideline for the development of science and technology personnel. He was also asked to set up a guideline on strengthening science and technology education, developing technological training, and securing scientists and engineers. Also stipulated by the law was the setup of a steering committee participated in by related ministries (EPB, ministries of defense, education and labor).

The government from the 1990s also boosted its emphasis on basic sciences, moving the priority of its public R&D activity from industrial technological development to fundamental research. This was because the private sector since the 1980s had spent more on R&D than the government, and thus led the development of applied technology in many areas.

The Korea Institute of Science and Technology (KIST), set up as a nonprofit and independent foundation in 1966, changed its research focus to the development of basic science and frontier technology. KITECH, however, would replace KIST as the main platform for technological assistance to the private sector, especially SMEs. To nurture world-class scientists and engineers in fundamental research of frontier technology, the Korea Science Academy of the Korea Advanced Institute of Science

and Technology (KAIST) was founded to discover science-gifted students early and educate them more rigorously.

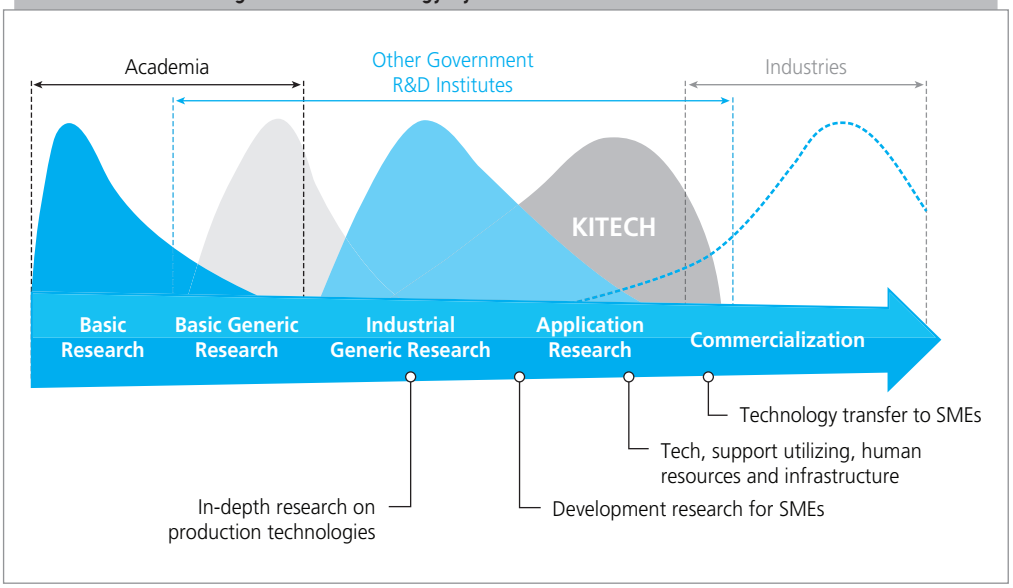
4.2. Understanding of Korea Institute of Industrial Technology (KITECH)

4.2.1. Overview of KITECH

KITECH's purpose is strengthening the autonomy of SMEs to allow them to weather any external pressure and lead the nation's industrial growth by providing technical knowhow. Established in 1989, the think tank pioneered HDTV technology in the 1990s and high-speed rail technologies in the early 2000s. Its mission is to contribute to the growth of manufacturing through development, application and commercialization of related technology and support for SMEs.

KITECH's research area by technology cycle can be represented as shown in [Figure 3-4]; it is responsible for industrial generic and application research and commercialization.

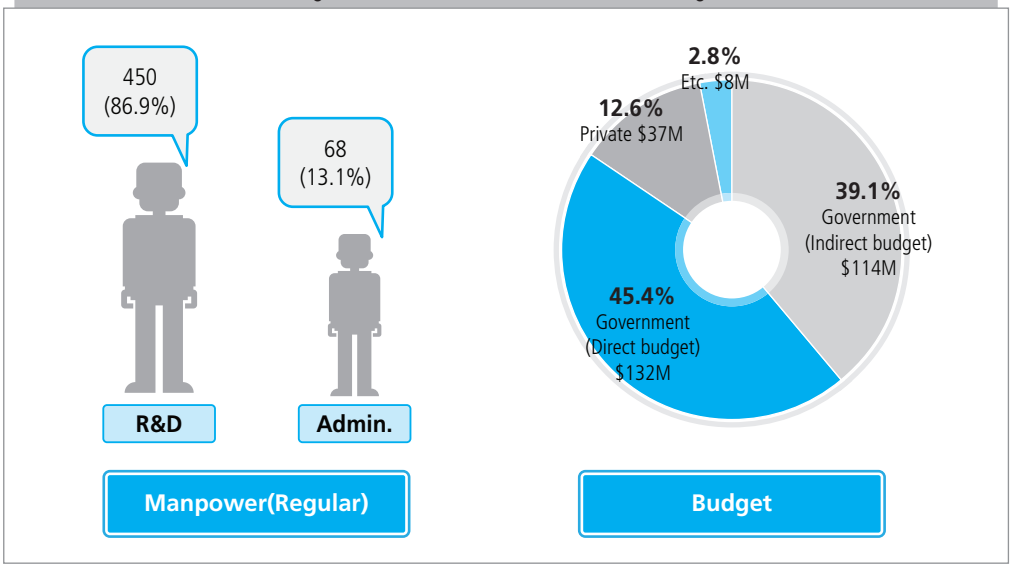
[Figure 3-4] Technology Cycle and KITECH's Research Areas



Source: www.kitech.re.kr.

Of KITECH's 1,142 staff, 87 percent are R&D technical employees. Its budget is approximately US$300 million, about half of which comes directly from the government and 40 percent from indirect government funds. The self-financing funds from the private sector account for 12.6 percent of the budget. [Figure 3-5] below shows the personnel and budget of KITECH.

[Figure 3-5] KITECH's Personnel and Budget

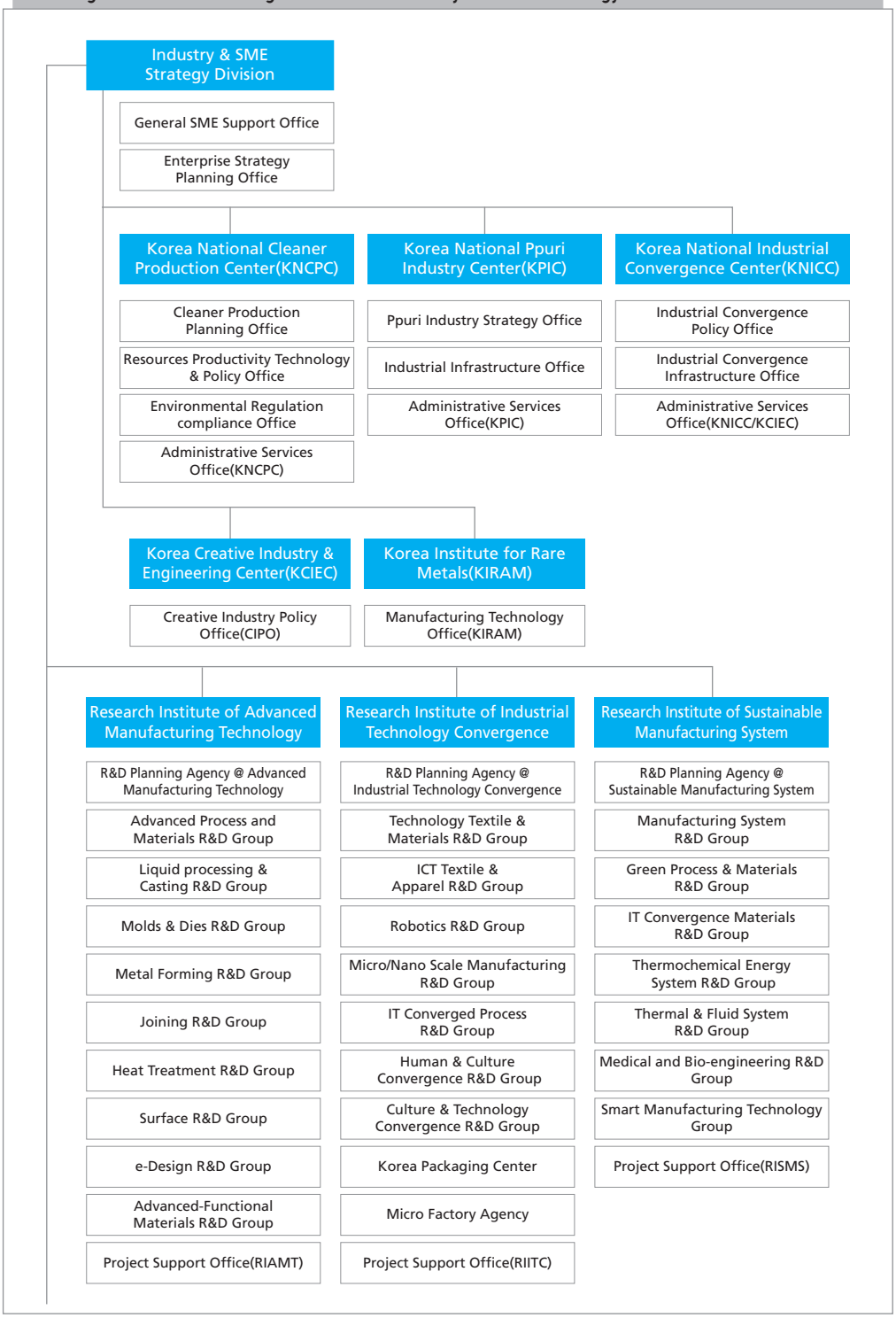


Source: www.kitech.re.kr.

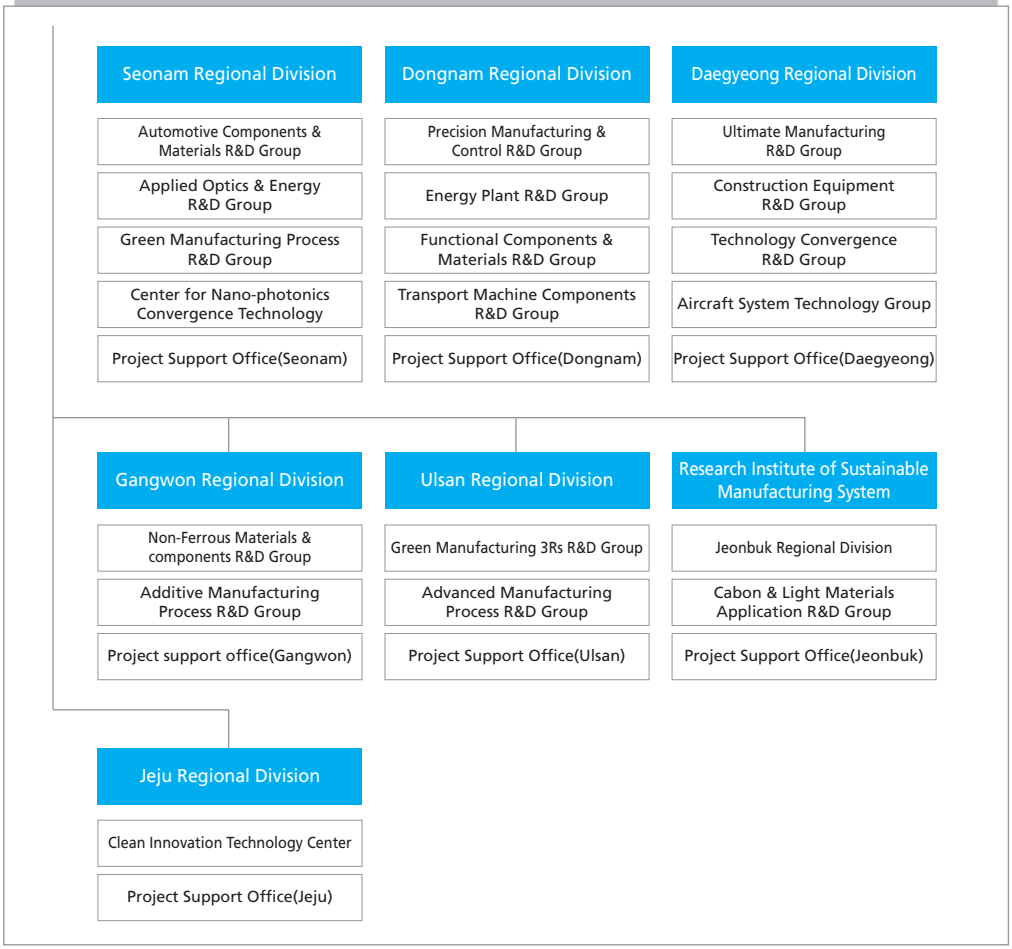
KITECH consists of three institutes and seven regional centers. The overall organization of the Industry and SME Strategy Division and three institutes are represented in [Figure 3-6], and the seven regional centers are indicated in the following figure. The three institutes are the Clean Production System Research Institute (at KITECH headquarters in Cheonan, Chungcheongnam-do), Converged Technology Research Institute (Ansan, Gyeonggi-do), and Root Industry Research Institute (Incheon Metropolitan City).

KITECH has seven regional think tanks that assist high demand industries. In other words, the centers help specialized companies by region. For example, the Ulsan regional center focuses on mechanical manufacturing, while that of Jeju Island on clean innovation technology.

[Figure 3-6] KITECH Organization for Industry and SME Strategy Division and 3 Institutes



[Figure 3-6] Continued



Source: www.kitech.re.kr.

4.2.2. Three Key Areas of R&D of KITECH

The three key technological areas of R&D in KITECH are root industry, green manufacturing system and industry convergence; the goal is to reinforce the country's industrial technology and the technological competitiveness of domestic SMEs.

Root industry technology comprises six core technologies for turning raw materials into processed materials and then into industrial components. The six are casting, molding, heat treatment, surface treatment, plastic working and welding. KITECH's R&D in root technology strengthens the country's industrial and SME competitiveness. The major achievements of this technology are:

- World's first titanium (Ti) regeneration technology

- Refining and reforging of titanium using electromagnetic induction and hydrogen plasma
- World's first eco-magnesium (Eco-Mg) and eco-aluminium (Eco-Al) alloy technology (eco-friendly alloy technology that enables the use of magnesium and aluminum without creating greenhouse gases)

KITECH supports green manufacturing system technology for the sustainable growth of domestic industry through the development of energy-efficient and eco-friendly manufacturing systems. The major achievements are:

- Real-time TDLAS (tunable diode laser absorption spectroscopy), or reduction of CO2 emissions through deliberate combustion control
- Eco-friendly bio-diesel technology that is developing manufacturing technology for eco-friendly bio-diesel through convergence of diversified BT

Industry convergence technology deals with the convergence among technologies, technology and industry, or between industries. KITECH is leading the way by nurturing new growth engines to lead the future, including ICT, nanotechnology converged with robotics, fiber and wellness technology. The major achievement of this area is Hyper, a robotic suit with enhanced strength capable of working up to nine hours and lifting up to 120 kg at construction or disaster sites and extreme fields.

4.3. The Formats of Cooperation between KITECH and SME's

KITECH programs foster cooperation with SMEs including a research partner system to support businesses based on close partnerships; open labs and incubation center for startups to support companies with equipment and facilities; and an integrated support center to help SMEs find solutions with one phone call by dialing 1379. KITECH seeks to enhance the technological competitiveness of SMEs by offering a variety of support services.

4.3.1. Technology Transfer Process

As an institute specialized in commercialization, KITECH has devised internal R&D processes and explores and develops need-based technology from the R&D phase. At the same time, it runs a service supporting the management of intellectual property to oversee performance on a regular basis from patent application, technology transfer and business development to post-management.

To improve KITECH's technology transfer system, its Technology Licensing Office (TLO) was re-organized into the Creative Business Office (CBO) and incentives were given to those who contributed to technology transfer to boost performance. Thanks to projects like super intellectual property and tailored R&D initiatives, the number of technology transfer cases has grown an astounding 350 percent.

KITECH has high-level administrative staff in TLO for technology transfer activities. As of 2016, TLO had a budget of about US$800,000 and its income from technology royalties was approximately US$4.2 million.

[Figure 3-7] represents the KITECH R&D process for technology transfer and business development.

[Figure 3-7] KITECH R&D Process for Technology Transfer and Business Development

Source: www.kitech.re.kr.

4.3.2. SME Contact Center

SMEs can contact the center online (partner.kitech.re.kr) or over the phone to solve their technological difficulties or problems. KITECH does its best to provide solutions.

4.3.3. Partner Company System

This is a system for conducting joint R&D with KITECH and mentoring, with 3,137 partners as of May 2016. Each technical staff member needs to choose at least five SMEs to supervise the entire process of their growth. This partner system is based on the concept of family companies for those in close partnership with KITECH, and designed to help SMEs grow into global players with customized close-range support. Companies selected as partners receive various forms of support including

that of R&D-based priority technology, technology innovation based on technology community and close-range support through visits to the field.

To qualify as a partner company, an SME needs to meet a few of the following conditions:

i. Perform joint research and development with KITECH
ii. Receive technology support from KITECH
iii. Sign contracts on patent technology transfer with KITECH
iv. Take part in KITECH's Startup Incubation Center and graduate from the program with a successful outcome
v. Be a tech-intensive company with high growth potential

The support content a partner company should have is indicated in [Figure 3-8].

[Figure 3-8] Support Content for Partner Companies

R&D-based technology support	Research facility support	Dispatch of competent resources through technology talents project
• Priority support from KITECH (Industry-associated projects) • Priority support from KITECH (Tailored technology support project)	• Access to research facilities at 31 open labs	• Priority support of competent workforce(with degree of MD or ph.D) as core R&D staff in the long term(longer than 3 years)
Close-range support, visit and dispatch to the fields	**Technology information support**	**Technology innovation exchange support leveraging technology community**
• Technology advisory support with visits or dispatch to the fields where they suffer from technology issues	• Regular mailing service to share information on national R&D projects, educational seminar, patent transfer technology and technology trend forum	• Support companies' technology exchange including new markets exploring and R&D outcome sharing through the community

Source: www.kitech.re.kr.

4.3.4. Technology Communities

This community operation is for planning demand-driven R&D projects, R&D output sharing, technological cooperation and information sharing.

4.3.5. Field Partnership

KITECH senior researchers must visit partner or contacted companies at least once a month, and are also responsible for finding new partners.

4.3.6. Open Lab

KITECH has about 30 open labs across the nation for SMEs to ensure that the latter have easy access to quality high-tech equipment and offer technological support including testing, investigation and prototype fabrication. Open labs consist of test centers and labs for prototype fabrication and rental research. <Table 3-5> is a list of all KITECH's open labs nationwide.

〈Table 3-5〉 KITECH's Open Labs by Region

Incheon Regional Division	• Casting Technology Process Lab - Chemical Analysis Common Lab • Materials Nature Analysis/Testing Common Lab - Surface Analysis Common Lab • Gliding Technology Processing Lab - Heat Processing Technology Lab • Precision Molding Lab • Wielding Technology Support Process Lab • Plastic Working Process Lab • Bicycle Manufacturing Technology Support Process Lab • Cyber Design Technology/High-tech Equipment Support Process Lab
Gyeonggi Regional Division	• Hazardous Substance Chemical Analysis Common Lab • Precision Measurement Common Lab • Industrial Fiber Process Lab • Textile Prototype Process Lab • Apparel Technology Support Process Lab • Packaging Technology Process Lab
Chungcheong Regional Division	• Materials Analysis and Nature Common Lab • Energy Facility Functionality Certification Process Lab • Acoustical Vibration Common Lab • Green Environment Common Lab • Smart Automation Process Lab
Honam Regional Division	• Materials Nature Analysis Common Lab • Precision/Ultra Precision Processing Process Lab • Precision Motor Test Analysis Common Lab • Kolas Length Dynamics Certification Common Lab • Mold Tryout Process Lab • Energy Environment (rohs) Common Lab • Nanotechnology Integration Process Lab
Dongnam Regional Division	• Forming Process Common Lab • Ultra Precision Processing Process Lab • Convergence Plating Common Lab • Casting Technology Support Process Lab
Daegyeong Regional Division	• Biomedical Technology Center Common Lab • Casting Technology Support Process Lab
Gangwon Regional Division	• Nonferrous Metal Common Lab

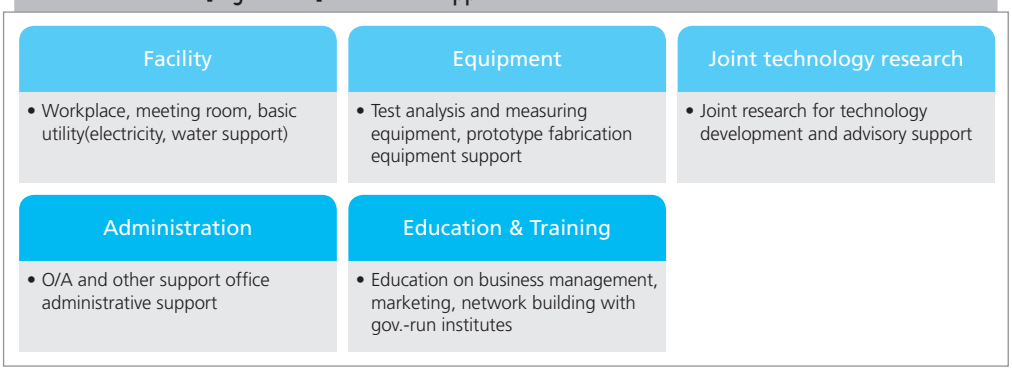
Source: www.kitech.re.kr.

4.3.6. Regional Business Incubation Centers

These centers promote the ability of venture startups to stay independent and afloat with comprehensive incubation support. KITECH seeks to help them develop the competence and knowhow to do business and survive on their own by using KITECH's facilities, resources, prototype fabrication and marketing support. KITECH helps them keep growing and overcome hardship in their early days. This has helped raise the success rate for business start-ups and led to more job creation.

The targets of support are companies preparing tech-based startups, individual entrepreneurs wishing to open tech-intensive SMEs, companies recognized for having technologies with high business development potential and strong technological impact, and companies in less than 2 years at the time of application. More details on support for startups are in [Figure 3-9].

[Figure 3-9] Details of Support at Business Incubation Center



Source: www.kitech.re.kr.

4.3.7. Globalization Support

KITECH is helping SMEs wishing to conduct global marketing or set up overseas branches in collaboration with the Korea Trade-Investment Promotion Agency (KOTRA).

4.4. KITECH's HR Management on Researchers

KITECH employs specific practices of human resource management to encourage technical staff to assist SMEs. First, the results of SME support activities are reflected in staff evaluations, accounting for 20–40 percent of individual assessments. This motivates employees to do their best to get good evaluations on their SME activity results that can net them performance bonuses.

4.4.1. SME Dispatching System

Another KITECH strength is its SME dispatch system. A KITECH staff member upon request can be dispatched to SMEs for up to three years, during which the SME pays 40 percent of the staff's salary and the rest by KITECH. The duration of deployment can be extended if all (staff member, KITECH and SME) agree.

4.4.2. Dispatched Staffs Reward System

Senior staff who are not active researchers can be evaluated purely based on the performances of their SME support activities instead of those of R&D such as patents or journal articles. The top 20 percent of staff earn performance bonuses.

4.4.3. Technical Staff Reward System

i. Reward for research tasks: research allowance or bonus (approximately US$4 million per year for 1,200 technical staff)
ii. Reward for technology transfer: A successful case of technology transfer results in 50-60 percent of the royalty income paid to technical staff (around US$6 million to 550 technical staff); 40 percent of staff get this reward
iii. Reward based on annual evaluation

Reward 1: graded payment based on R&D performance and financial contribution (worth up to percent of annual salary)

Reward 2: Top 1 percent of staffs entitled to 10 percent raise in annual salary (this increment goes on forever)

5. Policy Suggestions for Tanzanian Research Institutions

Tanzanian R&D institutions might find it hard to directly implement KITECH's actions. Several strategies, however, can be applied and need serious consideration to boost Tanzania's industrial growth.

5.1. SME Partner Systems

Each technical staff (or researcher) of a research institution needs to form long-term relationships with partner SMEs. Just as KITECH researchers have at least five

SME partners, Tanzanian staff need a set number of SME partners to supervise the entire process of their growth. Such a relationship will increase the staff's responsibility and provide continuous supports from institutions to SMEs. At the same time, having clear partner SMEs will enable incentives for technical staff. The incentive program is explained below.

Also, administrative staff play key roles at research institutions. As mentioned in the previous section, KITECH has superior administrative staff at TLO for technology transfers. With the help of such staff, the technologies developed by KITECH researchers can be transferred to the private sector more smoothly. A large portion of R&D workers in Tanzania are administrative staff. In the long run, Tanzanian institutions need to consider training administrative staff to become TLO officers.

5.2. Incentive Scheme for Institutions

A key factor for Tanzanian industrial think tanks to help SMEs grow is the eagerness or enthusiasm of an institution's technical staff. As mentioned earlier, KITECH researchers fully realize that the success of SMEs they are in charge of results in a substantial amount of financial benefits. Most KITECH researchers will earn bonuses based on the performances of the SMEs they support. On average, a bonus of 10 percent of their annual salary is earned. In a few small cases, the incentive amounts can even exceed a staff's annual salary two-fold. No wonder KITECH researchers are eager to help their partner SMEs.

Tanzania thus needs to adopt a similar incentive system. On top of basic salary, the promise of bonuses can motivate technical staff to actively help SMEs. First, staff need an open mind to accept a graded pay system, with their overall salaries based on their partner SMEs' performances. Of course, the incentive programs must consider the financial condition of an institution. The government needs to earmark more budget in the initial stage of a bonus system as the existing budget levels will never be enough to implement the incentive program. Once a group of SMEs becomes successful, the benefits could come back to the R&D institution and make it financially healthy. Eventually, this could lead to a self-sufficient financial structure.

Tanzania also has government-owned R&D institutions other than those devoted to industrial research. In the long run, the government could consider applying the incentive program at the institutional level. In other words, the government allocates the budget based on the collective performances of institutions. Yet careful study is needed on this kind of institution-level incentive system because unnecessary competition and animosity could result.

5.3. Independent Operations of Institutes

Advanced economies allow research institutes to run independently. The Republic of Korea, however, has been subpar at granting think tanks autonomy. Government intervention has been a fact of life for the country's R&D sector. With the inauguration of a new president and administration, think tanks have occasionally had to change the directions or targets of their research. The Tanzanian government can better than the Republic of Korea in this area. Regardless of change of cabinet or administration, research institutions require independent and consistent operations. For that purpose, a control tower of Tanzania's three research institutions is needed.

5.4. Institutions Need to Have Educational Functions

Basic education is provided by universities but advanced technical work and additional education for traditional labor could be more effectively done by government-supported industrial think tanks rather than universities. Knowing this, the government set up the University of Science and Technology (UST) in Daejeon to cultivate practical and creative minds who can lead the future development of core and industrial technology. The UST offers education programs featuring on-site experience and research activities for new interdisciplinary convergence technology. Government think tanks or publicly-funded research institutes established the UST, a graduate school whose students pursue a master's or Ph.D. and work and study at the research institutes. Researchers with doctorates can serve as advisers to students.

Tanzania should consider this educational function of research institutes. Graduate students could be encouraged or linked to jobs at TEMDO, TIRDO or CAMARTEC under certain agreements. This can help Tanzania in two ways. First, it can boost the quality of education in becoming more field- and industry-oriented. Second and more importantly for research institutions, this can help alleviate the lack of proper human resources.

5.5. More Cooperation among the Three Institutions

Section 5.3 mentioned the need for a national R&D control tower to independent operations in industrial R&D. Another reason is boosting cooperation and coordination among the three institutions. If the control tower is too difficult to set up over the short term, an alternative is setting up a council representing research institutions to help them share strategic goals and research plans.

The pooling of resources needs more serious consideration. And a method of good cooperation is regional specialization. Since TIRDO and TEMDO are in different regions, regional specialization like what KITECH practices can be considered. This can also justify budget increases for research institutes.

In the long run, cooperation can go one step further through a merger. The three think tanks can eventually be put under one umbrella. KITECH has a couple of technology- and regional-based think tank affiliates, a model Tanzania can apply.

6. Concluding Remarks

This study sought to share the experiences of think tanks in the Republic of Korea in helping and boosting the growth of industrial technologies. In other words, this study provided specific recommendations for boosting the capacity and capabilities of the three top think tanks for industrial research in Tanzania: TIRDO (Tanzania Industrial Research and Development Organization), TEMDO (Tanzania Engineering and Manufacturing Design Organization), and CAMARTEC (Center for Agricultural Mechanization and Rural Technology).

The first task was to review the status of Tanzania and its main three research institutions. A survey was done on the perception of staff at the institutions on their roles. The biggest difference between think tanks of the two countries was the degree of staff enthusiasm and dedication, something caused by the incentives offered (or not as in the case of the three Tanzanian institutes). Elaboration followed of KITECH's policy and efforts to link research institutions with industry to suggest a benchmark for Tanzanian research institutes to follow. Finally, five action plans were recommended for Tanzania: the SME partner system, incentive programs, independent operations, educational functions and heightened cooperation. Incentives are the most important suggestion of this study, and to facilitate their implementation, the Tanzanian government needs to allocate more budget to industrial think tanks.

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