Knowledge Sharing Program

2015/16 Knowledge Sharing Program with Bulgaria:

Policy Studies for Bulgaria's Sustainable Growth: Enhancing Innovation and Accountability

Ministry of Strategy and Finance

KDI Korea Development Institute

2015/16 Knowledge Sharing Program with Bulgaria

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Preface

In the 21st century, knowledge is one of the key determinants of a country's level of socio-economic development. Based on this recognition, Korea's Knowledge Sharing Program (KSP) was launched in 2004 by the Ministry of Strategy and Finance (MOSF) and the Korea Development Institute (KDI).

KSP aims to share Korea's experience and knowledge with the partner countries to achieve mutual prosperity and cooperative partnership. Former high-ranking government officials are directly involved in the policy consultation to share their intimate knowledge of development challenges, and to complement the analytical work of policy experts and specialists who have extensive experience in their fields. The government officials and practitioners effectively pair up with their counterparts in the development partner countries to work jointly on pressing policy challenges and share development knowledge in the process. The program includes policy research, consultation and capacity-building activities, all in all to provide comprehensive and tailor-made assistance to the development partner countries in building a stable foundation and fostering capabilities to pursue self-sustainable growth.

In 2015, policy consultation and capacity building workshop were carried out with 26 partner countries covering over 100 research agendas. As a new partner, Nicaragua and Visegrad Group were selected in consideration of the country's policy demand, growth potential, and strategic economic partnership.

The 2015/16 Knowledge Sharing Program with Bulgaria was carried out with the aim of exchanging socio-economic development experience of two countries for improving Bulgaria's policy making capacity and achieving her socio-economic development. Under the MOU signed between the Ministry of Strategy and Finance of Korea and the Bulgarian Academy of Sciences, the joint research and seminars were conducted in order to support the establishment of "Policy Studies for Bulgaria's Sustainable Growth: Enhancing Innovation and Accountability".

I would like to take this opportunity to express my sincere gratitude to Senior Advisor Mr. Young Keun Lee, Project Manager Prof. Jin Park, as well as the project consultants including Prof. Jong Ho Hong and Dr. Taeyoung Shin for their immense efforts in successfully completing the 2015/16 KSP with Bulgaria. I am also grateful to Executive Director Dr. Si Wook Lee, Program Director Dr. Il Dong Koh, and Program Officer Mr. Dae Hong Kim, and all members of the Center for International Development,

KDI for their hard work and dedication to this program. Lastly, I extend my warmest thanks to the Bulgarian counterparts, the Economic Research Institute at the Bulgarian Academy of Sciences, Ministry of Environment and Water, Sofia Tech Park and other related agencies, program coordinators, and participants for showing active cooperation and great support.

In your hands is the publication of the results of the 2015/16 KSP with Bulgaria. I believe that KSP will serve as a valuable opportunity to further elevate mutual economic cooperation of Bulgaria and Korea to a new level. I sincerely hope the final research results on the selected areas could be fully utilized to support Bulgaria in achieving economic development goal in the near future.

Joon-Kyung Kim
President
Korea Development Institute

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2015/16 KSP with Bulgaria

Dae Hong Kim (Korea Development Institute)

1. Background

The Knowledge Sharing Program (KSP) with Bulgaria was first launched in 2014 as a means of strengthening comprehensive bilateral cooperation between Korea and Bulgaria by sharing development experience and policy know-how for the industrial development of the Bulgarian economy.

Upon the successful completion of the 2014/15 KSP with Bulgaria, a second year of the KSP project with Bulgaria was launched in 2015 under the main theme of "Policy Studies for Bulgaria's Sustainable Growth: Enhancing Innovation and Accountability." This consisted of three sub-topics: 1) Governance Innovation for SOEs in Bulgaria: Based on the Korean Experience in 31 Questions; 2) Strategies for Enhancing the Extended Producer Responsibility System in Bulgaria: The Case of WEEE; and 3) Building a Strategic Model for Sofia Tech Park's Development: Strategic Issues and Planning Guidelines. The major theme and the subtopics for the 2015/16 KSP with Bulgaria were selected by the demand surveys submitted by the Economic Research Institute at the Bulgarian Academy of Sciences (ERI-BAS), the Ministry of Environment and Water (MoEW) and Sofia Tech Park, and finalized by mutual consent.

Based on the research areas above, a KSP research team was formed and its Senior Advisor was appointed in accordance with relevant expertise in the fields of public sector reform, environment, science and technology policy, and related knowledge and know-how for sharing the Korean development experience.

Bulgarian consultants from relevant policy areas were also invited to provide critical input in the collaborative research, reflecting the local context in policy analyses.

A brief overview of the 2015/16 KSP that includes its main theme, consultation topics, the KSP team members and Bulgarian consultants can be found in <Table 1> below.

〈Table 1〉 2015/16 KSP Consultation Team and Topics

Policy Studies for Bulgaria's Sustainable Growth: Enhancing Innovation and Accountability			
No.	Consultation Topics (Relevant Organizations)	Name of Korean Experts	Name of Bulgarian Consultants
1	Governance Innovation for SOEs in Bulgaria: Based on the Korean Experience in 31 Questions (Economic Research Institute at the Bulgarian Academy of Sciences)	**Jin Park** KDI School of Public Policy and Management	**Mitko Dimitrov** **Daniela Bobeva** **Spartak Keremidchiev** **Plamen D. Tchipev** Economic Research Institute at the Bulgarian Academy of Sciences
2	Strategies for Enhancing the Extended Producer Responsibility System in Bulgaria: The Case of WEEE (Ministry of Environment and Water)	**Jong Ho Hong** Seoul National University	**Anton Peychev** Ministry of Environment and Water
3	Building a Strategic Model for Sofia Tech Park's Development: Strategic Issues and Planning Guidelines (Sofia Tech Park)	**Taeyoung Shin** Science and Technology Policy Institute	**Anna-Marie Vilamovska** Cabinet of the President of the Republic of Bulgaria

*Senior Advisor: Young Keun Lee (Former Vice Chairperson of Anti-Corruption and Civil Rights Commission of Korea)
*Program Director: Il Dong Koh (Senior Research Fellow, CID, KDI)
*Project Manager: Jin Park (Professor, KDI School of Public Policy and Management)
*Program Officer: Dae Hong Kim (Research Associate, CID, KDI)
*Young KSPians (YKSP): Bo Ram Im (Graduate Student, Korea University)
Sae Young Jong (Student, Sogang University)

2. Process of the Project

2.1. High-level Demand Survey and Pilot Study (July 19–24, 2015, Sofia, Bulgaria)

As the first step of the 2015/16 KSP with Bulgaria, the High-level Demand Survey and Pilot Study was carried out between July 19 and July 24, 2015, in Bulgaria. The Korean delegation led by Jin Park, Project Manager of the 2015/16 KSP with Bulgaria, visited the main Bulgarian counterpart organizations—ERI-BAS, MoEW, and Sofia Tech Park—to identify specific areas of policy demand based on the submitted demand surveys, and discuss the scope of research and expectations for this year's KSP.

For the Pilot Study, additional meetings were held with representatives from the Ministry of Economy, the Ministry of Finance and the Bulgarian Presidential Office to obtain a detailed picture of the current status of the KSP topics in Bulgaria, as well as to identify how the policy demands are aligned to national policy priorities.

Alongside a series of discussions on the KSP topics, a project coordination meeting was conducted to discuss the details of mutual cooperation and activities in each stage of the KSP project, including cost-sharing rules and the content of a Memorandum of Understanding (MOU) and Activity Agreement (AA).

2.2. Additional Pilot Study (October 13–17, 2015, Sofia, Bulgaria)

In order to obtain the necessary data and information for the study, a Korean delegation headed by Mr. Young Keun Lee, Senior Advisor of the 2015/16 KSP with Bulgaria, visited Bulgaria between October 13 and October 17, 2015.

During this phase, the Korean experts held a series of meetings with policy makers and experts, and conducted on-site surveys at the relevant organizations such as the Ministry of Economy, the Ministry of Transport, Information Technology and Communications, Bulgarian Energy Holding, Eltechresource JSC, Ecobultech JSC, the Association of Producers of Household Appliances Bulgaria, the Small and Medium Enterprises Promotion Agency, and the Sofia Tech Park construction site to clearly identify current policy issues and collect related data.

In addition, the signing ceremony for the Memorandum of Understanding between the Ministry of Strategy and Finance of Korea (MoSF) and the Bulgarian Academy of Sciences (BAS) for the 2015/16 KSP with Bulgaria was held at the Academy on October 16, 2015, attended by the Korean delegates, BAS President Mr.

Stefan Vodenicharov, and Bulgarian consultants from ERI-BAS. Moreover, an Activity Agreement (AA) was signed between the KDI and each Bulgarian counterpart organization on cooperation and the implementation of the 2015/16 KSP with Bulgaria.

2.3. Interim Reporting and Policy Practitioners' Workshop (November 11–20, 2015, Seoul, Korea)

The Bulgarian delegation, headed by Prof. Daniela Bobeva, Former Deputy Prime Minister for Economic Development, visited Korea from November 11 to November 20, 2015, to participate in the Interim Reporting and Policy Practitioners' Workshop.

At the Interim Reporting Workshop held on November 13, 2015, Korean researchers, together with their Bulgarian consultants, presented their interim research findings and had in-depth discussions on the progress of the research.

During the Policy Practitioners' Workshop, the Bulgarian delegation visited various Korean institutions relevant to each KSP topic in order to gain first-hand experience and practical knowledge about the Korean case and to network with experts and policymakers. The institutions which the Bulgarian delegates visited are shown in <Table 2>.

〈Table 2〉 Institutions Visited by the Bulgarian Delegation

	Topic 1 Governance Innovation	Topic 2 Extended Producer Responsibility System	Topic 3 A Strategic Model for Sofia Tech Park's Development
1	Korea Development Institute	Sudokwon Landfill Site Management Corporation	Electronics and Telecommunications Research Institute
2	Korea Institute for Industrial Economics and Trade	Korea Environment Corporation	Korea Research Institute of Standards and Science
3	Korea Trade-Investment Promotion Agency	Seoul Metropolitan Government (Resource Recirculation Division)	National Fusion Research Institute
4	Korea Hydro and Nuclear Power Co. Ltd.	Korea Electronics Recycling Cooperative	Chungnam TechnoPark

2.4. Senior Policy Dialogue and Final Reporting Workshop (February 23–28, 2016, Sofia, Bulgaria)

In the final stage of the 2015/16 KSP with Bulgaria, the Korean delegation, headed by Mr. Young Keun Lee, visited Bulgaria between February 23 and February 28, 2016, to share their final research findings and policy recommendations. In the opening session of the Final Reporting Workshop, Prof. Daniela Bobeva opened the event with welcoming remarks, followed by opening remarks from Mr. Young Keun Lee and congratulatory remarks from H.E. Mr. Maeng-ho Shin, Korea's Ambassador to Bulgaria. During the presentation session, the final research findings of the policy study by Korean experts and Bulgarian consultants were shared with approximately 100 Bulgarian participants from the government, the private sector and civil society who gathered at ERI-BAS. The findings were also reported in the Bulgarian media. Following the presentation, critical comments and questions were actively exchanged among the participants.

The day after the workshop, Mr. Young Keun Lee and Korean researchers conducted policy dialogue sessions at the Bulgarian Academy of Sciences, including each counterpart office briefly presenting its key research outcomes, as well as discussing recommended policies.

After the final event and a series of meetings were concluded, two more main tasks for this trip were carried out. First, an End of Project Evaluation Interview for the 2015/16 KSP was conducted to evaluate the whole cycle of the project and measure the potential outcomes of the project by interviewing Bulgarian project stakeholders such as a project manager, a local consultant, and a coordinator. Second, a Prior Consultation for the 2016/17 KSP with Bulgaria was conducted based on the previously submitted demand survey forms in order to identify the specific policy demands of the project proposed by institutes from Bulgaria and the current issues of the suggested research topics for next year's project.

2.5. Publication of the KSP Policy Consultation Report (June, 2016)

In the spirit of mutual respect and cooperation over the course of the project, both Korea and Bulgaria have produced this Policy Consultation Report 2015/16 KSP with Bulgaria. The details are to be delivered to the Bulgarian KSP counterparts (i.e. ERI-BAS, the Ministry of Environment, and Sofia Tech Park), the Bulgarian Academy of Sciences, the Korean Embassy in Bulgaria, and other stakeholder institutes.

Executive Summary*

Jin Park (KDI School of Public Policy and Management)

This is a collection of three papers that aims to support "Bulgaria's Sustainable Growth through Enhancing Innovation and Accountability." The first paper presented governance innovation for SOEs. This paper asks 31 questions regarding a good governance system, and presents 31 specific recommendations including a centralized Management Committee overseeing SOEs. The second paper, titled "Strategies for Enhancing the Extended Producer Responsibility System in Bulgaria," provides recommendations in four different categories: systems, regulations, economic incentives, and culture and education. This paper suggests limits on informal sectors, a re-evaluation of curbside containers, the introduction of a volume-based waste tax, and environmental education. The third paper, titled "Building a Strategic Model of Sofia Tech Park's Development," focuses on incubation, technology transfer and commercialization, business support services, and its role in the regional innovation system. The paper recommends overall strategic planning as a coordinating mechanism and highlights a need for a science and technology policy research unit.

* It is a great pleasure to present this paper which was jointly written by researchers of both countries. We would like to thank the honorable, the president of Bulgaria who made a visit to Korea May 2015, and started this collaborative journey. We would like to thank Mr. Maeng-ho Shin, then-Korean Ambassador to Bulgaria for his strong support all the way. Everyone who participated in this program especially the three counterpart institutes of ERI, Ministry of Environment and Water, and Sofia Tech Park of course deserve the most sincere and grateful recognition. I also would like to thank the program director Il Dong Koh of KDI, and the administrative staff including Mr. Dae Hong Kim and two Young KSPians Boram Im and Saeyoung Jong for their dedication. Of course, my special thanks goes to the project manager of the Bulgarian side Prof. Bobeva, whose academic inspiration, leadership and energy have made this program successful.

As it turns out, the three topics were not closely related to each other. However, we have found many common lessons from the three papers. First, despite the heterogeneous nature of the topic, the main philosophical principle was surprisingly homogenous, that is, innovation by enhanced accountability. Higher accountability in SOE governance, waste management and also Sofia Tech Park management were the fundamental principles of all three papers.

Second, an external anchor is an important driving force for reform. As in the second paper, the Bulgarian government has tried to harmonize its policies with that of the European Union's in waste management. Sofia Tech Park is also part of the EU program. In addition, the OECD Guidelines on Corporate Governance of State-Owned Enterprises will be very useful for Bulgaria as a member in the near future. The recommendations presented here are all aligned with these guidelines by international organizations.

Third, coordination among different players is a key for the success of any policy initiatives. Coordination between different government agencies is a key solution in the first and the third paper. The second paper recommends coordination between government policy and the culture and behavior of its citizens. We need to win the minds of the people and the political leadership to get the job done. In this respect, we sincerely hope that this report will play such a role in attracting political and citizen support.

Finally, as indicated in the title of a "Knowledge Sharing Program," we would like to emphasize that Korea has learned a great deal from this joint effort. Korea's SOE governance and waste management were not ideal although Korea's Chungnam Techno Park was a good example. We attempted to ensure that we were fully committed to what we recommended. Ultimately we found that many of our policy recommendations for Bulgaria were also relevant for Korea. It has truly been a knowledge sharing program for both countries.

2015/16 Knowledge Sharing Program with Bulgaria:
Policy Studies for Bulgaria's Sustainable Growth:
Enhancing Innovation and Accountability

Chapter 1

Governance Innovation for SOEs in Bulgaria: Based on the Korean Experience in 31 Questions

Governance Innovation for SOEs in Bulgaria: Based on the Korean Experience in 31 Questions*

Jin Park (KDI School of Public Policy and Management)
Mitko Atanassov Dimitrov (ERI-BAS)
Daniela Nikolova Bobeva-Filipova (ERI-BAS)
Spartak Vasilev Keremidchiev (ERI-BAS)
Plamen Dimitrov Tchipev (ERI-BAS)

Summary

The recent financial performances of many Bulgarian SOEs have revealed the shortcomings in the management of its SOEs. The main direction of Bulgarian reforms should be improving transparency, better selection and appraisal of management, sustainable dividend policy, strengthening financial discipline and coherent ways to reduce the debt burden. The institutional status quo is clearly inefficient and needs to be replaced.

The direction of SOE governance reforms in Korea and Bulgaria are substantially different. Korea has maintained a very centralized grip over SOEs for an extended period of time, and it needs to reduce government intervention by guaranteeing more autonomy for SOEs. On the other hand, Bulgaria needs more centralized control over SOEs, which is expected to improve their performance. The Korean experience in reforming its SOE management system is highly relevant for Bulgaria and it complies with the OECD Guidelines on Corporate Governance of State-Owned Enterprises.

This paper asks 31 questions regarding a system of good governance and presents options for each question regarding positive and negative aspects, followed by

* The authors would like to convey their deep gratitude to the ERI and KDI for their support regarding this research and also Mr. Dae Hong Kim of the KDI for his administrative assistance. The comments of two anonymous referees were also very helpful in improving the quality of this paper.

specific recommendations for the Bulgarian government. It is recommended that a centralized authority responsible for the management of SOEs be established which is composed of line vice-ministers and experts from academia and the private sector. Major tasks and responsibilities should be transferred gradually from line ministries to this new setting. Among these include increasing transparency, the introduction of an evaluation system with strict consequences and related open competitive procedures for the selection, the appointment and appraisal of CEOs, as well as an annual bonus system.

SOE governance reform in Bulgaria will touch off strong resistance from both line ministries and their SOEs. Therefore, it will require a good deal of effort and strategy to accomplish the task. It is important to win the minds of the people and the political leadership in that the current system is subject to a number of problems, and that reform of the system is critical to a more efficient economy and provision of better public services to its citizens.

1. Introduction

State-Owned Enterprises (SOEs) in any country are criticized as less efficient than the private sector. Since they are free from the risk of bankruptcy or even from competition in many cases, their slack management is not surprising. Members of an SOE labor union often enjoy higher job security, a relatively lighter workload and even higher compensation, including fringe benefits, than those in private companies, and this is why a labor union is militantly against any privatization plan. Politically motivated, the government often initiates projects using SOEs' budgets. In Korea, many under-utilized kinds of infrastructure are examples of such politically-driven projects. A low utility rate for services offered by SOEs dampens their financial imbalance even more. However, SOEs are not that keen about the need for reform. Rather, they have little motivation to change the status quo. So the question is: How can we make SOEs provide better services at a lower cost?

Although Korea's SOEs are not free from the above-mentioned problems, most demonstrate world-class performance. Incheon International Airport, for instance, has been rated number one in the ASQ global ranking by ACI for a decade.[1)] KEPCO (Korea Electric Power Corporation) exhibits the lowest black-out rate in the world. KORAIL (Korea Railway Corporation) shows one of world's highest on-time arrival rates.[2)] Even on the cost side, SOEs in Korea have maintained reasonably efficient

1) ASQ (Airport Service Quality), ACI (Airport Council International).

2) As a part of the evaluation system for SOEs, the Korean government introduced a so-called global comparative index system in which an evaluation is made based on the relative performance of an SOE compared to the best performing SOEs in the world. This comparative evaluation system has been abolished now since almost all Korean SOEs ranked top in the world, thereby rendering the global

and sometimes innovative management, although this may not be comparable with private companies.

What are the reasons behind the relatively good performance of SOEs in Korea? The most important explanatory variable is the Framework Act on SOE Management enacted in 1983, of which a revised version is now called the Act of the Management of Public Institutions. Among many features of the Act, there are two salient factors that have not changed since 1983: A central governance system and a strong evaluation system.

An SOE is one of the categories of the 323 public institutions in Korea.[3] Among public institutions, SOEs have two distinct conditions: (1) It should be a corporation whose shares are owned by the government or by other public institutions controlled by the government. (2) Its revenue from the market should be more than 50 percent of its total revenue including the government budget. If a public institution does not meet any of these two conditions, it is categorized as a quasi-government organization (QGO). There are 30 SOEs in Korea as of 2016.[4]

On the other hand, SOEs in Bulgaria have enjoyed a very high level of autonomy not only in their internal management but also in their project selection and even in their pricing. Each line ministry as the owner of the SOEs under its umbrella appoints the CEOs, but there is no formal evaluation process. There has been discussion on more centralized SOE governance in Bulgaria, but it could not overcome the resistance of line ministries and their SOEs.

This paper explains the SOE governance structure of Bulgaria, and tries to propose policy recommendations to improve the efficiency of SOEs in Bulgaria based on the Korean experience. Section 2 demonstrates the current standing of SOE governance in Bulgaria. Section 3 and 4 is the core part of the research which illustrates policy recommendations for the Bulgarian government regarding 31 key questions necessary for a good governance system for SOEs. For each of the 31 questions, different options are set side-by-side with their positive and negative aspects before a specific recommendation is proposed for Bulgaria. Section 3 focuses on governing bodies and policy tools for controlling SOEs, and Section 4 highlights an evaluation system, the most important policy tool for SOEs in Korea. Section 5 presents a

index useless.

3) These public institutions are public organizations designated as such by the government. Since the definition is rather vague, the number of public institutions varies slightly year to year. The common characteristic of public institutions is the influence of the government in the appointment of the head of the organization.

4) These are again divided into two groups: market-based SOEs with more than 85% revenue from the market, and semi-market based SOEs with more than 50%, but less than 85%, revenue from the market. There is no difference in the government policy towards those two groups. A list is available in the appendix 2.

summary and various conclusions.

2. Description of Bulgaria's SOEs and its Governance

2.1. Overview

As per the legal framework in Bulgaria there are two legal definitions. In this report, we will use the term SOEs referring to the first category of the following:

- **Commercial companies with state participation:** These are fully commercialized companies that apply Commercial Law rules and are referred to as companies with state participation. In addition to the general provisions of the Commercial Law the Regulation for Exercising the Ownership Rights in the Commercial Companies with State Participation stipulates the specific rules for governing those enterprises since they differ from the private companies. Enterprises with more than 50 percent of state participation are further governed by regulation No. 114 of the Council of Ministers for Monitoring of Financial Performance of SOEs (Attachment: List of enterprises with more than 50 percent state participation).

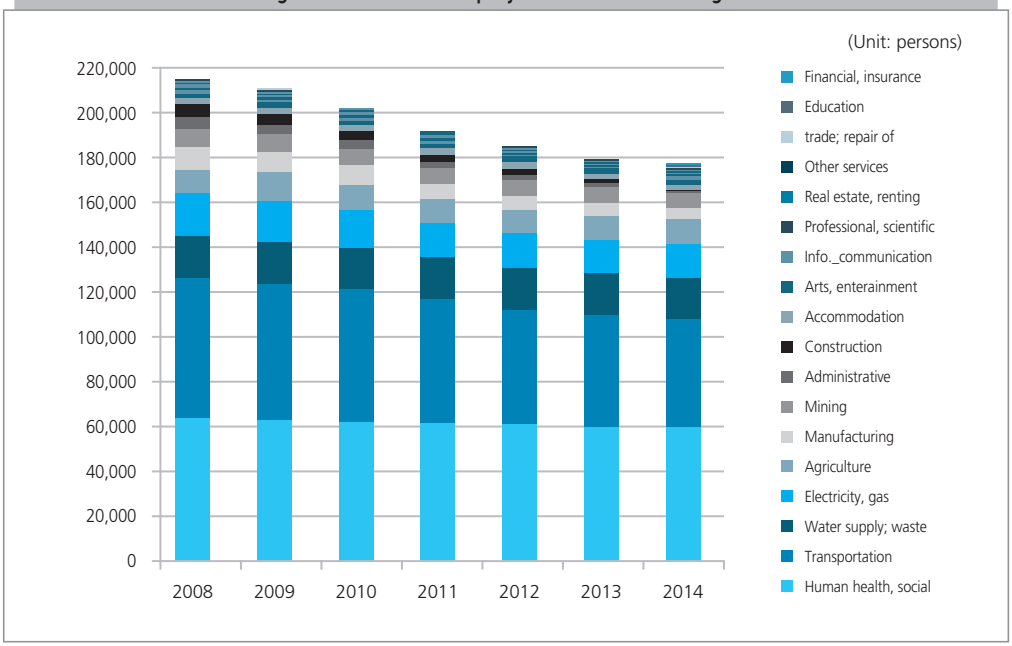
- **State enterprises:** Enterprises that are state budget based; most are regulated by the provisions of a particular Law. This corresponds to quasi-government organizations (QGOs) in Korea.

After a prolonged and hesitant privatization process, the public sector in Bulgaria was reduced to 157 companies where state participation is more than 50 percent.[5] SOEs contribute about 5 percent of GDP and employ about 7 percent of the labor force. They are concentrated in several sectors such as medical services, transportation, water supply and sewage, energy (electricity and gas), and production of arms, by the order of its employment size.

In terms of GDP share in each sector, the largest sector is transportation, followed by medical services, energy, mining, water supply, and agriculture. The total GDP contribution by SOEs reached its peak around 2011 and is now in a declining trend.

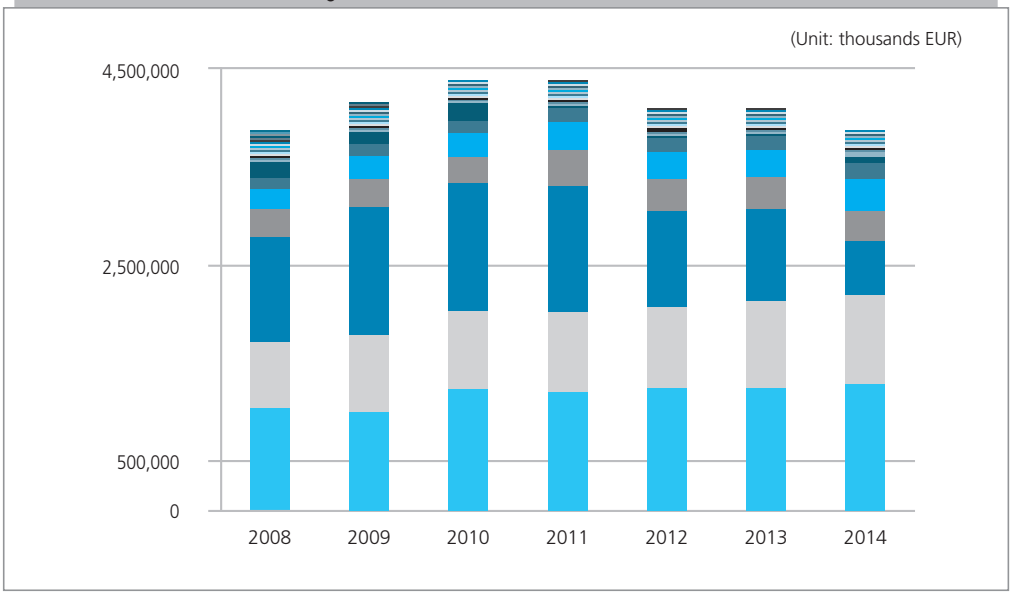
5) Without hospitals and enterprises with less than 50% state participation.

[Figure 1-1] Size of Employment in SOEs in Bulgaria



Source: National Statistical Institute (NSI). The NSI does not compile and publish data on SOEs sector. For the purposes of this project the NSI compiled data for 2014 based on the annual balance sheets and financial reports of SOEs.

[Figure 1-2] Total Value-added of all SOEs



Source: National Statistical Institute (NSI). The NSI does not compile and publish data on SOEs. For the purposes of this project, the NSI compiled data for 2014 based on the annual balance sheets and financial reports of SOEs.

2.1.1. General Problems for SOEs in Bulgaria

Performance in general is weak and the diminishing role of SOEs in the overall GDP and employment is a result of poor performance and management. A fully decentralized management system led to a rather wide range of performance. While some enterprises function efficiently, providing both public good and profit, others accrue huge deficits and burden the economy since non-serviced debts to the private sector and the state budget pose severe financial risks. The main challenges as regards the functioning of SOEs are as follows:

- Fragmented and often altered legal frameworks for SOEs. Full discretion of line ministers that lead to decentralized regulations and practices which vary between different ministries. Recently, two reports from the Bulgarian National Audit revealed that the line ministries do not efficiently exercise their responsibilities in managing state participation in the companies. In many ministries there are no internal rules for control over their performance, for the monitoring of business programs, for the evaluation of management, and the like. A recent IMF Article IV report also emphasizes that the weaknesses in SOEs governance pose a risk for economic and financial stability.
- SOEs are not sufficiently transparent
- Since 2010, the financial performance of SOEs is subject to regular monitoring and analysis according to regulation 114/2010 of the Council of Ministers. The data on each enterprise is published quarterly but not an analysis of the state-owned sector, nor is there a dynamic or comparative analysis.
- The board of directors and CEOs are directly employed without a selective procedure and clear job requirements. Management is subject to frequent change, rarely motivated by political preferences rather than the company performance.
- The dividend policy is unpredictable since the Council of Ministers makes ad hoc decisions every year. This puts the enterprises in an uncertain position and limits motivation for better performance. In past years, between 60 percent and 80 percent of SOEs' dividends went to state budget revenues, thus restricting opportunities for investment and innovation in the SOEs sector. In 2015, the government decided to request 50 percent of dividends from profits to be allocated to the state budget.
- Privatization halted in the last five years. Almost no privatization deals were concluded, though there were about 20 SOEs that are eligible for privatization.
- Severe decapitalization of enterprises with a minority stake of the state and difficulties in privatizing the minority shares. There is evidence that SOEs do not perform efficiently and that profitability is very low. According to 2014 financial reports for 152 companies with state participation over 50 percent, the net loss was 739 m BGN (496 m BGN in 2013). The main source of this loss

is the National Energy Company. Being the only sector where state enterprises prevail, this sector is the main source of financial losses. Among 152 enterprises, 60 sustained losses, and 5 had zero profit.

- Most of the SOEs are highly indebted. Three companies have debts over BGN 1 billion BGN (National Electric Company: BGN 3.5 billion, National Railway Company: approx. BGN 2 billion and Bulgarian Energy Holding: BGN 1.2 billion). Almost all energy sector companies are highly indebted.
- The SOEs spend fewer funds for R&D than the private sector. The SOEs share of total R&D dropped from 69 percent in 2000 to 36 percent in 2011.

2.1.2. Privatization Efforts

Privatization in Bulgaria was a huge and complex task. Prior to this and in the early years of transition, Bulgaria had an extensive industrial sector that represented approximately 60 percent of GDP. In addition, the private sector was practically nonexistent. The share of state property in the industry was about 95 percent. Companies were very large. Some 20 percent of companies had more than 5,000 workers and two-thirds had more than 1,000 employees. Only five percent of companies had less than 200 workers. The productivity structure corresponded to the Soviet industrialization model and the international division of the labor in the framework of the CMEA exchange system.

Privatization has been a slow process that has only accelerated since 1997. There have been several methods of privatization. The main methods were cash privatization, including MEBO sales, and mass privatization. Since 1997 with the consolidation of macroeconomic stability and external support, sales to foreign investors increased.

Privatization in the country is almost complete. The pace of privatization over the last few years has been slow. In the first half of 2014, only three deals were signed amounting to BGN 1.3 million. The total number of SOEs for privatization comes to about 20 rather small companies. The sales of minority state shares and the privatization of infrastructure branches (energy, electricity production, water supply, etc.) have yet to be finalized. The privatization of the postal service and other public services is expected in the long run. Therefore, what is a priority for Bulgaria is to improve the governance system for SOEs, which is the research question of this paper.

The Privatization Agency has almost exhausted its mandate and needs institutional changes. Among possible options, one is to merge with a new SOEs management authority. A similar pattern of institutional change was applied recently by most Central and Eastern European countries.

2.2. Governance System for SOEs

2.2.1. Governing Ministries

Practically all ministries govern SOEs in their respective sectors of competence as Appendix 1 shows. Although the Bulgarian model of SOEs management is rather decentralized, there are certain provisions that are obligatory for all enterprises with state participation. For example, all SOEs' long-term assets can be sold only through a tender based on the price determined by licensed independent appraiser and after the approval of the line minister. Loans, borrowing or lending by SOEs can be done only after approval of the line minister. Similar are the restrictions set up in the Privatization Law. A common mechanism is established, which determines the remuneration of managers, members of the board, and of CEOs. The remunerations in general should be related to results, but in practice this differs depending on the different ministries and enterprises.

An assessment of the SOEs is conducted only once a year, together with the approval of the annual financial reports and it is rather formal. There is no regular monitoring and control over the implementation of business plans.

The institutional framework for SOEs in Bulgaria changed several times, starting from a stronger Council of Ministers control on the key SOEs to a fully decentralized structure where the ministers exercise full state ownership rights. One of the main changes in the last few years was the establishment of holding companies in the sectors controlled by the state, like energy and road infrastructure. Most of the ministries have in their structure special divisions that deal with SOEs. Their primary objective is to support the minister in his capacity of representing the owner (the state) in the SOEs. These include:

- supporting the management of SOEs in performing their functions;
- preparing all the documents and positions of the state in the general meetings of the companies;
- preparing the legal acts for restructuring and closure of SOEs as well as the participation of SOEs in other companies;
- giving instructions as regards the management of long-term assets;
- preparing the management contracts and monitors their implementation;
- analyses the economic and financial performance of SOEs and preparing reports for the minster;
- monitoring the financial indicators as per the regulation of the Council of Ministers;
- monitoring the business plans of SOEs,
- in the case of bankruptcy of the SOE the department recruits and dismisses the

liquidator;
- supporting the established Audit Committees according to the Law for Independent Financial Audit;
- supporting the SOEs in their participation in the relations in tripartite committees (with trade unions),
- maintaining special register of SOEs; maintains a register of assets of SOEs;
- preparing the needed documentation in the case of privatization.

Since the management system is rather decentralized, the practice varies between the ministries and also depends on the scope of state ownership in the respective sector.

2.2.2. CEO and Board Member Appointment

The Bulgarian Council of Ministers (CM) or the minister of the specific industry branch (Branch Minister, BM) exercise ownership rights in the companies with state participation in the capital (CSPC). In these companies, where state participation composes just a fraction of the capital, the BM or its representative participates in the General Meeting of company, complying with the requirements of the Commercial Law. In the companies where all of the capital is provided by the state, the CM/BM act as a sole proprietor and appoints the Company Manager (in the case of Ltd. companies) or, the Board of Directors (BD), respectively the Supervisory and Managing Board (SB and MB) in the case of join-stock companies.

According to the powers entrusted, the sole proprietor:

- Selects and dismisses the Manager and Controller or members of the BD (SB and MB respectively);
- Determines the remuneration of the persons above.

The managers and the Board members in the Ltd companies and both physical and legal entities where permitted by the statutes of the shareholder companies. The number of members in the BD (SB and MB) is limited to five, except for the cases approved by the Council of Ministers. The number proposed by the *sole proprietor* must be in accordance to the share of the capital hold by the state.

The managers and board members are not allowed to serve on more than one managing or controlling board of the CSPC. Those individuals are subject of various restrictions in terms of their loyal and prudent behavior to the specific company if they are:

- carrying out of commercial deals*;

- being partners in limited or shareholding companies*;
- being CEO's or BM in other companies*;
- taking the managing and controlling positions if sentenced by the court;
- being ministers; MPs, mayors and such officials;
- civil servants;
- being on a work contract.

* The first three are applicable if the field of operation of the CSPC coincides with the activities of the person in question.

The managing bodies of the CSPC report on a quarterly basis to the relevant sole proprietor, about their service: corporate performance, fulfillment of the business plan, possible problems and correction measures. The sole proprietor agrees on the contracts with the persons in question; in some cases, it might be completed through a competition. The contracts are for a maximum of 3 years.

The contracts include the amount and forms of remuneration and a pledge regarding the performance of their duties. They also include a business plan on the whole mandate of the governing bodies, complying with the strategy of the company. It must be specific and hold economic targets, such as profits, market share, and employees.

Remuneration of CSPC managers and board members is supposed to be determined in accordance with the size of the long-term assets, the number of personnel, profitability, financial performance, the value added of an employee, servicing of company debt and more specific obligations, taken in the contracts. The final value is based on quantified indices and the minimum national salary for the specific month and limited to a five-month cap. It is expanded for executive members and managers representing the companies with a limiting cap up to 12 min salaries.

Remuneration is determined and revised each quarter based on the achieved targets. Additionally, in case of a profit growth, a bonus is provided from the earnings after tax and dividends, though it is limited to one average monthly payment to the board members.

2.2.3. Dividend Policy

There are two key issues as regards the dividend policies: how much of the dividend remains in the company (what is the share provided to the state budget) as well as when the dividend is to be paid. Dividend policies in both aspects were rather unstable in the past few years. These policies are not stipulated in the Law but are subject to Government decisions. Certainly, this provides the Government with flexibility and the revenues from the dividend of SOEs could well serve as a buffer in

difficult budgetary times, but the uncertainty poses severe risks for the management of SOEs. A number of years ago the dividend policy was fixed in the State Budget Law, but this practice was recently abolished.

The other problem is that the state drains the dividends from enterprises. In the last few years the budget collected from 60 percent to 80 percent (after taxation) of dividends, which is an extremely unfavorable policy as compared to OECD countries. Furthermore, a more stringent policy is applied to some SOEs which perform well: for example, for Sofia Airport Ltd, the share from the profits provided to the budget is 90 percent. In the past, the state as the owner of the SOEs established overly flexible dividend policies, listing ten SOEs for which additional sums (beyond 80 percent) had to be provided to the state budget (Regulation No. 285/2013 of the Council of Ministers).

2.2.4. Managerial Autonomy

State-owned enterprises in Bulgaria are separate legal entities. They are registered in the Court as commercial companies and have their own capital provided by the state. They possess high managerial autonomy. The managers appointed by the line ministries have the right to make decisions that affect the strategic and operational problems of companies including to hire and fire staff, sign contracts with their commercial partners and to manage their finances. Managerial autonomy is limited in making these decisions is sought sanction from the state body that performs the functions of the owner of state capital:

- profit sharing and its payment and payment of bonuses to managers and their size;
- solutions to reduce and increase capital;
- determine the remuneration of managers;
- elect an auditor of the company;
- decisions to open or close branches and participating in other commercial or civil companies;
- on the acquisition and disposition of real estate and property rights;
- decisions to acquire or dispose of shares or shares-owned by the company in other companies, as well as acquisition or disposal of financial fixed assets of the company abroad;
- decisions for filing claims against the company manager or supervisor and appointing a representative to conduct trials against them;
- solutions for additional cash contributions;
- permission for lending to third parties and to grant security in favor of third parties; the conclusion of a judicial or extrajudicial agreement, which recognized obligations or forgive debt;

- where authorization to dispose of fixed assets, lease real estate with a carrying amount that exceeds 5 percent of the total book value of fixed assets as on December 31 of the previous year; conclusion of credit agreements for cooperation in meeting promissory liabilities;
- selects the insurer before the conclusion of contracts compulsory insurance of property;
- permission for a mortgage and pledge of fixed assets of the company;
- appoint the liquidators at the company.

2.2.5. Internal and External Audit

An internal audit in state-owned enterprises is carried out according to the Law on Internal Audit in the public sector (Prom. SG. No. 27 of March 31, 2006). Under the law, all state-owned companies should employ internal auditors who have special training and qualifications. An internal audit helps the company to achieve its goals by:

1. Identifying and assessing risks in the company;
2. Assessing the adequacy and effectiveness of financial management and control with regard to:
   a) Identification, assessment and risk management of the company management;
   b) Compliance with laws, regulations and contracts;
   c) Reliability and integrity of financial and operational information;
   d) The effectiveness, efficiency and economy of operations;
   e) The protection of assets and information;
   f) The implementation of tasks and achievement of objectives;
3. Recommendations for improving the activities of the company.

Large state enterprises and designated as 'enterprises operating in the public interest' from the following sectors: energy, trade and transit of natural gas, water, sewage and telecommunications services, and the "Bulgarian State Railways" EAD and its subsidiaries must have an audit committee. The Audit Committee performs the following functions:

1. Monitoring the financial reporting processes;
2. Monitoring the effectiveness of internal control;
3. Monitoring the effectiveness of risk management;
4. Monitoring the independent financial audit.

An external audit of state enterprises is done by selected by the AGM auditors and by the Bulgarian National Audit Office (BNAO). The BNAO audits are performed according to the annual program.

3. Policy Options to Improve Institutional Framework for SOE Governance

3.1. Governance Structure

3.1.1. Centralized vs. Decentralized Governing System

SOEs in Korea are under the control of two different government bodies. A relevant line ministry takes care of the business side of its SOEs, whereas the Management Committee chaired by Minister of MOSF (Ministry of Strategy and Finance) is in charge of the management side of all SOEs. Since the Committee and MOSF controls most of the managerial leverage such as evaluation, control over the number of staff, budget and remuneration, we can say that SOEs in Korea are centrally governed.

There are many benefits to the central governance system. It can minimize the collusive behavior between an SOE and the relevant ministry which has been a source of inefficiency of SOEs. In conducting its policies, a line ministry often utilizes SOEs flexible budgets, and it can even enjoy post-retirement positions at the SOEs. In order to maintain such benefits, the line ministry is in general averse to the privatization of SOEs. The ministry may also have a tendency to tolerate overly generous compensation and surplus employment in SOEs. The OECD, therefore, recommends the central governance system to member countries. However, the central governance system may turn out to be rather inflexible since universal rules and regulation should be applied to all SOEs under different ministries.

〈Table 1-1〉 Governing System for SOE

	Positive	Negative
Central system	- Tighter and more efficient management - Better for privatization	- Inflexible management - Conflicts with the line ministries
Decentralized to line ministries	- Flexible management for each SOE	- Collusion between line ministry and SOE

The recommendation for Bulgaria is the first option. Bulgaria does not have a centralized agency to manage SOEs, and instead each line ministry plays an ownership role. The current institutional framework gives unlimited powers to the line ministries in managing SOEs. That is why the practices applied by different ministries are rather different and control over their performance is weak. There was an attempt in 2010 with Regulation 114/2010 to give more power to the Ministry

of Finance in monitoring the performance of SOEs with a focus on their financial situation. This did not lead to centralization or a strengthening of control, but instead the line ministries simply started to publish their SOEs' quarterly financial reports on the Ministry of Finance web page. This attempt proves resistance to reforms in the status quo. The worsening financial situation of most SOEs, though, calls for a stronger and speedier reform process. This paper suggests a centralized system for Bulgaria in institutional reform. The main benefits of this option would be the introduction of uniform management practices, avoidance or a decrease of political influence over the nomination and replacement of CEO and boards of directors, as well as the introduction of an evaluation system.

3.1.2. The Central Body: Should It be a Committee or a Single Ministry?

The central governance system will touch off some resistance from line ministries which will have to lose some of their control over SOEs. It is therefore useful to establish a Management Board, which in Korea is named the Management Committee for SOEs. Being composed of vice-ministers of major line-ministries with SOEs, the Committee in Korea is an arena where major policy decisions on SOEs are coordinated and finalized. However, the Committee in general can slow down the decision-making process, and can make accountability a little unclear. In Korea, the speed of decision-making is an issue especially in the process of CEO appointments because the Committee cannot convene as frequently as it should be. Accountability is not an issue in Korea because it is clear that the decisions by the Committee are mostly driven by the Secretariat, which is a Bureau of Public Institution under MOSF.

〈Table 1-2〉 Management Committee for SOE

	Positive	Negative
No such Committee (Instead, one central agency)	- Faster decision-making - Better incorporation of the specific sectors' concerns - Freedom and flexibility at the company's decision making level	- Difference in practices between the line ministries - Limited control
Establish a Committee	- Participatory decision-making - Useful inputs from themembers - Harmonized rules for the management - Sustainability of management and investment policy - Transferability of best practices	- Economy of scale: it is expected that the staff of departments dealing with SOEs in each ministry should be limited since some of the functions will be transferred to the steering Committee - Shared accountability

The recommendation for Bulgaria is the second option. In order to ease expected resistance from line ministries, it will be useful to have a Committee with a presence of line ministries. A tentative name for the Committee could be the 'Steering Committee for SOEs Management'. Each line ministry will maintain its control over the business side of SOEs as is the case in Korea. The most important question is which functions will be transferred to this Committee. The Committee should discuss topics, which are mainly related to the unified governance of the SOEs. The line ministers should keep their role with respect to the strategic governance of the companies in their sector. More specifically, the line ministers should be responsible for the topics and the issues, which are relevant to the general policy of the sector that they govern, in case that general policy is fulfilled by SOEs.

3.1.3. Who Should Play the Role of Secretariat of the Management Committee?

The central governing Committee needs a Secretariat whose role is to assist the decision of the Committee. There are four candidates for the Secretariat. The first option is a ministry in charge of the national budget. The second option is a ministry in charge of planning or economic policy. The first and the second option results in the same ministry in Korea since both functions are in one ministry, MOSF.[6] The third option is the Prime Minister's Office. Finally, we may create a new government body independent from ministries specializing in the management of SOEs. In option one–through three, the Secretariat of the Management Committee should be placed under the corresponding agency, whereas that of option four will be newly created and placed directly under the Committee. Each option has strengths and weaknesses as explained in the following table.

Korea followed the first option for an extended period of time. Though the ministry name has changed on a number of occasions,[7] the ministry with a budgetary function has always been the central agency in charge of SOE governance. The reasons are as follows. First, many SOE policies are boiled down to fiscal implications. Second, the budget office has accumulated knowledge on the line ministries and their SOEs. Third, it does not carry its own SOEs, which makes the budget office neutral. One problem for the budget office being the central agency is that, with a view to minimizing budgetary support for SOEs, it may allow SOEs to earn revenue from the market that should be enjoyed by the private companies rather than the government. However, this is not a problem in Bulgaria because SOEs in Bulgaria are prohibited from state aid.

6) In 2008, two ministries in charge of planning and budget (Ministry of Planning and Budget) and economic policy (Ministry of Finance and Economy) were merged in Korea.

7) Economic Planning Board (1961~1994), Board of Finance and Economy (1994~1998), Planning and Budget Commission (1998~1999), Ministry of Planning and Budget (1998~2008).

〈Table 1-3〉 Candidates for Central Agency

	Positive	Negative
Ministry with Budget Office	- Power for implementation - Some experience inmonitoring the SOEs financial performance - Stringent budgetary control - Implementing the state aid rules as per the EUrestrictions	- The mandate of MOF is focused on the state budget and dealing with SOEs may defocus from the main priority fiscal policy and financial stability - No expertise in different sectors of the SOEs, limited experience in SOEs management - More resistance from line ministries since MOF is already a strong ministry
Ministry in charge of Economic Policy	- Policy of SOEs is one of economic policies - Extensive experience in managing SOEs in a broad sector range - In the EU SOEs management falls within the competence of DG Industry	- Its mandate on economic growth may encourage SOEs' expansionary position. - Does not have expertise in some sectors where the state participation is crucial (infrastructure, health, etc.) - Limited power of the Minister of Economy, no fiscal and financial tools
Prime Minister's Office (PMO)	- Neutrality	- SOE management may not be so important for PMO - Insufficient staff, expertise and experience in SOEs management
Separate Secretariat Committee	- Specialization andNeutrality - Can be compromise among ministries	- It may not have enough of leverages for SOEs. - The new creation of government agency will take time

The recommendation for Bulgaria is option four. An independent Secretariat is the best option because it can create a neutral, specialized body. The Ministry of Economy is one good option but neutrality is an issue because there are many SOEs currently under its auspices. The MOF is another good option but its central role will touch off a strong resistance from line ministries since the MOF is already a strong ministry. A conflict over the selection between the MOE and MOF for the central agency's role could ruin the whole reform process. Although the creation of a new administrative body may be difficult, it will be easier than a choice between the MOE and MOF. The chairperson of the Management Committee will have to be at a minister level.

3.1.4. Composition of Management Committee

The Management committee for SOEs in Korea is chaired by the minister of MOSF and is composed of vice ministers and experts who are mostly professors, lawyers or public accountants. There are three options for its composition: civil servants only and civil servants plus experts, and finally the inclusion of the labor union. There are many decisions made by the Committee that have a direct and significant impact on employers in SOEs. Therefore, the involvement of labor union members in the Committee makes sense, but it may seriously slow down the decision-making process. Korea allows the third option by law, but in effect follows option two. Labor unions in Korea are rather militant, so their members have not been seriously invited to the Committee yet. By and large, the Korean system has proven successful in enforcing more transparency and openness in the process.

〈Table 1-4〉 Composition of the Management Committee for SOEs

	Positive	Negative
Civil servants only	- Faster and more realistic decision making process	- Opacity
Civil servants + experts	- More neutral and diverse view provided by the experts	- Experts have a limitation in checking the central agency only to slow down the process
Civil servants + experts + labor union	- Openness - Participation of major stakeholder	- More difficult decision making - Information leakage

The recommendation for Bulgaria is option two. Bulgaria has extensive experience in inviting external experts in governing bodies and decision making as regards state affairs. Recently, external experts were broadly invited in the public procurement procedures but the results were not encouraging since the invited external experts tend to also be dependent. In spite of this, option two seems to be appropriate for Bulgaria as well for the following reasons: i) The outside experts will closely observe current SOEs performance and will serve as a public watchdog; ii) They will act like independent directors in the listed companies; iii) They will help increase transparency of SOEs. These experts should be nominated by a special selection procedure which needs to be elaborated. It would set professional requirements for experts, determine who has the right to nominate them, and who and how the experts should be selected. The current legal framework, particularly Article 19 of the Regulation for Exercising the Ownership Rights in the Commercial Companies with State Participation sets up the requirements for the CEOs and the members of the decision making bodies of SOEs, for example, boards of directors and supervisory boards. The regulation says who cannot be, instead of who could

be, members. There are restrictions for Members of the Parliament, persons who perform similar business activities, etc. Similar rules can be applied to the non-government members of the Steering Committee. It is not recommendable, however, for the central agency or Steering Committee to include members from labor unions. The labor unions in Bulgaria participate in the tripartite cooperation counsel, along with the government and the employers' organizations. There have been many cases in which decision making was delayed due to the questions and concerns raised by the labor unions. Should the labor unions participate in the Steering Committee, quick decision making will not be possible.

3.1.5. Who Should be Centrally Governed?

There are other types of public institutions in both Korea and Bulgaria. Those whose revenues mostly come from the government are called quasi-government organizations (QGO), and they are also governed by the Management Committee in Korea. However, the central agency can only supervise SOEs leaving QGOs in the hands of line ministries as in the second option.

〈Table 1-5〉 Coverage of Central Governance

	Positive	Negative
Both SOEs and QGO	- Equal treatment for both SOEs and QGOs who have many similarities	- Identical treatment for both SOEs and QGOs despite their difference
Only SOEs	- Less conflict with line ministries - Different treatment for QGOs	- Loose management for QGOs

The central agency in Korea only covered SOEs until 1998 when the Planning and Budget Commission later renamed as Ministry of Planning and Budget (MPB), first tackled the inefficient operation of QGOs. Although the intervention of the MPB was lacking in legal background, line ministries had to stay silent because it was right after the financial crisis of Korea in 1997. The MPB realized the need for a legal foundation that enabled it to cover not only SOEs but also QGOs because those two types of public institutions have a lot in common. Since 2007, both SOEs and QGOs have been governed by the Act on the Management of Public Institutions.

An SOE and QGO have both many similarities and dissimilarities. They provide a service to citizens on behalf of the government, and their CEOs are appointed by the government. Both SOEs and QGOs can collude with their relevant line ministries. However, QGOs' revenue mostly comes from the government and not from the market, which makes them much more dependent upon the line ministries than

SOEs are. In other words, SOEs need to have more managerial flexibility than QGOs do, and this is why there is an argument in Korea that MOSF should return its grip over QGOs to line ministries.

The recommendation for Bulgaria is option two, unlike Korea. Bulgaria's central agency will have to cover only SOEs, leaving QGOs in the hands of the line ministries. QGOs in Bulgaria are called state enterprises. Including QGOs in the hands of the central agency may drive the whole reform process into a cul-de-sac. In Bulgaria most QGOs are created by specific laws where their functions and the ways they operate are fixed. This supports the choice of the second option proposed above of not changing the existing system with the exception maybe for closer monitoring of their functions. Depending on the relative performance of QGOs compared to SOEs, the central agency can raise this jurisdiction issue later. It is suggested that Bulgaria's central body also cover privatization and post-privatization functions and governance of enterprises with a minority stake of the state. However, it is recommendable for Bulgaria's central agency to apply the function review to QGOs which will be explained later in this paper.

3.1.6. Open Recruitment vs. Direct Appointment for CEO

Although open public recruiting is a standard process for any appointment position, there are some problems as listed in the following. Sometimes, the most eligible person may not apply for the position for fear of losing in the open competition. Occasionally the one with the appointive power, such as the Office of the President, unofficially pre-designates the winner of the recruiting procedure, making the whole process useless. The open recruiting process also prolongs the appointment process.[8)] There is an argument in Korea that the current system has lower accountability than the direct appointment by the President since an intervention by the President or the Office of the President is camouflaged by a seemingly open and fair process. More important positions, such as cabinet ministers, are directly appointed by the President of Korea. The people accept the President's selection since the ministers' qualifications are examined in a Congressional Personnel Hearing. In this respect, direct appointment, coupled with an open public hearing, emerges as an effective way to recruit the most qualified person for the position. A public hearing for CEOs can be conducted by the central agency. There is a third option in which the one with appointive power chooses between option one and two for each case.

8) Sometimes a CEO position is vacant for more than 6 months to complete the process.

〈Table 1-6〉 Methods of Recruitment

	Positive	Negative
Openpublic recruiting	- Minimize collusive behavior - Maximize transparency	- Time consuming - The most eligible may not apply. - Pre-designation by the appointer can make the process useless.
Direct appointment with public hearing	- Clear accountability of the appointer	- May open a door for corruption due to limited competition
Mix	- Effectiveness of the system	

The recommendation for Bulgaria is the first option. The current legislative framework does not require a public recruitment process for CEOs and boards members although the rule says that an open procedure may be applied.[9] However, no minister prescribes such rules and opportunities, and therefore the practice is always a direct appointment by the responsible minister. There are no selection procedures, job requirements, public announcements, etc. Very often the appointees are simply political nominees without proper credentials and experience. Improving the procedure for the appointment of the CEO of a SOE is of crucial importance for its better governance. A more transparent and competitive procedure might be achieved if the full discretion of the minister is limited and an open selection procedure based on concrete qualification criteria is conducted. The open procedure certainly requires more time and qualified candidates may choose not to apply, but the benefits of the open procedure are enormous and will contribute to the better performance of SOEs. However, introducing a competitive recruitment process will be a radical reform that will limit political interference and that is why it will face resistance from political parties.

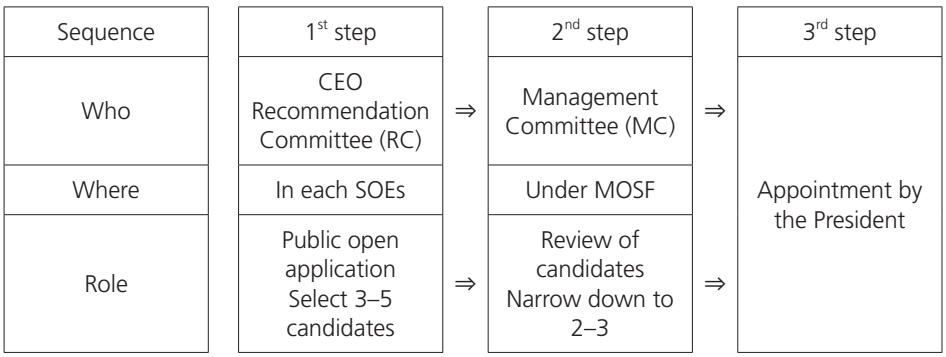
3.1.7. Who Should be Involved in the CEO Appointment Process?

The CEO appointment process in Korea is rather complex. The first step is the CEO Recommendation Committee in each SOE which is composed of non-standing board members and invited outsiders on an ad hoc basis, without any SOE insiders. In principle, the Board of Directors should play the role of the recommendation committee, but the Korean government wanted to separate the process from insiders. This committee accepts open applications, and selects –three to five adequate candidates. The second step is the Management Committee for SOEs chaired by the minister of MOSF, which narrows down options to –two to three

9) "The management of the SOEs could be assigned after a competitive procedure set up by the minister." (Regulation for Exercising the Ownership Rights in the Commercial Companies with State Participation).

candidates. This decision by the Committee is supposed to be seconded by the relevant line minister, which is only a rubber stamp process. The third step is the appointment by the President of Republic of Korea.[10)]

[Figure 1-3] Process of CEO Appointment for SOEs in Korea



There are four different types of CEO appointment process. One extreme is Korean model that follows for all three steps. The other extreme is a direct appoint without the first step of open recruiting by Recommendation Committee (RC) and without the second step of review by the Management Committee (MC). There are two variations in-between the two extremes. Korea follows the first option of open public recruiting.

〈Table 1-7〉 Those Involved in the CEO's Appointment

	Positive	Negative
Both RC and MC	- Transparency - Finding the most suitable person	- Time consuming - The process may not be respected
Only MC	- Minimize collusive behavior	- Too much power of the central agency
Only RC	- Accountability of each SOE's Board of Directors	- Possibility of collusive behavior if the Board is not fully accountable
Neither RC nor MC (direct appointment)	- Time saving - Accountability of the appointer	- Too much discretion of the appointer

10) The CEO Appointment process for QGOs is relatively simpler than that for SOEs in that it does not go through the second step. The CEO of QGO is appointed by the relevant line minister rather than the President unless there is a separate specification.

The recommendation for Bulgaria is the third option (only RC, skipping the second step) in which each Board of Directors (or Recommendation Committee) in SOE narrows down the applicants to –two to three candidates so that the appointer appoints the best performing candidate. The second step of the Management Committee will not only slow down the appointment process but also will create a huge resistance from the line ministries who have to share their appointive power with the central agency.

3.1.8. Who Appoints the CEO and Board Members?

The CEO of the SOE is appointed by the President in Korea, whereas in Bulgaria it is by the line ministers. There are four possible appointers of CEOs of SOEs: political leaders such as the President or Prime Minister, the Chair of Steering Committee (or central governing agency), relevant line ministers, or Chairman of Board of Directors.

〈Table 1-8〉 Who Appoints the CEO?

	Positive	Negative
Political leader (President, or PM)	Strengthen the independence of SOE	Less delegation from the top
Chair of Management Committee	Strengthen the power of the central agency	Resistance from line ministries
Relevant Line Minister	Accountability of the line ministry	Possibility of collusion
Chairman of Board of Directors	Accountability of the BoardIndependence of SOE from line ministries	Weak accountability of Board members

The recommendation for Bulgaria is option one or option three. It is a highly political decision to select option one. Bulgaria may find it very difficult to deviate from the current third option when the central agency takes a controlling power away from the line ministries. However, the source of inefficiency in SOEs is the collusive behavior between the line ministries and SOEs which will be reduced if the appointive power is given to political leaders such as the President or Prime Minister. If CEOs are appointed by a political leader, the relationship between the line ministry and the SOEs will become a little more horizontal and less collusive. Support for option three will depend on the fairness and openness of the recruiting process.

3.1.9. Composition of Board Members

The general rule is that the board needs to operate as a representative of the

whole entity. Regarding the composition of the board, there are three models: all insiders without non-standing members, all outsiders, or a mixed composition. Korea follows a mixed composition: more than half of the board members are composed of outside non-standing members.[11] However, some SOEs like four port authorities[12] have boards of directors composed of only non-standing outsiders, with the exception of the CEO. In this case, the board is dominated by outsiders, which makes the board much more independent from inside executive managers.

〈Table 1-9〉 Composition of Board Members

	Positive	Negative
All insiders (no non-standing members)		High possibility of collusive behavior
CEO is the only inside board member	Strong role of the board	Burden of the CEO
Mixed composition	Middle of the Road between two extremes (option 1 and 2)	

The recommendation for Bulgaria is the second option. The mixed composition of the Bulgarian public boards is a legal requirement and it is advised by the OECD to follow such a procedure for the SOEs as well in order to enhance the objectivity of SOE boards. It is important to nominate a sufficient number of competent non-executive board members who are capable of independent judgment. These board members should have the relevant competence and experience and it is advisable that they be recruited from the private sector. It will help in making boards more business-oriented, particularly for SOEs that operate in competitive markets. Their expertise could also include qualifications related to an SOE's specific obligations and policy objectives. Bulgaria may want to expand its public companies' legislation over the SOE and confirm the mixed composition if not the second option.

3.1.10. Who Appoints Non-standing Board Members?

The appointment process for non-standing board members in Korea is similar to the CEO position except that the appointment is made by the MOSF minister, not by the President of the Republic of Korea. It is notable that the non-standing board members are appointed neither by the relevant minister nor by the CEO of the SOE. This is a way to guarantee the objective role of the non-standing board members in

11) These non-standing members are appointed by the minister for MOSF, and they are supposed to play a role in the checks and balances process of board operations.

12) There are four Port Authorities in Korea: Busan, Incheon, Ulsan, Yeosu.

checking the CEO.[13] Standing executive board members are by law supposed to be appointed by the CEO, but sometimes this is influenced by the relevant ministers in Korea.

〈Table 1-10〉 Who Appoints Non-standing Board Members?

	Positive	Negative
All insiders (no non-standing members)	Checks and balances with insiders of the board	Time consuming process
CEO is the only inside board member	Harmony between SOE and the relevant line ministry	Too much influence of line ministry on SOE
Mixed composition	Autonomy of SOE	Weak checks and balances

Recommendations for Bulgaria somewhere between the first and the second option. It is important to change the current practice in which the line ministers alone appoint board members, including the CEO, without any prescribed rules and requirements. The power of appointment can be shared by the two: a half of non-standing board members appointed by the central agency, and the other half by the line ministry. Alternatively, it may stay with the line minister but the whole process can be regulated and supervised by the central agency. In Bulgaria, the nomination and selection of all board members should follow same procedure as the CEO. That is enforced by the fact that according to commercial law in Bulgaria, all members of the board have equal rights and obligations. As in Korea, though contrary to some other countries, in Bulgaria the executive director is also a member of the board, and the executive director is empowered by the other members of the board to represent the company in accordance with the board's decisions.

3.2. Policy Tools for SOEs by the Central Agency

The Management Committee (hereafter, the Committee) in Korea has diverse leverages on SOEs. This part will investigate whether those policy tools are applicable to Bulgaria.

3.2.1. Input Control

In Korea, the central agency controls the budget, employment, internal organization, and remuneration of SOEs in a very tight manner. It is safe to say that MOSF controls all those policy tools for the SOE since the MOSF minister is the chair of the Management Committee, and since the Secretariat of the Committee is an internal organization of MOSF.

13) Insiders are a CEO and standing board members of the SOE who are appointed by the CEO.

There are three different approaches for input control. First, strict approval may be required as in Korea where all the inputs variables are approved by MOSF. Second, after basic guidelines are provided, the efficient use of the inputs is assessed by a formalized monitoring and evaluation system. Third, we may grant full autonomy to the SOE for its inputs when we can enforce an evaluation on its final performance.

〈Table 1-11〉 How Much to Regulate the Inputs for SOEs?

	Positive	Negative
Approval for major input variables	Tight control of SOE efficiency	Lack of autonomy
Setting input guidelines and Ex-post monitoring and evaluation for inputs	Harmony between autonomy and efficiency	
No ex-ante intervention and Ex-post Outcome Evaluation	Autonomy of SOE	Possibility of inefficiency

The recommendation for Bulgaria is the second option. In principle, control over input variables is not necessary when the outcome is clearly measured. However, since it will take time for the outcome index and strict evaluation system to be developed in Bulgaria, controlling inputs makes good sense. However, option one appears to involve too much intervention by the central agency. Guidelines coupled with ex-post monitoring will be enough to strengthen the efficiency of SOEs. With initial guidelines, ex-post monitoring will be much easier. In Bulgaria input control is delegated to the line ministry within the framework of the control over the business plans implementation. The management of the SOEs is obliged every quarter to present written report to the line minister as regards the results of their activities in implementing the business plan of the company, the financial situation, the weaknesses and the measures undertaken for their resolution.[14] The three-year business plans have to consist concrete economic indicators. Regulation, though, fails to prescribe clearly the compulsory indicators for the performance of SOEs. This makes the practice and the assessment very weak. The entire process rests at the discretion of the line ministry. The ministries do not set up performance targets. Recently the national audit chamber has performed an evaluation of the control performed by two ministries on the SOEs' business plans. The result in both cases was worrying. The reports state that there is no internal procedure involving reports on neither business plans nor an evaluation of results. The ministries do not prepare regular reports on the economic and financial performance of the SOEs under their control.

14) Act 23 of the Regulation for Exercising the Ownership Rights in the Commercial Companies with State Participation.

3.2.2. Input Regulator

The next question is who should set the input guidelines and conduct ex-post monitoring to check whether each SOE satisfied the guidelines. In Korea, the result of the monitoring is an important part of the management evaluation that will be explained in the next section. There are three options, as follows: the Chairman of the Committee, Relevant Line Minister, and Chairman of the Board of each SOE. If input control is necessary to enhance the efficiency of SOEs, the central agency's direct involvement is unavoidable. However, SOEs will be seriously resistant to these new regulations on their salary, new hires, etc. The decision should be made based on this pros and cons for strong input control by the central agency.

〈Table 1-12〉 Who Regulates the Inputs for SOEs?

	Positive	Negative
Central Agency	- Efficiency	- Resistance of the lineministries - Same treatment for different SOEs
Relevant Line Minister	- More information	- Possibility ofcollusive behavior
Chairman of Board of Directors	- Autonomy of SOEs - Flexible management	- If the Board has low accountability, serious collusive behavior is expected

The recommendation for Bulgaria is the first option, as practiced in Korea. As long as Bulgaria introduces a more centralized governance system, the central agency should assume such roles. The second and third options will simply open the door to collusive behavior. As was discussed earlier, however, controlling the business plan should remain with the line ministries since they do understand the sectors better than the central agency.

3.2.3. Project Control

Normally SOEs' projects are controlled by the line ministries unless the projects are financed by the government. Korea has maintained the division of labor between the line ministry (projects and business) and MOSF (management and evaluation). However, the line ministry has been inclined to be generous for the new projects of SOEs since both the ministry and SOEs have enjoyed the expansion of business even when it is not profitable. This collusive behavior resulted in huge debts in many SOEs. Therefore, the Korean government recently introduced a pre-feasibility study for SOE projects even though they are not financed by the government. The pre-feasibility study for government projects has been conducted by the KDI (Korea Development Institute) since 1999, and non-budget SOE projects became a recently added

mission for the KDI. There are three options for the project intervention by the central agency. First, no intervention is called for unless the project is funded by the government. Second, even projects funded by a SOE's own revenue are controlled if the amount exceeds US$10 million. Third, one may lower the floor to US$1 million in order to control more SOE projects. In Korea, the floor is presently US$50 million.

〈Table 1-13〉 Should Projects of SOEs be Controlled by the Committee?

	Positive	Negative
(1) Only projects by government budget	Autonomy of SOEs	Possibility of over-expansion
(1) + any projects with more than US$10 million	Target only large projects	Few projects are controlled.
(1) + any projects with more than US$1 million	Tight control over SOE projects	Loss of autonomy of SOEs

The recommendation for Bulgaria is option one. The line ministers should deal with project control and planning when such projects are related to the execution of governmental programs and strategies. When the projects are related to operational activities, then the management of the company has to have autonomy and flexibility. The current practice in Bulgaria is that all investment projects are part of the business plan and the line ministry controls their implementation as much as it controls the business plan implementation. In cases where the state budget is involved, this falls within the EU state aid rules. In order to receive approval, such investments follow a strict EU procedure including permission from the European Commission. Since the government receives the bulk of the profit (60 to 80 percent) there is not much room for large investments by SOEs. There is no risk for over-expansion. The problem in Bulgaria is just the opposite. The limited investment makes SOEs non-competitive and their products and services difficult to penetrate the market except in areas where they have monopolistic positions. This is one of the reasons for their weak performance. Reforms need to give more room for investment by the SOEs. It is not just who is going to control the investment, but how to provide opportunities for investment.

3.2.4. Information Disclosure

Korea has regulated 323 public institutions, including 30 SOEs, to upload their managerial information on Alio, an integrated website (www.alio.go.kr). It includes 37 pieces of information, such the level of employment, salary, budget, fringe benefits, debt level, etc. It also provides information on job openings, tenders of

SOEs, and best practices. The benefit of an integrated system comes from the easy comparison of different SOEs. When the integrated website was first opened, however, there were many discrepancies between information on Alio, the respective internet homepages of each SOE, and the accounting report. Some were simple mistakes, but some were intentional. MOSF asks each SOE to punish personnel who are responsible for incorrect information being submitted to Alio. MOSF is working to improve Alio to the level of the DART (Data Analysis, Retrieval and Transfer System) which is an on-line information disclosure system for private companies listed on Korea's stock market.[15] Depending on the level of enforcement, there are four approaches. Korea took the first option.

〈Table 1-14〉 The Enforcement Level of Information Disclosure

	Positive	Negative
Integrated website with punishment for false info	Strong impact	Burden for SOEs and their resistance
Integrated website without punishment	Easy implementation	Possibility for many false info
Enforce info disclosure thru respective internet homepage	Easier implementation	Difficult to compare info of different SOEs
Recommend SOEs to list information on their homepage	Easiest implementation	Weak impact

The recommendation for Bulgaria is the second option for the time being. Bulgarian SOEs are not sufficiently transparent and this is one of the main reasons for their weak performance. SOEs should disclose material information on all matters prescribed by the best corporate governance practices, while additionally focusing on areas of significant concern for the ultimate owner, the general public. This means that in addition to the third proposed option, it needs to report to a centralized reporting system for public companies, something akin to the Alio system or DART in Korea. However, the punishment clause seems to be somewhat excessive since it may invite serious resistance from SOEs. As for the legal framework, they are obliged to present their annual reports and accounts. Currently, the quarterly reports of SOEs with more than 50 percent state participation may be also found in the Ministry of Finance web page, but it is neither comprehensive nor accurate. If this is the case even after the mandatory information disclosure through an integrated web site, Bulgaria can move on to the first option.

15) The DART is managed by Financial Supervisory Service in collaboration with KRX (Korea Exchange). For more information on DART, please visit englishdart.fss.or.kr/.

3.2.5. Customer Satisfaction Survey

Every year, all SOEs in Korea should conduct a customer satisfaction survey. In order to guarantee the objective survey process, MOSF, not the SOEs, designates one consulting company to conduct a survey for all SOEs. Each SOE negotiates with MOSF over the definition of customers, the method of the survey, and the questionnaire. The result of the survey is one index in a management evaluation that will be explained in the next section.

As the survey has been conducted over the years, almost all SOEs receive a score over 90 percent, making the survey lose its differentiating power as an evaluation index. Some people say that this is a result of the efforts by SOEs to enhance customer satisfaction, but some say that the equally high score for all SOEs is a result of customer manipulation. Although both arguments are not wrong, the truth seems to lie closer to the positive interpretation: It cannot be denied that the survey has contributed to the enhanced satisfaction level of customers. Defining their customers and their needs, the questionnaire turned out to be a very educational process for SOEs.

Depending on the level of enforcement, there are three options. First is the Korean model where the central agency (MOSF) conducts a mandatory customer satisfaction survey. Second, each SOE conducts a mandatory customer satisfaction survey. Compared to the first option, the second option may end up with less reliable results because the survey is conducted by the SOE itself. The third option is a simple recommendation to SOEs to initiate a customer satisfaction survey, which may end up with no implementation by any SOE.

〈Table 1-15〉 The Level of Enforcement of Customer Satisfaction Survey

	Positive	Negative
Mandatory for all SOEs conducted by central agency	Strong impact	Cost for the central agency (budget, administration)
Mandatory for all SOEs conducted by each SOE	Impact with less costs	Reliability of the survey result
Simple recommendation for SOEs	No conflict	No implementation

The recommendation for Bulgaria is option one. This will have a strong impact and opportunities for comparison between the different SOEs. In Bulgaria there has never been a consumer satisfactory survey. There has been a discussion just recently about a similar survey to be conducted for health services provided by some of the

nation's hospitals. Conducting different surveys for each sector and SOEs, together with a different methodology and interpretation of the results, may be harmful. Since Bulgaria has no such experience it would be better to start with a more uniform approach. This part of the reform is of key importance for overall reforms since the public will gain a substantial amount of knowledge and clear opinions about the performance of SOEs.

3.2.6. Function Review

In Korea, MOSF regularly reviews the functions of an SOE to see if any should be stopped or integrated with another SOE. Many SOEs in Korea have expanded their businesses for different reasons. They may want to raise revenue in the market even when there are already private providers. When SOEs compete against private firms, competitive neutrality is often violated. Sometimes SOEs start a new business in the face of unfavorable financial prospect only to expand their employment and organization hoping to enjoy speedier promotion. There are also cases where line ministries ask for a certain project against the will of the relevant SOE to fulfill their policy objectives. As a result, the functions of SOEs are often very much bloated and excessive. There are even cases where similar functions are being conducted by multiple SOEs.

There are three different approaches for a function review. First, as in Korea, the central agency can review the functions of SOEs annually. Although implementation of the review is strongly enforced by the law in Korea, this may not be the case in Bulgaria. Second, the central agency can perform a function review sporadically right after the new political leadership comes in. This will provide a good political environment in dealing with the resistance of SOEs and line ministries. However, a sporadic review matching with the political cycle may not allow enough time for the examination and analysis of the different functions of SOEs. Some functions could be left out of the review due to the time constraints. Third, one may pass the responsibility to a line ministry, in which case not much will happen since no one wants to fundamentally reform its SOEs. In Korea, MOSF initially followed option two, but altered its policy to option one in 2013 to make the function review a more continuous process. Every year, MOSF sets areas of priority for the function review. During the first half of 2015, 87 public institutions in three focus areas[16] had to undergo a function review by MOSF.

16) The three areas were social overhead capital, agriculture and fisheries, and culture and arts. 52 different functions were streamlined: integrated, reduced, and stopped. There are, however, cases where an expansion of a certain function is recommended.

〈Table 1-16〉 The Level of Enforcement of a Function Review

	Positive	Negative
Continuous process conducted by central agency	- High impact	- Large burden for the central agency
May not be implemented	- Impact with less costs	- Reliability of the survey result
At the beginning of a new government conducted by central agency	- Good political support	- Not enough time for review - Some functions are let out.
Leave the function review at the hands of line ministry	- Easy implementation	- Weak impact

The recommendation for Bulgaria is the first option. Ministries have no interest in initiating the privatization of SOEs. That is why a central agency could take over this function. The central agency will have to conduct a regular function review, but may stage rather substantial reforms such as privatization of SOEs during the honeymoon period of a new government. The line ministries should be asked to propose a reform plan of their SOEs, but it is the central agency that approves and makes the decision. When the central agency does not have enough staff for the function review, it may want to form a taskforce with experts from the private sector and academia. However, these experts can provide only knowledge, not a driving force, that is essential to overcome the strong resistance from both a ministry and an SOE. Therefore, when the central agency is seriously under-staffed, the second option could prove more realistic.

The function review of SOEs in Bulgaria is defined in two legal acts, the Commercial Law and the Law on Privatization. The Privatization Agency, which reports to Parliament, prepares an annual program where it proposes which SOEs have to be offered for privatization. They make their proposal on the grounds of their assessment of the functions of the SOEs and also in coordination with the line ministries and the Council of Ministers. Once the program is adopted the Agency starts the procedure.

Mergers and acquisitions of SOEs are prescribed in government regulations, where the power is clearly divided between the Council of Ministers and the line ministries. The current practice does not create substantial problems and there may be need for radical reforms. The problem is that the Bulgarian legislation does not clearly distinguish between the commercial and the social functions of the SOEs as requested by the OECD Guidelines for SOEs management. Such distinctions would be beneficial for both remuneration from the budget of the social functions and

also for the facilitation of the decision as to which SOEs should remain state-owned and which should be privatized. Such an analysis is also needed when it comes to the creation[17] of a new SOE to see whether the function it will perform has a social or any other public interest.

3.2.7. Long-term Fiscal Planning: Scope and Enforcement

Every year in Korea, SOEs have to submit their five-year fiscal planning which is delivered to National Assembly after being reviewed by MOSF. The first question is which SOEs should submit a plan. The central agency may enforce the submission of a plan for all SOEs or only for large SOEs,[18] or for SOEs with a bad financial status.[19] Every year, MOSF designates SOEs that are either large or financially bad. However, we may have an option where it is simply recommended that SOEs conduct a five-year fiscal assessment without legal obligation.

〈Table 1-17〉 Four Ways of Enforcing a 5-year Fiscal Plan for SOEs

	Positive	Negative
Mandatory for all SOEs	Simple	Too much work for the central agency if the plan should be reviewed
Mandatory for large SOEs	Effective	Where to draw the line?
Mandatory for financially bad SOEs		
Simple recommendation for SOEs	Autonomy of SOEs	Not much impact

The recommendation for Bulgaria is the first option, unlike Korea. The current practice in Bulgaria is that the management of SOEs is employed for three years (The contracts are for three years). According to Art. 28. (1) of the Regulation for the Execution of Property Rights of the State in the SOEs the Board members are obliged to prepare a business plan for the entire three-year period and also for each year. The business programs shall consist indicators such as productivity, turnover, profitability, new markets, equipment, maintaining a certain number of employees, financial obligations, investments, etc. The business program is presented to the responsible minister for approval.

17) According to the legislation, the Council of Ministers may create new SOEs.
18) The size of an SOE in Korea is measured by the amount of assets.
19) This is measured in Korea by the debt/asset ratio.

3.2.8. Long-term Fiscal Planning: Involvement of the Central Agency

Another dimension of long-term fiscal planning is whether or not the central agency intervenes in the formulation of the plan. When this new regulation was first introduced in Korea, MOSF simply accepted the plan which was formulated by the SOE and was discussed with the relevant line ministry before being submitted to MOSF. As the debt of SOEs became a serious issue, however, MOSF began to deepen its involvement since planning was a very useful process in directly changing the future financial status of SOEs. However, we can have an option where the central agency lets SOEs and their relevant ministry submits their plan directly to Congress. Korea's current practice is option three, which requires substantial human resources during a relatively short review period.[20] When the initially submitted plan proves unsatisfactory, MOSF asks for a revision by an SOE.

〈Table 1-18〉 Three Ways of Reviewing 5-Year Fiscal Planning of SOEs

	Positive	Negative
SOE → Parliament	- Accountability of SOEs	- Limitation of self-reform
SOE → line ministry → Parliament	- Accountability of line ministries	- Collusive behavior
SOE → line ministry → central agency → Parliament	- Possibility of Reform	- Too much work for the central agency - Could be ineffective process if the central agency is not powerful enough

The recommendation for Bulgaria is option two, with elements of option three. Bulgaria may start with the second option, but the central agency can review the adequacy of financial plans of selected debt-ridden SOEs. When the financial plan is not innovative enough to reduce the high debt of such SOEs, the central agency should decisively step in to correct the plan. However, such intervention will require more human resources with relevant competency.

3.2.9. More vs. Less Dividend

The Korean government has maintained a rather low propensity to dividend at around 20 percent. Since prior to 2008 the Korean government enjoyed a consolidated fiscal surplus, dividends from the SOEs were not important for the government. After 2008, however, the debt of SOEs soared, reducing the dividend capacity of SOEs. As the debt situation has stabilized, the Korean government plans

20) MOSF works with Research Center for SOEs established under Korea Institute for Public Finance.

to increase the propensity to dividend to 40 percent by 2020.

〈Table 1-19〉 Propensity to Dividend in Korea

	2009	2010	2011	2012	2013	2014
Government investment (US$1 billion)	55.6	59.0	60.5	61.1	61.5	61.7
Dividend (US$1 billion)	0.34	0.20	0.43	0.60	0.49	0.33
Rate of Return on Investment (%)	0.60	0.34	0.72	0.99	0.80	0.53
Propensity to Dividend (%) = Dividend/Net profit		19.8	20.2	20.4	24.2	21.5

Source: MOSF Press Release.

MOSF divides all SOEs into four different groups depending on the ratio of self-generated revenue. Then, to finalize the dividend ratio, MOSF applies index such as profit ratio, debt ratio, reserve ratio, and government support. What is the optimal dividend ratio is not an easy question to answer. This paper suggests a higher ratio than Korea's current level of 21.5 percent because higher dividends will enforce the motivation of the government to increase the profits of SOEs and eventually to list the SOEs in the stock market.

〈Table 1-20〉 The Level of Propensity to Dividend

	Positive	Negative
Lower than now	- SOEs can use more reserves for investment - SOEs' stronger motivation for profits	• Government's weaker motivation - to list SOEs in the stock market - to see more profits of the SOE
Higher than now	• Govt's stronger motivation - to list SOEs in the stock market - to see more profits of the SOE	- SOEs' less reserves forinvestment - SOEs' weaker motivation for profits

The recommendation for Bulgaria is the first option. The propensity to dividend in Bulgaria has been extremely high, reaching 80 percent. Only recently was it decreased to 50 percent. The dividend policy of Bulgaria has two problems: (i) the uncertainty about how much the budget will take in the next year, which makes it difficult for SOEs to plan for business and investment, and (ii) the huge propensity to dividend. By all standards, the Bulgarian practice is irrelevant for the development of SOEs. First, unlike Korea, the dividend ratio should be lowered. Bulgaria should adopt a dividend policy which takes into account the conditions of each company

and its growth possibilities. The policy goal should escape from securing additional income for the central budget. Second, the dividend ratio should be predictable. Korea's way of calculating dividend ratio is one good example. All those issues have to be agreed in the Central Steering Committee and then adopted in the three-year fiscal plan.

4. Evaluation System for Better Performance of SOEs in Bulgaria

Management evaluation of SOEs is one of the most influential policy tools for the central agency in Korea. Evaluations have been conducted since 1984, and the backbone of the system has been maintained without much change. The efficiency and good performance of Korea's SOEs can be credited to this evaluation system.

4.1. Evaluation System

4.1.1. Who Should be Evaluated: Type of Organizations

Korea evaluates both SOEs and QGOs. Out of 323 public institutions, all 30 SOEs and 90 QGOs are evaluated by the central agency, leaving 203 small QGOs being evaluated by line ministries based on a much simpler method. Evaluating SOEs is easier than QGOs since performance of SOEs can be easily measured by a quantitative index such as net profits. Including QGOs requires a much larger evaluation team and involves more costs.

〈Table 1-21〉 Scope of Organizations for the Centralized Evaluation System

	Positive	Negative
Only large SOEs	- Easier to get a consensus - Less financial and time cost	- Inefficiency of QGOs
All but only SOEs	- Same rule for all SOEs	- Large burden for evaluation
All SOEs and QGOs	- QGOs will be more efficient.	- QGOs are more difficult to evaluate - Serious financial and time costs

The recommendation for Bulgaria is option two. While Korea's central agency is undergoing huge financial and time costs in dealing with 120 organizations, 157 SOEs for the Bulgarian central agency is a considerably large group for evaluation. This is why the third option is not realistic. However, all SOEs should be evaluated by one single system, if not, the central management will lose its ground, and this

is why the first option should not be selected. An evaluation system will not be effective without clear consequences. A universal evaluation system for all SOEs is a foundation for the universal consequences attached to its result. There is, of course, a need for reducing the burden to the central agency, which will be discussed in the following.

4.1.2. Evaluator in Charge

Which ministry should be in charge of the evaluation? There are three options. The central agency is the first option, and the second is a line ministry. The third option is evaluation by the line ministry which is examined and corrected by the central agency. This type of two-layer evaluation system is often found in the performance management system in the Korean government. The third option is useful when the line ministries have more essential information than the central agency, and when there is not much room for discretionary evaluation by line ministries.

〈Table 1-22〉 Who Should be in Charge of Evaluation?

	Positive	Negative
Central Agency	- Objective and Time saving - More power to central agency	- Too much work - Resistance from line ministries
Line ministry	- More information - Accountability of ministries	- Collusive behavior
Evaluation by line ministries is re-evaluated by central agency	- Double check - Participation of line ministries	- Expensive - Re-evaluation creates more conflicts with line ministries

Recommendations for Bulgaria are a combination of the first and third option. We should not just leave the evaluation in the hands of the line ministry as is the current standing, which has already been proven problematic. It is therefore recommended that the first option be followed where the central agency is in charge of the evaluation. However, it will be difficult for the central agency to evaluate all SOEs in Bulgaria. Therefore, some of the evaluation can be delegated to line ministries. The next issue pertains to the division of labor between the central and line ministry.

4.1.3. Division of Roles between the Central Agency and Line Ministries

In terms of their roles in evaluating SOEs, there are two ways of drawing the line between the central agency and line ministry. In the first case, the central agency designates and evaluates around 30 out of 157 SOEs using criteria such as volume of revenue, size of assets, or the volume of liability. Though the same evaluation methods and criteria should be applied to all SOEs, relatively smaller SOEs are evaluated by line ministries and then if necessary checked and amended by the central agency. The central agency can focus on 30 SOEs with major implications for the national economy. When the central agency is equipped with more staff and resources, it can designate more SOEs under its direct evaluation. The problem with this option is whether or not we can trust the evaluation by the line ministries. If there is no such trust, the central agency will have to repeat the evaluation process for the remaining 127 SOEs, which will be a very costly process.

The second option is to draw the line depending on an evaluation index: a qualitative one which is a more subjective evaluation by the central agency, and a quantitative one, which is a more objective evaluation by the line ministries. Since there is little room for discretion in the quantitative evaluation, the central agency can better trust the evaluation by line ministries than in the first option. Since both the central agency and the line ministry evaluate all SOEs, there are times when the evaluations by two parties may be very different. Integrating the two evaluations should be done by the central agency.

〈Table 1-23〉 Division of Roles between the Central Agency and Line Ministries

	Positive	Negative
Large SOEs by the Center Others by line ministries*	- Focus on Big Fish - Easy adjustment of workload by the Center	- How to compareresults by two organizations - Collusive behavior
Qualitative index by the Center Quantitative index by line ministries	- Universal treatment for SOEs - Utilize better knowledge of line ministries - Less resistance from line ministries	- A heavy burden for the central agency

Note: * The evaluation by line ministries will be checked and subject to change by the central agency.

The recommendation for Bulgaria is the second option. By providing specific guidelines for quantitative evaluation, the central agency can minimize the collusive behavior of the line ministries. The line ministries will be relatively more receptive to

the evaluation reform initiative under the second option since they can share power with the central agency. The consumer satisfaction survey may have to be conducted by the central agency although it is a quantitative index. The central agency can conserve resources in the evaluation by utilizing the expertise of the line ministries. The only problem left is the large burden of the central agency which can be handled in the following manner.

4.1.4. Implementation of the Evaluation: External Experts vs. Government Staff

Another issue pertains to who actually conducts an evaluation. In Korea, MOSF organizes the evaluation taskforce, which is composed of mostly professors and certified public accountants. The number of members in the evaluation team ranges around 150, and approximately 30 percent of members change every year in order to minimize any collusive behavior between team members and the SOEs. Since the evaluation takes place mostly from March –through May, the taskforce is appropriate in order to complete the work in a short period of time. However, some team members are occasionally criticized for their superficial understanding of SOEs. An alternative option is an evaluation by government officials in the central agency. This is an effective way to maintain the quality and consistency of the evaluation. However, this may also entail collusive behavior between the central agency and the SOEs. Another problem is the concentrated workload of those government officials during a specific period of the year.

〈Table 1-24〉 Who Actually Conducts an Evaluation?

	Positive	Negative
Expert Taskforce	- More neutrality and independence - Easy to conduct in a short period of time	- Lower expertise in some cases - Increased costs
Government Staff	- Higher expertise after a certain period - Higher accountability	- Possibility of collusion - Uneven annual workload

The recommendation for Bulgaria is the first option. As previously stated, one of the main weakness in SOEs is insufficient transparency. One of the powerful tools to make an evaluation more independent and at the same time build public confidence in the performance of SOEs is to open the evaluation to external experts. Taking into consideration that around 150 experts are actively engaged in Korea's evaluation process for three months, option two is not realistic for the current state of human resources for Bulgaria's central agency. The first option will, however, create a lot of

resistance from the ministries and political powers that will see their influence on SOEs decline. One of the arguments against this approach will be the complications in selecting external evaluators[21] and garnering financial resources[22] to hire and implement external experts.

4.1.5. Which Should be Evaluated: The CEO or SOE?

Should we evaluate the SOE as an organization or the CEO as an individual? Korea evaluates both because the performance of an SOE and its CEO are not necessarily correlated. A first-rate CEO cannot perform well in a hopeless SOE such as the Korea Coal Corporation (KCC). Since the coal industry is on the decline in Korea, no amount of genius in management can improve the negative financial status of the KCC. On the other hand, a hopelessly incompetent CEO who works for a well-established SOE may have a high score in the evaluation thanks to all the managerial and technological systems in place.

What should be evaluated depends on the consequences of the evaluation. If an annual performance bonus for each staff member is a result of the evaluation, the SOE should be evaluated. However, CEO should be tested if personnel decision for CEO such as discharge, reappointment is the consequence of the evaluation. In Korea both the SOE and CEO are evaluated because this has consequences for both staff and the CEO. Another issue is correlation: If the performance of the SOE and the CEO are closely correlated in Bulgaria, and if the CEO can influence the salary level of each employee, the central agency can evaluate only the CEO since a well-motivated CEO can change his or her own SOE.

〈Table 1-25〉 Who Should be Evaluated?

	Positive	Negative
SOE as an organization	- Good for changing staff in an SOE	- Is the CEO responsible? (A bad CEO in a well-established SOE or vice versa)
CEO as an individual	- Good for personnel decisionsby CEO - Easy to implement	- Can we motivate staff in each SOE?
SOE and CEO	- Powerful	- Redundancy - More costly

21) Many professors and public accountants seek to join the evaluation taskforce in Korea. The member of the taskforce can expect the following benefits: an opportunity to learn about insider information on SOEs, networking with SOEs, and a substantial evaluation fee. The central agency (MOSF) designates the head of the taskforce along with the other members.

22) It takes US$ 2 million for an annual evaluation in Korea, which is mostly spent on fees for the 150 members of the taskforce.

The recommendation for Bulgaria is option three, as is the case in Korea. Instead of the current indirect evaluation of CEOs in Bulgaria, there is a need for a full-fledged evaluation procedure criteria and results, including dismissal for the worst performers. The legal framework for the evaluation is rather different from current practices in Bulgaria. Management is an indirect subject of evaluation when the business plan is annually evaluated. Also, management shall be evaluated for the purposes of setting salaries. According to the Council of Ministers Regulation Art. 33. (1) the remuneration of the managers depends on: long-term assets, the number of personnel, profitability, financial results, the change of the value added per employee, debt service, as well as other obligations as per the management contract. The monthly salaries should be based on an integral score of the indicators for the last quarter. In practice, though, this is not strictly followed. The regulations also stipulate the scope and the basis for the calculation of bonuses. The SOE performance in Bulgaria should also be evaluated according to Regulation 114/2010.

4.1.6. Implementation of SOE and CEO Evaluation

If both SOEs and CEOs are evaluated, should there be two separate taskforces or can just one taskforce cover both? Korea once divided the taskforce into two in order to ensure the accuracy of the CEO's evaluation, which would then be used for re-appointment. However, this bifurcation incurred more costs, and there was some redundancy in the process. Korea now utilizes only one taskforce to evaluate both SOEs and CEOs.

The next question is which evaluation is a subset of which. If the CEO evaluation is subset of the SOE evaluation, the results of the CEO evaluation will be one part of the SOE evaluation meaning that the SOE evaluation has more indexes. The rationale for this option is that CEO leadership is also a factor in SOE performance. Since the result of the SOE evaluation determines the compensation of employees in Korea, when the CEO evaluation is poor, the employees may complain as to why they should be penalized by the performance of a poor CEO whom they did not appoint. The other option is to make an SOE evaluation a subset of the CEO evaluation, which makes sense since the CEO should be responsible for the performance of his or her SOE. In this case, there still remains the issue of an unclear correlation between SOE performance and CEO competency. In addition, employees may not pay a great deal of attention to the exclusive index of their CEO since their annual bonuses are already determined by the SOE evaluation.

〈Table 1-26〉 How to Evaluate both the SOE and CEO?

	Rationale	Criticism
Two separate evaluations and teams	- More thorough evaluation of the CEO	- Redundancy in evaluation index - More costs
CEO evaluation + more index = SOE evaluation	- Leadership of CEO is one input for the SOE's performance	- Why should employees be responsible for a bad CEO?
SOE evaluation + more index = CEO evaluation	- CEO should be responsible for the SOE evaluation	- Why should a CEO be responsible for ahopeless SOE? - Staff may not be keen about a 'more index' CEO evaluation.

The recommendation for Bulgaria is option three, unlike Korea's selection of option two. The performance of the CEO's SOE is the most important evaluation criteria for the CEO. Compared to Korea, SOEs in Bulgaria are relatively more autonomous in their policies on service and pricing, and CEO competency is more closely correlated with SOE performance. Although there is the possibility that the employees are not helpful to their CEO in preparation for the 'other index' of the evaluation, this poses no significant problem when the other indexes are properly selected, and when the CEO can effectively control his or her staff.

4.1.7. Frequency

How often should we evaluate SOEs? The first option is an annual evaluation, which is practiced in Korea. However, this option is criticized not only by SOEs but also by scholars for two reasons: It encourages CEOs to have a myopic one-year horizon, as well as being a burden for SOEs. The second option is therefore once in every three years, which matches the CEO's term in office. Korea's MOSF defends the annual option on the grounds that option two makes it difficult to set annual bonuses for SOE employees based on the results of the evaluation. MOSF also wants to penalize SOE wrongdoings or incompliance through annual evaluations, as opposed to having to wait for two more years. The third option is a combination of the first two options: The central agency conducts a full scale evaluation every three years, but applies a simplified[23] evaluation annually for the first two years: Full scale - simple – simple – full scale – simple – simple – full scale – etc.

23) One example of a simplified evaluation focuses on a quantitative evaluation for an input category.

〈Table 1-27〉 Frequency of Evaluation

	Positive	Negative
Every year	- Prompt feedback - Easy for setting annual bonu	- Myopic horizon of CEOs - Burden on SEOsHigh cost
Every 3 years	- Longer term horizon - Match with CEO's term - Less burden for central agency	- Slow feedback so less discipline of SOEs
Comprehensive: every 3 years Simple scale: 1st, 2nd year	- Combination of the first and second options - Simple scale: only quantitative evaluation (by line ministry) - Comprehensive: quantitative + qualitative (by central agency)	

The recommendation for Bulgaria is the third option. The status quo in Bulgaria, which is to have a remuneration related evaluation each quarter, simply does not work. It needs to introduce the annual staff bonuses. The annual bonus in a year of a simplified evaluation can be calculated by a weighted average of a full scale evaluation and a simplified one.[24] Option three is also useful to reduce the burden on the central agency. By dividing 157 SOEs into three groups, the central agency can focus on a full-scale evaluation of 52 SOEs annually, which is much more manageable. On the other hand, the line ministries will have to conduct an evaluation every year.

〈Table 1-28〉 Criteria of an Annual Bonus (example)

Annual Bonus of	Comprehensive Evaluation (2017)	Simplified evaluation	Evaluation is based on performance of
2017 (comprehensive evaluation)	100%	-	2016
2018 (simplified)	60% (2017)	40% (2018)	2017
2019 (simplified)	40% (2017)	60% (2019)	2018

24) One example is as follows. An annual bonus for 2017 is based 100% on a full scale evaluation of the 2016 performance conducted in 2017. An annual bonus for 2018 is based on a full scale evaluation conducted in the previous year (60%), the simplified evaluation for 2017 as conducted in 2018 (40%). An annual bonus for 2019 is based on a full scale evaluation conducted two years prior (40%), a simplified evaluation for 2018 conducted in 2019 (60%).

4.1.8. Consequences

The secret behind more than 30 years of history of the evaluation system in Korea lies in the harsh consequences of the evaluation. There are three consequences of the evaluation.

〈Table 1-29〉 Three Consequences of Management Evaluation in Korea

Grade	(1) CEO Re-appointment	(2) Annual Bonus of Each Employee	(3) Non-payroll Expense Budget for Each SOE
S	No official consequence (only unofficial recognition by President)	250%	Increase up to 1%
A		200%	
B		150%	Unchanged
C		100%	
D	Warning	0%	Decrease up to 1%
E	Recommended to be discharged		

First, MOSF recommends to the President of Korea a discontinuation of the contract with the CEO if the CEO gets the lowest grade E out of six levels of S, A, B, C, D, E. If one receives a D, he or she will be warned by the central agency. If one is warned two years in a row, he or she will be recommended to be discharged as well.

Second, each and every SOE employee will receive an annual bonus payment depending on the results of the evaluation. Prior to the Korean government giving this annual bonus based on the results of an evaluation, each SOE used to pay annual bonuses mainly based on seniority. The government, however, passed a law that the total volume of annual bonuses must depend on the results of the evaluation. Each SOE employee with an S grade will receive an annual bonus equal to 250 percent of their monthly basic salary, but one working for SOEs with a D or E grade will end up with 0 percent. For instance, if one's basic monthly salary is US$2,000; the annual bonus will range from US$0 to US$5,000 depending on the evaluation results.

The third consequence of the evaluation is the increase rate of non-payroll expenses for each SOE. Non-payroll expenses include travel, maintenance costs, office appliances, costs for gatherings, and other miscellaneous expenses. Although this is not a substantial part of the budget, it has a certain influence on the smooth operation of the SOE. This is why all employees and CEOs of SOEs in Korea are so keen about their management evaluation. Based on the three consequences that are applied in Korea, we can postulate the following five combination of consequences.

〈Table 1-30〉 Consequences of the Evaluation

	Positive	Negative
CEO Re-appointment only	CEO's accountability	Staff and labor union may not be interested in the evaluation.
Annual bonus of employees in SOEs only	Attract SOE employees' attention	Resistance from labor union
Non-payroll Expense	Incentive for the organizational level	Lower autonomy of SOEs
CEO and Annual Bonusof Employees	Good pressure for both CEO and employees	Resistance from SOEs
All three (Korea's case)	Most tight control	Too much intervention

The recommendation for Bulgaria is option four, unlike Korea. Current policies in Bulgaria do not envisage consequences from the CEO evaluation other than a change in salary and the bonus. And even for defining the salary, the rules do not fully work. From that prospective, introducing a full-fledged evaluation system with well-defined and harsh consequences will be a very radical change. The CEO re-appointment and annual bonus of each employee seem to be very useful leverage. However, the inclusion of the non-payroll expense budget as a consequence appears to be too much intervention in the Bulgarian context where SOEs' budgets are formulated based on their own revenue.

4.2. Evaluation Methods

4.2.1. Relative vs. Absolute Evaluation

In a relative evaluation, the central agency needs to provide an ordering in the evaluation results of different SOEs. Since it is very difficult to compare different SOEs, an absolute evaluation is in general a more ideal way of evaluation. However, an absolute evaluation may provide overly generous results for all SOEs. Korea's evaluation is in principle based on absolute criteria. In reality, however, quantitative indexes follow absolute criteria, whereas non-quantitative indexes tend to follow relative criteria. The final grade also tends to follow a relative evaluation with a certain curve. The distribution for the past years is as follows: S (less than 1%), A (around 15%), B (around 40%), C (around 30%), D (around 10%), E (4–% to 5%).

〈Table 1-31〉 Evaluation Criteria

	Positive	Negative
Relative	- Easy to evaluate - Maximizecompetition	- Controversy for unequal footing - Apple to apple comparison?
Absolute	- Ideal way	- Undifferentiated generous result - Difficult to evaluate
Mix	- Absolute evaluation in principle but with a distribution of the final grade	

The recommendation for Bulgaria is the third option, as in Korea. The evaluation should be completed using absolute criteria, but the final grade should be given based on a certain curve. Without such a distribution, the evaluation could be all too generous without providing much by way of differentiated consequences. This will be the case in Bulgaria which has not yet experienced such an evaluation system which enforces harsh consequences.

4.2.2. Grouping of SOEs for Relative Evaluation

The curve distribution of the final grade inevitably entails a grouping issue. Korea divides all public institutions under evaluation into three groups: SOEs (30), large QGOs (around 30), and small QGOs (around 60). Size-based grouping makes sense because a large SOE has as many as 30 full time staff to prepare for the evaluation whereas a small SOE has only three members for the same job. Since all 30 SOEs are in one pool for grade distribution, there are many complaints from smaller SOEs. In the past, however, the grouping was made based on functional similarities such as an SOE group for social overhead capital, fund management, etc.

〈Table 1-32〉 Grouping for Distribution of Final Grade

	Positive	Negative
All SOEs in one group	- Big pool for a curve	- Most difficult to compare - Many complaints from SOEs
Grouping depending on size	- Fair in terms of the capacity of an SOE preparing for evaluation	- Difficult to compare
Grouping depending on functions	- Easy to compare	- Insufficient number of SOEs in a group

The recommendation for Bulgaria is option two and option three. Bulgaria has 68 state hospitals and 29 district water supply SOEs. Each can be a group within which the SOEs are relatively compared for distribution of final grades. Another 60 SOEs have a wide variety of sizes. While some enterprises in the service sector are composed of 10 to 50 employees, others employ thousands. That is why grouping on the size could be also a good solution: The 60 SOEs can be divided into two based on their size of employment and revenue. Then, there will be four groups of SOEs: 68 hospitals, 29 district water supply SOEs, around 30 small SOEs, and around 30 large SOEs. If the hospitals have a wide range of sizes, we may divide the hospitals into two groups as well. As was discussed in Question 26 on frequency, a comprehensive evaluation will take place once every three years. The following is one example of a cycle of comprehensive evaluation: the hospital group (68 SOEs) in the first year, water supply group (29 SOEs) and the 30 small SOEs in the second year, around 30 large SOEs in the third year. This kind of allocation will evenly distribute the work load of the central agency over a 3-year period.

4.2.3. Evaluation Indexes

There are two dimensions regarding the issue of indexes: whether to evaluate (1) all input, process, performance aspects of an SOE management, and (2) by a quantitative or non-quantitative index. The following are the current indexes in Korea. As you can see, all three aspects of management are evaluated with more emphasis (70%) on quantitative methods. Input and process indexes are the same for all SOEs, whereas the performance indexes are all different for each SOE.

〈Table 1-33〉 Evaluation Indexes in Korea

	Quantitative 70%	Non-Quantitative 30%	
In-put	Labor and asset productivity Budget and financial management Remuneration and performance management	Labor relation	Same indexes for all SOEs (60%)
Process	Customer satisfaction survey result*	Leadership (vision…) Board of Directors Transparency and ethics Social responsibilities	
Performance	Core business 1 (performance index) Core business 2 (performance index) Core business 3 (performance index) Core business 4 (performance index)	-	Different index for each SOE (40%)

Note: * As was discussed in Question 22, the survey may have to be conducted by the central agency although it is a quantitative index.

The evaluation index, as based on two dimensions, can be categorized into the following four options. One may say that performance should be the only domain under evaluation. However, if the evaluation omits an input index, SOEs may become a good service provider with a bad financial statement, which is often the case with many SOEs in Bulgaria. The process index should measure customer satisfaction, anti-corruption, social responsibility, etc.

〈Table 1-34〉 Four Options of Evaluation Index

	More Quantitative	More Non-quantitative
All three domains input, process, performance	Option 1 (Korea)	Option 2
Performance + input or process	Option 3	Option 3

The recommendation for Bulgaria is option one, as in Korea. This corresponds with the proposal to introduce a customer satisfaction survey in Bulgaria. As far as the composition of the criteria is concerned, the emphasis should be on quantitative indicators. The Korean model includes the CEO's leadership in the process domain, but Bulgaria can isolate the CEO evaluation from the SOE evaluation as was recommended in Question 25. It also recommendable for Bulgaria to give more weight to quantitative indexes as Korea does since it will enhance the level of acceptance by SOEs, which will be even more the case in Bulgaria if the quantitative evaluation is conducted by each line ministry as was recommended in Question 22.

4.2.4. How to Set Targets

For an absolute quantitative evaluation, there should be a target because an evaluation is made depending on the rate of achievement to the target. Since input and process indexes are identically applied to all SOEs, the same target level is given for all SOEs. However, since the performance indexes are different across SOEs, each index of an SOE needs to have its own target. This leads to the question of how to set the target in this case.

The first method adopted by Korea is forward induction based on past performance. The evaluation taskforce measures standard deviation of the past three years of the performance index of an SOE, and assigns grade A if the SOE outperforms previous year's index by more than the standard deviation. If the SOE maintains the previous year's performance level, grade C will be given. This method is a way to provide constant pressure on SOEs for better performance, which could, on the other hand, be too demanding on them because maintaining the status quo

means C (around lower 44%).

〈Table 1-35〉 Standard for Each Grade

Grade	Distribution*	Standard for Each Grade
S	1%	$P(16) > P(15) + 2\sigma$
A	15%	$P(15) + \sigma < P(16) \leq P(15) + 2\sigma$
B	40%	$P(15) < P(16) \leq P(15) + \sigma$
C	30%	$P(16) = P(15)$
D	10%	$P(15) - \sigma \leq P(16) < P(15)$
E	4%	$P(16) < P(15) - \sigma$

Note: 1) P(16): Performance of 2016, P(15): Performance of 2015.
σ : standard deviation of the performance index over the past three years.
2) * This is an average of recent years. No written regulation on the distribution of final grades.

The second method is a groperformance of foreign SOEs in the same business. For instance, the ACI[25] average score of the performance of the world's top 3 airports is set to be the upper target and the ACI average score of all the world's airports is the lower target. If Incheon International Airport exceeds the upper target, grade A is given, but if it falls below the lower target, it will get a D. This method is effective in that it uses an easy and unquestionable target, but one may argue that two SOEs in different countries cannot be compared. Another problem is that once an SOE reaches the top of the world level, there is no more pressure. After 2010 Korea applied this method for some years, but soon dropped it because almost all SOEs received full marks with this global performance index. The third method

〈Table 1-36〉 Three Ways to Set the Target

	Positive	Negative
Based on the past performance	- Continuous pressure for improvement	- Fatigue of SOEs
Global comparison	- Unquestionable standard - Easy to find the target	- No pressure once you reach the top - Can we compare SOEs in different countries - Availability of information
Based on the future goal	- Future-oriented	- Difficulties in setting the future goal - Asymmetry of information between the central agency and SOE.

25) ACI stands for Airports Council International.

is backward induction: First, set the strategic long-term goal of 5–10 years mostly benchmarking foreign companies, and then determining the next year's target as a first step towards the long-term goal. Although this method provides a future oriented perspective, it creates another difficult question of setting the future target.

The recommendation for Bulgaria is option one, as in Korea. Bulgarian SOEs are experienced in setting target based on the past performance. Introduction of this tool would be easier than the other options. In addition, information to apply this tool is accessible which is not the case of other options.

5. Conclusion

The SOE management system in Korea has given too much power to the central governance agency (MOSF), leaving little managerial autonomy for SOEs. Although their performance is very high by global standards, their efficiency has a good deal of room for improvement. It seems like Bulgarian SOEs, on the other hand, are enjoying much more autonomy and flexibility, but their performance and efficiency is still not very positive. Therefore, a number of modifications should be made in formulating Bulgaria's own governance model for SOEs based on Korea's experience since the two countries have a very different status quo and since the Korean model has many problems as well. Out of the 31 The recommendation for Bulgaria is this paper, only 11 recommendations are currently in practice in Korea.

〈Table 1-37〉 Comparison of SOE Management Systems

	Bulgaria now	Korea
Governing Body	Line ministries	Central agency, MOSF
Autonomy of SOEs	High	Low
Overall Performance	Low	High
Overall Efficiency	Low	Medium
Direction of Reform	More control over SOEs by the central agency	More autonomy of SOEs by reducing government intervention

The directions of SOE governance reforms in the two countries are in this respect very different. Korea needs to reduce government intervention by guaranteeing more autonomy of SOEs. On the other hand, Bulgaria needs to start institutional reforms. As a first step it could create a Steering Committee and a Secretariat that

will coordinate, design and control SOEs' policies. To accommodate the voice of the line ministries, it is recommendable that a committee composed of line vice-ministers and experts from academia and the private sector be established. Together with institutional reforms, Bulgaria needs to strengthen the transparency and accountability of SOEs as well as setting up a comprehensive but also working system for the evaluation of both SOEs and CEOs. In line with the Korean experience, the 2015 OECD guidelines for the SOEs should be implemented.

The future of the governance model for Bulgaria can be called a "collaborative governance" between the line ministries and the newly-created central agency, whereas the current Korean model is more a 'centralized governance.' In many respects, the Bulgaria's future seems like Korea's future as well.

〈Table 1-38〉 Future of Bulgaria's SOE Governance System

	Bulgaria now: Weak Governance	Bulgaria's future: Collaborative Governance	Korea now: Centralized Governance
Governing structure	Line ministries	Partially Centralized system	Centralized system
Centralbody	-	Steering Committee with its own Secretariat	Steering Committee with MOSF
CEO appointment	Line minister	Political leader or Line minister	Political leader
Inputcontrol	None	Ex ante guideline followed by monitoring	Tight ex ante control
Project control	None	All by line ministry	Major projects by the central agency
Evaluation in charge	None	Central agency and line ministries	Central agency
Frequency of evaluation	-	Once every three years	Every year
Consequence of evaluation	None	- CEO reappointment - Annual bonus	- CEO reappointment - Annual bonus - Non-payroll expense

These reforms will take a lot of effort and strategy. The following steps will have to be pursued. The recommendations will have to be presented to the Ministry of Finance and Ministry of Economy for their consideration. As requested by the MOF, the proposal to create a united body for the governance of SOEs will be provided together with the arguments and a necessary analysis. A discussion as regards possible legal changes will have to be made. Policy tools such as customer satisfaction surveys, evaluations, and an integrated information disclosure system will be organized. Most of all, it is important to win the minds of the people and political leadership in that the current system has a number of problems, and that reform of the system is critical to a more efficient economy and better service to citizens.

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Appendix

Appendix 1: List of SOEs in Bulgaria with more than 50% State Participation

NAME	LINE MINISTER	FUNCTION
Bulgarian Export Insurance Agency Pls	Minister of Economy	Export Insuarance
LB Bulgaricum Pls		Milk Processing and production
KINTEX Pls		Exporter of military equipment
National Company Industrial Zones Pls		Industrial park
VMZ Pls		Production of military equipment
Sofia Tech Park JSC		Innovation
Bulgarian Energy Holding Pls and it's subsidiary companies: KOZLODUY NPP Pls National Electric Company Pls Electricity system Operator Pls Mini Maritsa Iztok Pls TPP MaritsaEast 2 Pls Bulgargaz Pls Bulgartransgaz Pls	Minister of Energy	Energy sector
Holding BDZ Pls	Minister of Transport Information Technology and Communication	Railway Transport
BDZ Passenger Servicies Ltd		
BDZ Freight Servicies Ltd		
2 Sea Ports (Burgas and Varna)		Maritime Transport
3 River Ports (Ruse, Vidin and Lom)		Inland Waterway Transport
4 Airports (Sofia, Plovdiv, Ruse, G-Oryahovica)		Air Transport
Bulgarian Posts Pls		Postal Servicies
Bulgarian Stock Exchange JSC	Minister of Finance	Financial servicies
Bulgarian Development Bank JSC		
Napoitelny Sistemy (Irrigation Systems) Pls	Ministry of Agriculture and food	Agriculture
Ribni Resursi (Fishing resources) Ltd		
Terem Pls and it's subsidiary companies: TEREM TSAR SAMUIL Ltd TEREM-OVECH Ltd TEREM–Krz Flotski Arsenal Varna Ltd TEREM IVAILO Ltd EREM HAN KRUM Ltd TEREM-LETETS Ltd	Minister of Defence	Military repair and production
29 Water supply companies	Minister of Regional Development and Public Works	Water supply
Agency of Diplomatic real estate Ltd	Minister of Foreign Affairs	Property management
68 Hospitals	Minister of Health	Medical servicies

Appendix 2: List of 30 SOEs in Korea as of 2015

NAME	MINISTRY	FUNCTION
Incheon International Airport Corporation	Ministry of Land, Infrastructure and Transport	Transportation
Korea Airports Corporation		
Busan Port Authority		
Incheon Port Authority		
Ulsan Port Authority		
Yeosu-Gwangyang Port Authority		
Korea Expressway Corporation		
Korea Railway Corporation		
Korea Land and Housing Corporation		Land Development
Korea Water Resources Corporation		
Jeju Free International City Development Center		
Korea Appraisal Board		
Korea Housing Finance Corporation		
Korea Electricity Power Corporation	Ministry of Trade, Industry and Energy	Resource and Energy
Korea Gas Corporation		
Korea National Oil Corporation		
Korea Resources Corporation		
Korea Coal Corporation		
Korea District Heating Corporation		
Korea Hydro and Nuclear Power Corporation		
5 Power Generating Corporations		
Korea Horse-Racing Agency	Ministry of Culture, Sports and Tourism	Others
Korea Broadcasting Advertisement Corporation	Korea Communications Commission	
Korea Minting and Security Printing Corporation	Ministry of Strategy and Finance	
Korea Marine Environnent Management Corporation	Ministry of Oceans and Fisheries	

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Chapter 2

Strategies for Enhancing the Extended Producer Responsibility System in Bulgaria: The Case of WEEE

Strategies for Enhancing the Extended Producer Responsibility System in Bulgaria: The Case of WEEE*

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Summary

Since the beginning of the 2000s, Bulgaria has tried to harmonize its waste management policy with that of the European Union's. However, the country has experienced challenges for the efficient implementation of Extended Producer Responsibility (EPR) for Waste Electrical and Electronic Equipment (WEEE). This study aims to uncover the main issues in Bulgaria obstructing the success of the ever-growing WEEE sector, and then provide recommendations based on the historical experience and current discussions in Korea. The proposed suggestions are based on the comparative approach of legislation, literature, and statistical analysis, as well as on-site and off-site in-depth interviews with government officials, major consumer electronics manufacturers, representatives from collecting and recycling sectors, and informal WEEE sector representatives over the course of six months.

Upon presenting the main historical policy developments in Bulgaria and Korea in Chapters 2 and 3, respectively, Chapter 4 identifies four major types of issues and provides comprehensive recommendations on each of the problems identified. The study discusses such "system and regulation-related" issues as the

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use of mixed municipal solid waste system, the lack of control over household waste activities, criminal activities, large and active informal sectors that raise the cost of collection and exposes Bulgarian citizens to environmental hazards. The main recommendations for system-related issues include the improvement of current laws and limits on and transitional support to the informal sector. Regulation-related suggestions stretch from re-evaluation of the curbside containers' location to the strengthening of security measures and designation of recycling days. On "cultural and education" levels, Bulgaria has a lack of environmental education, inconsistent WEEE recycling campaigns, and an attachment to old electronic equipment. The introduction of environmental and recycling education at all levels of the national curriculum, and the information dissemination of potential energy and health risks in regard to the extended use and storage of old appliances will facilitate households to better participate in the WEEE recycling and management system. Finally, in terms of "economic" incentives, Bulgaria faces obstacles in the reduction of per household waste due to a property value-based waste management tax. This also contributes to an inequitable burden allocation among waste producing entities. The study argues for the introduction of a volume-based waste tax.

1. Introduction

Bulgaria has been a member state of the European Union (EU) for a period of nine years. For the time being, considerable efforts have been made to achieve legislative and regulatory compliance and attaining particular quantitative targets in different fields. Within a long period of preparation for the EU membership accession, which started in the 1990s and continued until 2007, a large number of national legislative acts had to be harmonized with the EU principles, leading to the introduction and implementation of different measures and policy concepts. This process included the environmental sector as well and in particular the waste management field.

From the beginning of the 2000s, new concepts and management principles have been implemented leading to the start of operation of separate waste collection systems and the introduction of the respective obligations and requirements concerning the affected market players.

Although separate waste collection systems, operating on the basis of the extended producer responsibility principle, have been installed in Bulgaria for almost a decade, there is a potential for improvement of their efficiency. Bulgaria fulfills the mandatory European collection and recycling targets on a national level. However, the level of environmental education, information on the provided waste management systems and principles, as well as the motivation of households to

participate in the separate collection systems, may not be sufficient. Another area for improvement is related to the effective control of proper waste disposal and a change of habits of the population.

These factors obstruct the effectiveness and the efficiency of the EPR system in Bulgaria on an economic and operational level, leading to the additional use of financial resources in terms of operation, collection of waste and littering.

Furthermore, the improvement of efficiency of waste management systems should also be analyzed within the perspective of resource efficiency economies and the European concept of "closing the loop" introduced in the new "circular economy" legislative package, proposing higher recycling targets and the need for additional measures stimulating eco-design of products, prevention of waste and reuse.

The EPR system for Waste Electrical and Electronic Equipment (WEEE) in particular represents all different aspects of waste management policy including household participation in separate collection, economic efficiency of waste activities and even people's awareness of the environmental and health risks that may occur if proper collection and treatment are not performed.

All potential measures and recommendations for the enhancement of the Bulgarian WEEE system based on the Korean waste policy experience, would be useful not only for the management of WEEE, but can be applicable for other EPR systems in Bulgaria. All suggestions are adjusted for Bulgaria's specific case rather than imposing Korea's current policies. The knowledge sharing practices in the field of EPR should lead to a new level of efficiency in the Bulgarian waste management system.

2. Current Status of Bulgarian EPR

2.1. Historical Development

After the transition to an open market economy at the end of 1989, Bulgaria clearly realized the need for political and economic integration with the developed countries of the European community. This led to a long preparation process of Bulgaria's accession to the EU which was intensified from the early 2000s. From 2001, as an accession precondition, Bulgaria had to start negotiations on harmonization of its regulations with the mature European system.

2.1.1. Initial Steps of EPR System

Taking into account the European experience with extended producer responsibility (EPR), which was implemented for the first time on EU level with the Directive on packaging and packaging waste from 1994, Bulgaria enforced its Ordinance on packaging and packaging waste in 2004 (State Journal, No. 19, 2004).

This act set the concepts of extended producer responsibility, separate waste collection, recovery and recycling targets in practice for the first time in Bulgaria. The EPR system in Bulgaria generally borrowed its initial policy design from the German "dual system" of waste collection, which consists of household packaging waste pickup in parallel to the existing municipal waste collection system. On the basis of the German "Duals System Deutschland" GmbH, the first recovery organizations (RO) in Bulgaria for packaging waste dedicated to the fulfillment of producers' obligations were launched.

The ROs are responsible for packaging waste materials placed into the separate wheelie bins that are collected and sorted by transportation and treatment facilities within their systems. Obligated producers and importers sign a membership contract and pay a license fee to the recovery organizations calculated by weight of packs, material type and the volume of product produced per annum.

In 2005, the Ordinance on End-of-Life Vehicles was enforced, followed by the first Bulgarian WEEE Ordinance (Ordinance on the requirements for placing on the market of electrical and electronic equipment, and treatment and transportation of waste electrical and electronic equipment, State Journal, No. 36, 2006). In contrast to the packaging waste case, the recovery organizations' collection and recycling systems for ELV and WEEE were created by the waste treatment sector. The reason is because there was an emergence of the metal scrap recycling sector in Bulgaria following the deindustrialization in the 1990s. This happened because of the use of outdated technologies and the loss of previously guaranteed markets in Eastern European and former Soviet states, which was prevalent during the centralized economy era.

2.1.2. Waste Management Budget

The mechanism for financing municipalities' waste management obligations, assigned by the Law on Waste Management, is regulated by the Local Taxes and Fees Act (LTFA, Art. 67, State Journal No. 117, 1997). The "municipal waste" charge is paid for the services of collection, transportation and disposal to landfills or recycling facilities, as well as to maintain the cleanliness of public areas in the settlements. By law, the fee must include the full cost of services. By November 2013, LTFA

required the amount of the fee to be determined by the quantity of waste, and when this could not be established, the amount of the fee would be calculated by the municipal council. This formulation led to the practice of "municipal waste" fee being decided based on the tax value of the real estate of a household. In turn, the tax value of real estate is calculated on the basis of real estate, type of the building, construction method and materials, energy efficiency ameliorations, and size and location of the real estate.

Total revenue from "municipal waste" fee as well as total expenses on waste management activities in the municipalities on a national level for 2009-2012 is presented in <Table 2-1>.

〈Table 2-1〉 Municipal Revenues and Expenses

(Unit: thousands BGN)

Revenues and Expenses	2009	2010	2011	2012
Total Revenue from Municipal Waste Fee	436,007	466,859	509,145	516,489
Total Waste Management Municipal Expenses	377,432	360,201	409,142	402,773

Source: National Statistical Institute.

〈Table 2-2〉 Expenses Decomposition

Expenses by Type	2009	2010	2011	2012
Purchaseof Municipal Solid Waste Collection Containers	5.3%	4.0%	2.8%	2.5%
Municipal Waste Collection and Transportation	47.1%	49.3%	47.8%	48.1%
Research, Design, Construction, Maintenance, Operation, Closure and Monitoring of Landfills	9.7%	9.4%	1.9%	18.3%
Remediation, Closure and Rehabilitation of OldContaminations	3.8%	3.8%	2.3%	1.6%
Seasonal Cleaning	34.1%	33.5%	31.3%	29.5%
TOTAL	100%	100%	86.1%	100%

Source: National Waste Management Plan 2014-2000.

The results in <Table 2-2> show an increase in the share of expenditures on research, design, construction, maintenance, operation, closure and monitoring of landfills from year 2011 to 2012. The reason for this increase is the effort of

municipalities to comply with the new regulations related to the construction of new and phasing out of old landfills in compliance with the EU legislation requirements. According to the last amendment of Article 67, part 2 of LTFA, from January 1, 2017, the new method of calculating "municipal waste" fee based on the amount of generated waste is planned for introduction.

2.1.3. Extended Producer Responsibility for WEEE

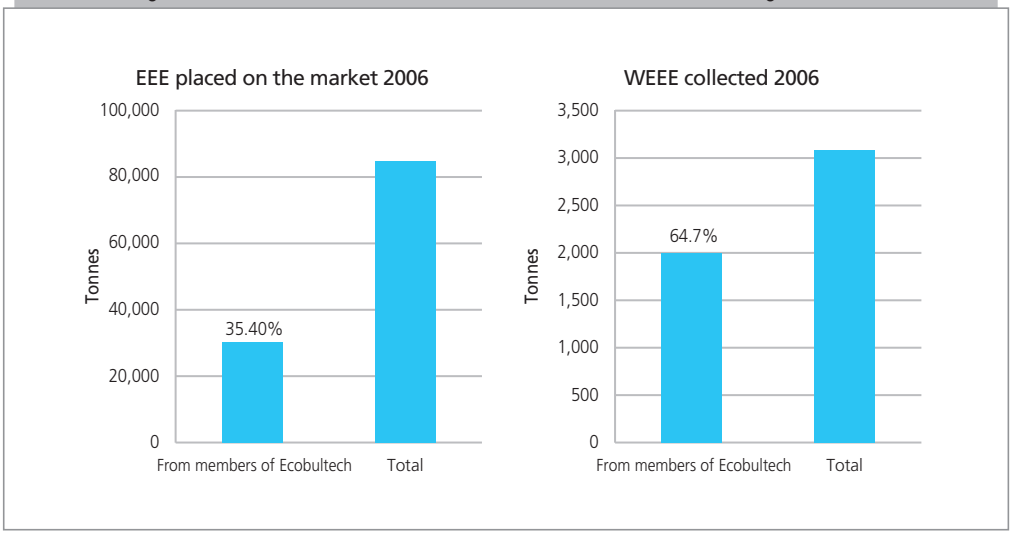
The WEEE Ordinance (Ordinance on the requirements for placing on the market of electrical and electronic equipment, and treatment and transportation of waste electrical and electronic equipment), enforced in 2006, guaranteed full transposition of Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment and Directive 2002/96/EC on waste electrical and electronic equipment. This ordinance imposed strict obligations on Bulgaria following its accession as an EU member. The ordinance was enforced on the basis of Article 24, Par. 2 of the Waste Management Act (WMA, State Journal, No. 86, 2003; repealed: State Journal, No. 53, 2012), setting the obligation for the "adoption of ordinances on the requirements to products, which generates widespread[1)] waste; the procedure and methods for separate collection, reuse, recycling, recovery and/or disposal, including targets for separate collection, recycling or recovery".

The ordinance entered into force from June 1, 2006, implementing the basic principles from the EU legislation on WEEE and repealing the Ordinance requirements for placing on the market of fluorescent and other lights, containing mercury and for treatment and transportation of out of use fluorescent and other lights, containing mercury. The new ordinance was in compliance with the already introduced EU "polluter pays" principles and "extended producer responsibility", requiring the coverage of cost for separate collection, pretreatment, recovery and disposal of waste. For the first time, producers and importers of EEE were given obligations on separate collection and recovery, either with a collective organization membership, or through a self-compliance scheme. The first recovery organization – Ecobultech JSC was created in September 2006.

For 2006, the first reported year, members of Ecobultech placed on the Bulgarian market a total of 30,090.2 tonnes of EEE. The collected amount of WEEE by Ecobultech, which represented 64.7 percent of the total collected WEEE, was 1,997.2 tonnes (Executive Environment Agency /EEA/ report 2007) [Figure 2-1].

1) "Widespread waste" means waste generated after use of products from multiple sources within the territory of the entire country which, due to its characteristics, requires special management. (§ 1, p. 7; Additional Provisions; WMA).

[Figure 2-1] EEE Placed on the Market and Collected WEEE in Bulgaria in 2006



Source: Executive Environmental Agency.

In 2007 a second WEEE recovery organization, Eltech Resource JSC, received a permit from the Ministry of Environment and Water, which started operations from 2008. Five companies set a self-compliance scheme. During the following years, the number of recovery organizations varied, resulting in seven recovery organizations by 2015. The first two performed leading roles, representing the collection of around 90 percent of the recycling and recovery market. The number of members in recovery organizations has also been on the increase to 1,185 companies according to the public register of persons placing EEE on the market in 2015 (supported by EEA).

2.2. Stakeholders Responsibilities

The first WEEE Directive (Directive 2002/96/EC) entered into force in February 2003, defining the scope of ten different categories of WEEE <Table 2-4>. Directive 2012/19/EU ("The New WEEE Directive") set the new concept of scope of targeted EEE within the transitional period between August 13, 2012 and August 14, 2018. After this period, the scope of the Directive will be widened to include all EEE, classified into six categories. From the latter scope, EEE will be excluded only if it falls under one of categories in Article 2, for example, equipment for security and military purposes, large-scale stationary industrial tools, etc.

〈Table 2-3〉 Scope of WEEE Directive

Category No	Type of Equipment
1	Large household appliances
2	Small household appliances
3	IT and telecommunications equipment
4	Consumer equipment
5	Lighting equipment
5a	Gas discharge lamps
6	Electrical and electronic tools
7	Toys, leisure and sports equipment
8	Medical devices
9	Monitoring and control instruments
10	Automatic dispensers

Source: WEEE Directive (2008).[2)]

The WEEE Directive, in particular the Bulgarian WEEE Ordinance, sets separate collection and recycling targets to be achieved by the obligated persons, placing EEE on the market (Art. 10). The collection target is of 4 kg per capita, while the recycling and recovery targets are shown in <Table 2-4> (by 31 December 2006 onwards).

〈Table 2-4〉 WEEE Recovery and Recycling Targets

Category	Rate of Recovery*	Rate of Reuse and Recycling
1 and 10	80 %	75 %
3 and 4	75 %	65 %
2, 5, 6, 7 and 9	70 %	50 %
gas discharge lamps		80%

Note: *minimum percentage by an average weight per appliance component, material and substance.
Source: WEEE Directive (Directive 2002/96/EC).

EEE producers are obliged to take measures in the design and production to facilitate pre-treatment and recovery, particularly for reuse and recycling. In order to minimize the disposal of WEEE in household waste, they have to mark their products with a WEEE symbol, promoting WEEE's separate collection. The user instructions of

2) WEEE Directive (2008), "10 Categories of Electrical and Electronic Equipment Covered by WEEE Directive". Retrieved from www.weeeregistration.com/categories-of-electrical-and-electronic-equipment-covered-by-WEEE-directive.html.

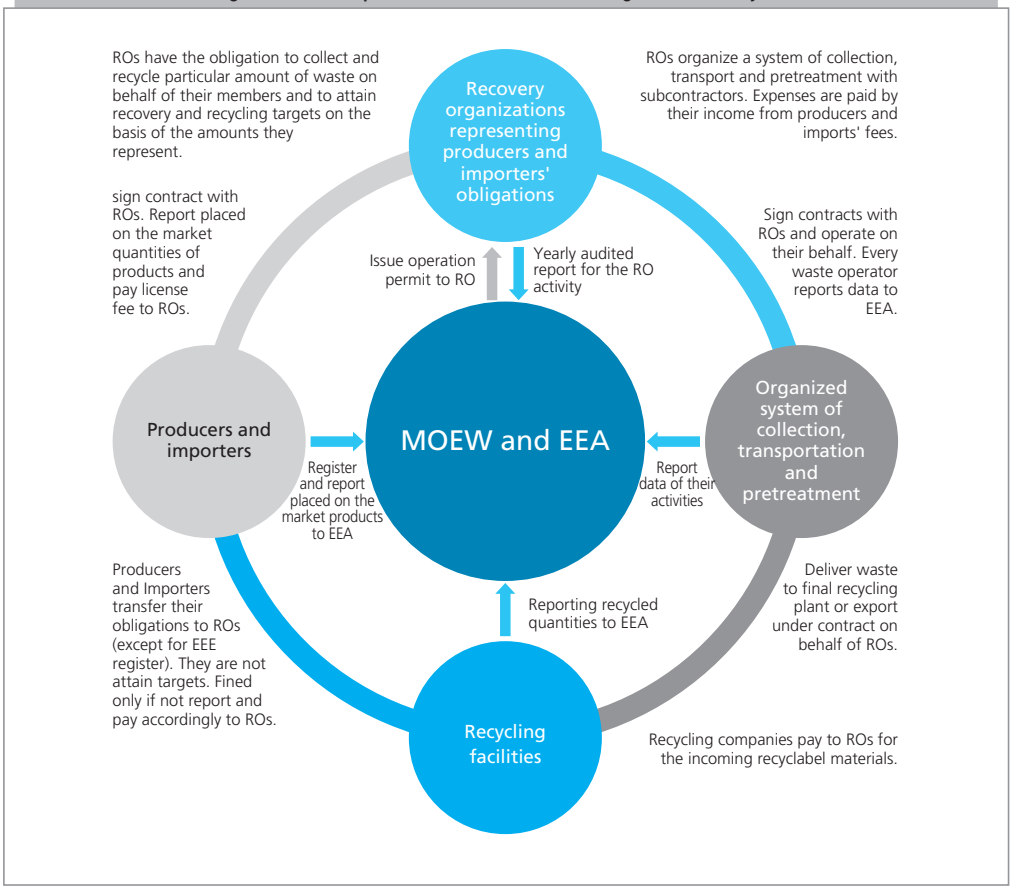
devices, which are intended for households, have to include information regarding the requirement for separate collection of WEEE; the ban sign on discarding WEEE into containers for mixed municipal waste; the available systems for take back and recovery of WEEE, and the possible harmful effects of WEEE on the environment and human health resulting from the presence of hazardous substances in the EEE. The retailers have the obligation to prominently display information on the possibilities and conditions for the collection of WEEE generated by households as well as for other available places for the discarded WEEE.

The WEEE Ordinance introduces the responsibility for persons placing EEE on the market for household use to achieve the set quantitative targets for separate collection, recycling and recovery of WEEE. Persons who place EEE on the market intended for use outside households are obliged to ensure the separate collection of the entire amount of WEEE marked and generated from their EEE without financial support from the holders of WEEE. Owners of WEEE that is generated from sources outside households are responsible for their separate collection, transportation, storage, pre-treatment, recycling, recovery and disposal. Sending WEEE and WEEE components, materials and substances from Bulgaria to another member States of the EU and/or exporting them for recovery and recycling, in compliance with the requirements of Regulation 1013/2006 on shipments of waste, is accepted as a measure for the achievement of recovery targets set in the Ordinance for EEE. The Ordinance allows companies placing EEE on the market to fulfill their obligations for separate collection and recycling of WEEE individually as a self-compliance scheme or through a collective system (Article 17, WEEE ordinance). The WEEE Ordinance introduces the requirement for registration of companies who place EEE on the market in a public registry supported by the Executive Environmental Agency (Article 45).

The EPR [Figure 2-2] schemes in Bulgaria are organized as private joint-stock companies. According to the Bulgarian legal definition (WMA, part 1, p. 16 of the Additional provisions), a recovery organization is "a legal person registered under the Commercial law or national legislation which does not distribute profit and which manages and/or carries out the activities of separate collection, recycling and recovery of widespread waste".

The recovery organizations are licensed by the Ministry of Environment and Water, receiving a permit for maximum five-year period (Article 88, WMA). According to the Bulgarian legislation, there are no legal obstacles to the operation of more than one recovery organization for a particular waste stream. Certain requirements need to be fulfilled within the permit issuing procedure as well as annual operating and reporting obligations.

[Figure 2-2] Responsibilities under the Bulgarian EPR System



Each recovery organization has the obligation to present a bank guarantee (Article 81, Waste Management Act) to the Minister of Environment and Water, which is to financially guarantee the fulfillment of their obligations, including recovery and recycling targets within the particular calendar year. Each year during the recovery organization activity, the bank guarantee has to be renewed or prolonged for the next year. For WEEE and packaging waste organizations, the bank guarantee is 1,000,000 BGN.

If a recovery organization does not attain the recovery and recycling targets on behalf of its members for a given year, it is penalized. The penalty is calculated on the basis of the total weight of EEE placed on the market by its members for the given year, multiplied by the product tax for each category of EEE (Article 59, WMA). The product tax by category is set in the Ordinance for the establishment of terms and amount of payment as a product tax for products, which use leads to the generation of widespread waste (State Journal, No. 53, 2008). This ordinance regulates the obligations and procedures for payment as well as the amount of product taxes for

all six widespread waste streams regulated by the WMA: packaging waste, WEEE, ELV, used oils, batteries and tires. The application of the product tax set by this act is dedicated for the cases when producers and importers do not cover their obligations by a recovery organization membership or a self-compliance scheme (Article 59, WMA).

The license fees, paid to the recovery organizations on the basis of the total weight of EEE placed on the market, are significantly lower than the amount of product tax set by the ordinance. That can be explained by the economy of scale related to the number of the recovery organization members.

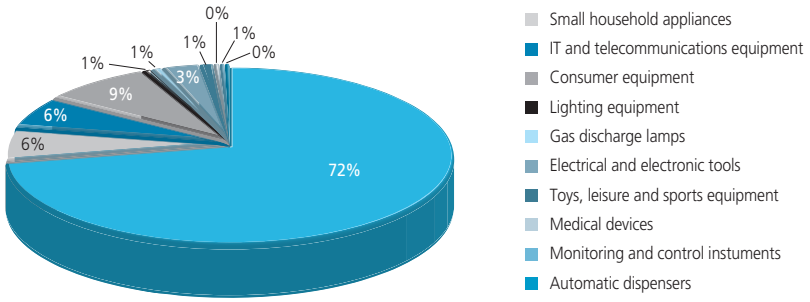
Recovery organizations fulfill their obligations to collect and recycle WEEE on behalf of their members through contracts with sub-contractors possessing permits for handling WEEE. The main scheme for the collection of WEEE from households is formed by the network of collection sites for WEEE of all 10 categories. Other common schemes are mobile collection points and the collection of WEEE from households on request. For the period between 2009 and 2013, the average number of collection centers was between 350 and 450 covering the whole territory of Bulgaria (Source: EEA expert calculation). The pick-up on request collection activity of WEEE from households is performed free of charge, and the collection is carried out either on collection sites of companies authorized to work with WEEE or at commercial points of sale of EEE to end users.

Carrying out treatment operations of WEEE requires authorization issued under Article 35 of the Waste Management Act or integrated permit issued under the Environment Protection Act. Companies performing waste management activities have the obligation to submit annual reports in accordance with the procedure, terms and formats of Ordinance №. 1 of June 4, 2014 on the order and the models for providing information about waste and the procedure for keeping public registries. The most effective scheme for the collection of WEEE from households, proven by practice in the countries of the European Union, is to build a network of sites for collection of all WEEE where return is done by the households. Additionally, recovery organizations are allowed to continue separate collection of WEEE within the territory of retail outlets providing the necessary containers, signposting, information materials and organized transportation of WEEE collected.

2.3. Achievement of Targets

Additional provisions of the Ordinance on EEE specifying 'placing on the market of electrical and electronic equipment' are 'first providing to consumers for a fee or free of charge with the purpose of use.'

[Figure 2-3] Composition of EEE Placed on the Market



Source: Executive Environmental Agency.

Most discarded WEEE is composed of large WEEE [Figure 2-3]. According to the official data of Bulgaria reported to Eurostat from year 2009 to 2013, the quantity of EEE by type placed on the market is the following <Table 2-5>:

〈Table 2-5〉 EEE Put on the Market in Bulgaria 2009-2013

(Unit: tonnes)

	Categories EEE Put on the Market	2009	2010	2011	2012	2013
1	Large household appliances	41,097	36,381	36,607	38,652	40,732
2	Small household appliances	2,537	3,100	2,879	2,616	3,462
3	IT and telecommunications equipment	3,301	3,334	3,105	3,245	3,489
4	Consumer equipment	5,631	4,881	4,743	4,482	5,009
5	Lighting equipment	613	478	453	481	469
5a	Gas discharge lamps	557	607	423	382	483
6	Electrical and electronic tools	1,061	1,423	1,859	1,814	1,768
7	Toys, leisure and sports equipment	539	233	278	485	606
8	Medical devices	291	129	167	204	241
9	Monitoring and control instruments	223	459	375	572	269
10	Automatic dispensers	199	181	285	210	173
	TOTAL	56,049	51,206	51,174	53,143	56,701

Source: Eurostat.

Collection of WEEE at the end users' sale points does not require any authorization or registration document, while the collection containers operated by another person require the necessary document. The collection of WEEE depends on its origin and marking – from households or outside the households; marked or unmarked. The marking with the WEEE symbol is required per Article 11(2) of the WEEE Directive. The WEEE symbol must be placed on an EEE product if the product falls in one of the 10 categories and is placed on the EU market after the August 13, 2005. The product is treated as "new" WEEE.

After 2007, the majority of collected WEEE is from households and it is not marked. The collection targets for a given year are calculated by a multiplying of the total population as of December 31 of the previous year by the minimum target of 4 kg per capita.

〈Table 2-6〉 Collection Targets 2009-2013

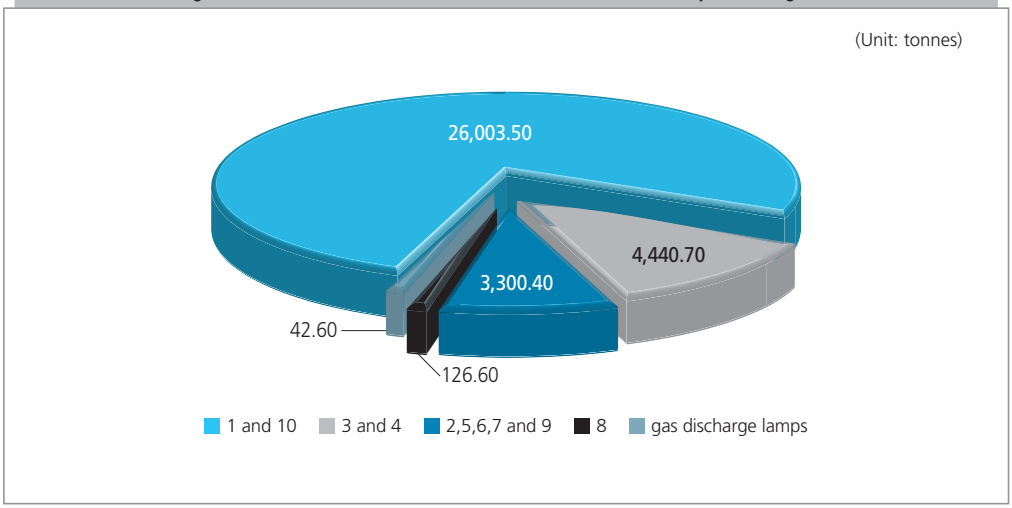
Bulgaria WEEE Collection Targets 2009-2013				
Annual Target 4 kg/per Capita				
Year	Population	Calculated Targets (tonnes)	Collected Waste from Households (tonnes)	Collected Waste Per Capita (kg)
2009	7,606,551	30,426	37,595	4.94
2010	7,563,710	30,255	42,095	5.57
2011	7,504,868	30,019	37,763	5.03
2012	7,327,224	29,309	34,556	4.72
2013	7,284,552	29,138	33,914	4.66

Source: Executive Environmental Agency.

[Figure 2-4] represents the shares of collected WEEE for 2013 by categories. The categories are grouped according to the provisions of the Bulgarian WEEE Ordinance, setting the reporting requirements on collection and recovery.

<Table 2-7> presents the quantity of collected WEEE from households for the period from year 2009 to 2013 in tonnes by grouped categories. Large household appliances and automatic dispensers occupy the majority of WEEE.

[Figure 2-4] Collected WEEE from Households in Grouped Categories



Source: Executive Environmental Agency.

〈Table 2-7〉 Collected WEEE from Households 2009-2013

Year	Category					Total by Year (t)
	1 and 10	3 and 4	2,5,6,7 and 9	8	Gas Discharge Lamps	
2009	2, 893,50	3,020,50	5,375,70	145,20	160,40	37,595,30
2010	31,156,90	5,102,70	5,441,70	125,40	268,10	42,094,80
2011	27,837,10	3,962,70	5,698,90	137,90	126,00	37,762,60
2012	25,622,10	4,529,00	4,236,10	105,20	63,90	34,556,30
2013	26,003,50	4,440,70	3,300,40	126,60	42,60	33,913,80
Total by Category	139, 513,10	21,055,60	24,052,80	640,30	661,00	185,922,8

Source: Executive Environmental Agency.

In 2013, the amount of WEEE market with the WEEE symbol collected from households was only 0.7 percent (EEA report). The collected materials were mainly in categories of "Large Household Appliances" and "Information and Telecommunications Equipment" (Categories 1 and 10, table 2-8). This large difference between the market and non-market collected WEEE can be due mainly to differences in the products lifetime. According to expert estimates, usually large household appliances in Bulgaria have a life span of around 10 years. This fact implies that the "new WEEE", resulting from the use of products placed on the market after 2005, will be collected and covered by the statistics as early as 2014 and 2015.

Any person selling electronics intended for the use outside the household is obliged to collect all WEEE resulting from this EEE. WEEE collected outside of households is mostly "Large Household Appliances" and "Information and Telecommunications Equipment". One reason for this is the different single weight of the appliances in various categories of EEE. "Discharge Lamps" and "Information and Telecommunications Equipment" are the two main categories exported for recovery and recycling to other EU countries.

〈Table 2-8〉 Recovered WEEE Compared to the Set Target, 2009-2013

(Unit: %)

Category	Set	Recovery				
	Target	2009	2010	2011	2012	2013
1 and 10	80	84.79	81.41	88.71	89.10	90.9
3 and 4	75	77.77	80.96	79.28	78.47	86.8
2, 5, 6, 7, 8 and 9	70	71.51	74.94	80.36	80.35	84.9

Source: Eurostat.

According to the WEEE Ordinance, recycling and recovery targets are calculated as the total recovered or recycled WEEE out of the total treated waste in the given year from the respective categories (Art. 15). The achieved results on national level in Bulgaria for 2009 – 2013 are presented in <Table 2-8> and <Table 2-9>. By the definition of Article 3 of Directive 2008/98/EC, "recycling" is any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes; while "recovery" is an operation the principal result of which is waste serving a useful purpose by replacing other materials. This is to explain that recovery by definition is wider category that includes recycling leading to a higher target for the first one.

〈Table 2-9〉 Recycled WEEE Compared to the Set Target, 2009-2013

(Unit: %)

Category	Set	Recovery				
	Target	2009	2010	2011	2012	2013
1 and 10	75	81.45	80.36	87.78	88.27	90.1
3 and 4	65	74.59	74.73	76.79	76.97	85.1
2, 5, 6, 7, 8 and 9	50	69.81	72.48	78.88	80.35	84.1
5a	80	84.53	83.85	86.05	87.23	82.1

Source: Eurostat.

During 2013, five ROs were licensed by the Ministry of Environment and Water. Together they were responsible for the total of 54,614 tonnes of EEE placed on the market from their members, which represented around 96 percent of the Bulgarian market (EEA report). <Table 2-10> represents the total amount of collected and recovered WEEE within the RO system for 2013.

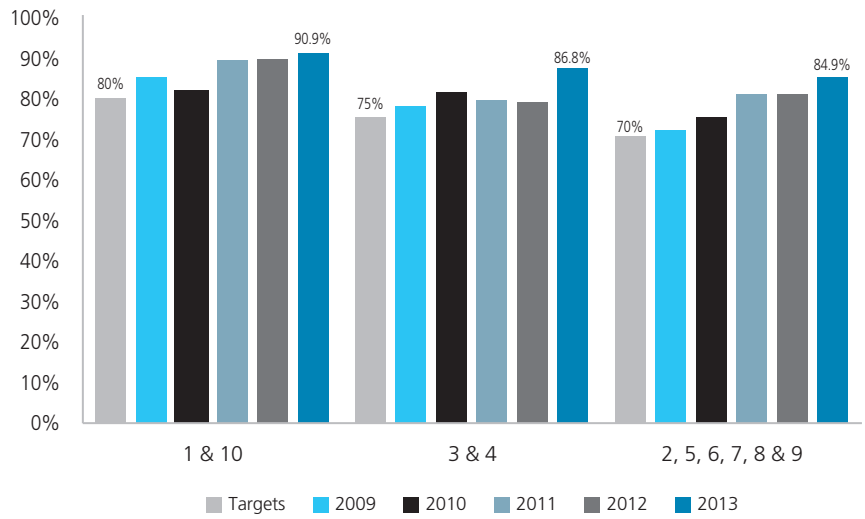
〈Table 2-10〉 Recovery Organizations Results

Recovery Organizations Results in 2013	
Collected WEEE (t)	36,127
Recovered (t)	30,302

Source: EEA report on WEEE.

[Figure 2-5] illustrates graphically the set target for WEEE recovery and the attained results on national level for the period 2009-2013.

[Figure 2-5] WEEE Recovery Targets and Results



Source: Eurostat.

2.4. Characteristics of WEEE EPR Schemes within the European Union

Within the EU, all 28 member states (EU-28) have introduced the EPR principle for WEEE. There are, however, different approaches to the realization of this principle in terms of the structure of the producer responsibility organizations for WEEE (PROs). Furthermore, there is some difference in the financial aspects of fees, cost coverage and the distribution of obligations between the stakeholders.

The final version of "Development of Guidance on Extended Producer Responsibility (EPR)", published by the European Commission in 2014, shows that there are many variations to key elements of WEEE systems on EU level such as scope, data availability and confidentiality, cost coverage and market structure and methods for data collection and reporting. From cost effectiveness and performance perspectives, there are many additional factors of influence which are external to the design and implementation of the EPR schemes. That is evident in the population density and country geography, historical development of the waste management infrastructure, value of secondary materials, willingness of citizens to participate and the existence of additional policy instruments such as "pay-as-you-throw" schemes. Competition is realized through the existence of more than one WEEE EPR organization in most member states.

A particular key element of variation between WEEE PROs is the different level of coverage for financial and organizational responsibility. Organizational responsibility is linked to the establishment of collection, transportation and treatment infrastructure and the performance of the respective services, while financial responsibility is related to the cost coverage of those services. The WEEE Directive does not explicitly identify who is responsible for the establishment of the waste management infrastructure. Regarding the financial responsibility, Article 12, Paragraph 1 of The New WEEE Directive indicates that producers should provide at least the financing of WEEE collection from collection points. That leaves the cost coverage of WEEE collection from private households to collection facilities as an optional responsibility.

The WEEE EPR schemes responsibilities among EU-28 vary from only financial to the combination of financial and organizational responsibility. The EPR organizations collect WEEE from municipal collection sites or retailers. Municipal authorities generally collect household WEEE free of charge at their collection centers, where the cost of the collection infrastructure establishment can vary from full coverage by municipalities (Denmark, Sweden) to financial compensation by the EPR organizations (Finland, France)[3)].

3) "Development of Guidance on Extended Producer Responsibility (EPR)", European Commission, p. 83.

As observed from the Eurostat Database for 2013, the WEEE recycling rates on EU level are relatively homogenous, while collection rates vary from 2.1 kg/capita/year for Croatia to 17.3 kg/capita/year for Sweden (Eurostat, WEEE Statistics).

Denmark and Finland, as two of the member states evaluated in "Development of Guidance on Extended Producer Responsibility (EPR)", offer different approaches to WEEE EPR schemes. Both countries have introduced competition-based PRO system, leading to three WEEE PROs in each country.

From the financial aspect, all costs for transport and net treatment of household WEEE are covered by the PROs in both countries. At the same time, Finish EPR organizations have full organizational responsibility, while in Denmark WEEE household collection responsibility is partial and divided between PROs and local authorities. Full organizational responsibility is implemented for commercial and industrial WEEE collection only. In Finland, local authorities may have contracts with PROs for providing WEEE collection from households, in which case collection costs are covered by the PROs.

From the administrative perspective, PROs in Finland are completely producer-led and regulated by the government, while in Denmark, the Danish Producer Responsibility System is the administrative body linking the responsibilities of the Ministry of Environment, producers, collective schemes and local authorities.[4)]

Finally, from a performance perspective, Denmark attained 12.6 kg/capita/year WEEE collection rate in 2013, while the result for Finland was 9.8 kg/capita/year (Eurostat, WEEE Statistics).

3. Current Status of Korean EPR

3.1. Historical Development

Rapid industrialization, rising living standards and a disproportionally small territory to the population necessitated the introduction of efficient waste electrical and electronic equipment (WEEE) policies in South Korea. For the past 20 years, it has been the social consensus that producers bear most of responsibility in resolving the issue. The history of development that has led to the current state of extended producer responsibility (EPR) can be summarized in three stages.

4) DPA System (2010). "Players". Retrieved from https://www.dpa-system.dk/en/WEEE/About-dpa-system/Players on February 1, 2016.

3.1.1. Deposit Refund System

The first stage is a producer-based deposit refund system. It was implemented from 1992 to 2003 with the purpose of increasing the responsibility of producers in the post-consumption stage of the product lifecycle. The mandatory items for collection included home appliances, packaging and containers, batteries, tires, engine oil and fluorescent lamps. (KEI, 1999) The program is overseen by the Ministry of Environment (ME), while the specific policies are set out by the Korea Environment Corporation (KECO). This system, as well as the next two, is mandated by law. In this case the base law for a deposit refund system is the Act on the Promotion of Savings and Recycling of Resources, Article 18. (KCA, 1998)

Simply put, under this policy the producer deposits a certain amount of money and once he recycles all the required materials for a specified amount in the given year, he receives a refund. The amount of deposit is equivalent to the value of delivered goods in the previous year multiplied by the deposit rate for the specific product. Therefore, the value of the producer's deposit does not deteriorate, since he can receive principal with accrued interest over the deposit period. This system has displayed a weakness in setting the deposit rate too low to cover the entire cost of collection. (Yoo et al., 1998) This resulted in a low collection rate of recyclable products – in 1994 the amount refunded constituted only 0.06 percent, which grew to 3 percent in 1995, 5.6 percent in 1996, 8.3 percent in 1997 and 7.3 percent in 1998. (KEI, 1999) The collection rate has improved only marginally over time because the majority of the companies viewed paying the deposit as a less costly option than recycling.

Problems with the producer-based deposit refund system motivated the introduction of the EPR in 2003. However, the "beverage container deposit system" is still in use and can be viewed as a consumer version of the deposit refund system. This system promotes collection and reuse of containers. It establishes refundable deposits on recyclable containers which customers can redeem when they return them. <Table 2-11> shows the volume of the containers and the amount of money received for their collection. The handling fee corresponds to the cost that the manufacturer of the original product pays to wholesaler and to transport beverage containers. For producers who fail to refund 80 percent of the deposits to their customer, recycling dues will be levied on the unfulfilled amount with the surcharges up to 30 percent. Recently, an increase in the refund amount per bottle is being considered to improve the collection rate.

〈Table 2-11〉 Beverage Container Deposit System

Volume	Container Refund	Handling Fee
Under 190ml	20KRW/bottle	8KRW/bottle
190 – 400ml	40KRW/bottle	16KRW/bottle
400ml – 1,000ml	50KRW/bottle	19KRW/bottle
Over 1,000ml	100KRW/bottle 300KRW/bottle	23KRW/bottle

Source: KECO internal data.

3.1.2. Extended Producer Responsibility System

In 2003, the Extended Producer Responsibility System was introduced with the objective of motivating producers take responsibility for their products up to the recycling stage. If the producer fails to fulfill his yearly targets, he will be punished with "recycling dues". This policy was based on the same act as the previous system (Act on the Promotion of Savings and Recycling of Resources), Article 16.[5)]

The items on the system have changed through years. At first, the system started with televisions, refrigerators, washing machines, air conditioners and personal computers. In 2005, it incorporated mobile phones and audio equipment, followed by the addition of printers, copy machines and fax machines in 2006. (Manomaivibool and Hong, 2014) As of 2014, the items managed by EPR included metal cans, glass bottles, carbon packs, plastic packages and products such as batteries, tires, lubricants, fluorescent lamps and Styrofoam floats.[6)] It is important to mention that electronic appliances that were previously regulated by EPR were transferred to Eco-Assurance (EcoAs) system from 2008, while the rest are still regulated by this policy.

To promote the quality and quantity of collected WEEE, the Ministry of Environment made amendments to the Act on the Promotion of Savings and Recycling of Resources, Article 16 enforced on November 23, 2013.[7)] According to the amended act, the Ministry of Environment is to set recycling and collection targets in order to incentivize permitted collection organizations collect better quality and larger amount of waste. With additional collection obligations, EEE retailers are required to financially support collection/sorting companies. (KECO internal source)

5) EPR homepage: www.iepr.or.kr.
6) Ibid.
7) National Assembly (Partially Amended on May 22nd, 2013, Executed on November 23, Law No.11788). "Act on the Promotion of Savings and Recycling of Resources".

Under the EPR policy, the producers were allowed to satisfy their obligations through the creation of recycling centers under the name of the company, outsourcing the recycling work to recycling businesses by becoming members of recycling cooperatives (PROs). (Manomaivibool and Hong, 2014) At the moment, over 90 percent of the obligated companies are members of the only cooperative for packaging materials (KPRC) established in December 2013.[8] This cooperative was born out of a coalition of smaller recycling cooperatives (the Discarded Can Resource Cooperative, the Waste PET Bottle Resource Recycling Cooperative, the Waste Plastic Recycling Cooperative, among others) in accordance with the revised Act on the Promotion of Savings and Recycling of Resources to assume administrative and educational roles.

Additionally, the revision of the Act on the Promotion of Savings and Recycling of Resources in 2013 gave birth to another organization, KORA, responsible for delivering financial support to collectors and recyclers of packaging waste.[9] These two organizations substituted for the first cooperative of producers called KAEE (Korean Association of Electronic Environment) established in September 2000.[10]

3.1.3. Eco-Assurance System

The third and the most recent stage of producer responsibility in South Korea is EcoAS. It was introduced in 2008 and holds the basic frame of the EPR system. In essence, the WEEE part split from EPR and became EcoAS. The base law for this policy is completely separate from previous ones. It is based on Act on Resource of Electrical and Electronic Equipment and Vehicles, Article 38. EcoAS assumed new functions such as overseeing recycling of vehicles in addition to electronics and restriction of hazardous substances.[11]

The regulated substances under this policy are Lead, Mercury, Hexavalent Chrome, PBB and PBDE whose content should not exceed 1,000 ppm (0.1% by weight in homogenous materials) and Cadmium whose content should not exceed 100 ppm (0.01% by weight in homogenous materials).[12] This system aims to prevent excessive use of toxic substances and create a traceable WEEE system. Similar to the EPR's case, EcoAS also sets separate collection responsibility to the collection/sorting companies, which constitutes approximately 50 percent of the collection targets per year. (KECO

8) KPRC (2013). "Purpose of Establishment and History". Retrieved from www.pkg.or.kr/kprc/RMID/RMID002.html on October 3, 2015.
9) KORA (2013). „Greetings". Retrieved from www.kora.or.kr/company/greetings.jsp on October 16, 2015.
10) Ministry of Environment (2000). "Establishment of Electronic Industry's 'Korea Electronics Industry Association' " (Report distributed on September 27, 2000).
11) EcoAS homepage: https://www.ecoas.or.kr/.
12) EcoAS (2014). "Car Producing and Importing Companies". Retrieved from www.ecoas.or.kr/recy/ecoaRecy0240_View.jsp on October 20, 2015.

internal data)

3.2. Stakeholder Responsibilities

The program is overseen by the Ministry of Environment and implemented by KECO. The Minister of Environment has the obligation to set short and long-term recycling targets per person. KECO has the responsibility to track the performance of the responsible parties and create relevant rules.

The obligated parties under Act on Resource of Electrical and Electronic Equipment and Vehicles are manufacturer with sales over KRW 1 billion in the previous year and importers whose sales over the same period exceed KRW 300 million, as specified under Article 5. The obligated producer has the responsibility to manufacture products from materials that can later be easily recycled. The electronic products should also satisfy the criteria for toxic materials specified in this act. All of the information regarding toxic components and materials used should be submitted online in the designated form.

The collection requirement is given to the seller of the electronics product with yearly sales over KRW 5 billion, which is specified under Article 16 of the Act. That Act came into force from January 6, 2012, so the notification about targets was released from 2012. At all times the collection targets are lower than the recycling targets since collection obligation is shared between electronics seller and manufacturer and the stated collection percentage is for sellers only. While there is a considerable number of retailers that are operating under the same brand name as a manufacturing company, recycling performance of these retailers is not taken into account when satisfying the quota. That distinction is made to avoid double counting and give incentives to retailers unaffiliated with companies to contribute to recycling targets.[13)]

The recyclers can be summarized in three types: electronic equipment crushing recyclers, crushed residue recyclers, and waste gas recyclers. According to the Korea Electronics Recycling Cooperative (KERC), the only PRO (Producer Responsibility Organization) responsible for e-waste collection in Korea, the technology required for recycling electronics in Korea is sufficiently developed and the only problem is that the unit cost of recycling is rather high. Recycling agencies have to record information on recycling volumes to EcoAS database.

If obligatory parties under the law do not satisfy their responsibilities, they will receive a monetary penalty. The method for calculation of the penalty is expressed in

13) Min Y. et al. (2009). "A Study of Reverse Logistics Systems for Sustainable Resource Circulation", Korea Transport Institute, p.118.

the following equation.[14)]

Unfulfilled Amount (kg) × Base Price for Recycling + Additional Price

The base price for recycling is per unit recycling cost multiplied by the index reported by the government yearly. In the case of 2015 that was 1.31 (as was released by the Ministry of Environment). An additional price is calculated as a recycling cost multiplied by the unfulfilled required amount and taking (15%–30%) of that amount. Since 2014 the per unit cost is equal for all products in the same category of product type.

〈Table 2-12〉 WEEE Recycling Cost per Unit

Type of Product	Recycling Cost per Unit (KRW)
Large Appliances	274
Communications and Office Appliances	433
Middle-sized Appliances	424
Small-sized Appliances	580
Mobile Devices	2,717

Source: Ministry of Environment.

It is important to note that statistics on the newly added 17 appliances are not available even from the official sources that collect such statistics. Furthermore, no reliable statistics on e-waste by municipalities is available.

3.3. Performance and Evaluation

3.3.1. Electronics Use Life

Korea is well-known for tech-savvy consumers who are quick to adopt new technologies. Compared to Eastern European countries, like Bulgaria, the average life of electronic products in Korea is shorter. <Table 2-13> below shows the survey results of use life for major electronic home appliances. The survey was conducted by KAEE in 2006. As can be observed from the table, large home electronics exhibit bimodal distribution. The first mode is below five years, a much shorter use life than in Bulgaria.

14) KECO (2012). „Calculation of Levy on Electronic and Electrical Equipment".

〈Table 2-13〉 Use Life of Major Electronic Products

(Unit: %)

Use Time (years)	TV	Air Conditioners	Washing Machines	PC Mainframes	PC Monitors	Mobile Phones	Audio	Printers
1	2.8	1.2	3.6	7.5	8.6	6.3	9.8	7.3
2	2.5	2.7	1.6	15.2	9.5	29.4	2.3	16
3	5.2	5.1	3.3	23.3	24.6	34.3	11.7	23.4
4	4.6	4.5	3.8	17.1	16.8	21.3	7.4	12.2
5	10.5	10.6	12.1	22.6	26.3	0	14.3	18.2
6	9.7	6.1	3.6	5.9	5.8	0	2.2	7.6
7	8.8	9.3	11.7	3.1	2.3	0	7.9	5.5
8	11	12.1	11.5	1.3	1.6	0	8.6	2.9
9	17.8	5.9	10.1	2.1	2.4	0	4.6	4.1
over 10	27.1	42.5	38.7	1.9	2.1	0	31.2	2.8
average	7.33	7.69	7.65	3.94	4.06	2.53	6.41	4.21

Source: KAEE (2006).

3.3.2. Collection and Recycling Targets

Up until year 2013, South Korea's yearly recycling requirements per product increased only marginally and were less than 20 percent on average. (<Table 2-14>, Ministry of Environment, yearly notifications). Certain products had to satisfy more ambitious goals since they were easier to recycle technically and had lower reuse value than other products.

〈Table 2-14〉 Recycling Obligation Rate for WEEE

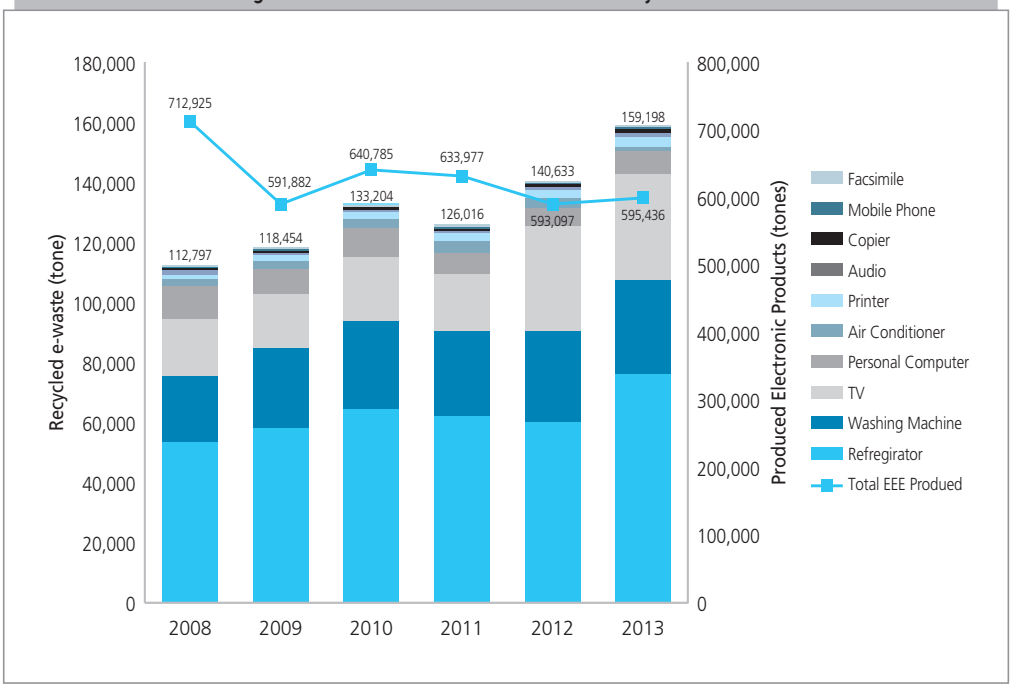
(Unit: %)

Product	2003	2004	2005	2006	2007	2008	2009	2010	2012	2013
Televisions	11.6	9.2	11.8	12.6	13.3	14.5	16.0	19.0	27.2	36.2
Refrigerators	9.0	10.8	14.1	16.9	17.3	18.9	20.6	22.1	26.7	34.3
Washing machines	25.3	21.8	21.2	23.4	24.2	25.3	26.1	27.4	31.7	38.8
Air conditioners	0.7	0.7	3.6	1.7	1.9	2.1	2.3	2.4	2.7	8.8
PCs	3.8	5.4	8.5	9.4	9.8	10.3	11.1	12.3	15.3	22.9
Audio	-	-	10.2	12.7	13.1	14.9	15.5	17.0	20.0	26.8
Mobile phones	-	-	11.9	15.4	16.5	18.0	19.8	22.0	35.6	39.9
Printers	-	-	-	8.4	9.2	11.2	11.9	13.0	15.0	21.8
Copiers	-	-	-	8.4	9.4	12.7	13.3	14.2	16.0	23.4
Fax machines	-	-	-	8.4	9.4	11.4	12.1	13.4	15.6	22.3

Source: Ministry of Environment (annual report).

The general picture of recycling performance is exhibited in [Figure2-6]. The left-hand side label of the graph in [Figure 2-6] indicates the actual recycling of 10 electronic products since the inception of EcoAS in 2008. On the other hand, the right-hand side corresponds to the total amount of electronics produced (more precisely delivered from a warehouse or imported in the given year). Almost every product (except for mobile phones) satisfied the yearly recycling quota. However, the year-on-year quota increase was sluggish until year 2013. The year-on-year increase in e-waste recycling was 5 percent from 2008 to 2009, 12.4 percent from 2009 to 2010, negative 5.4 percent in the next year, and finally 13 percent from 2012 to 2013. The absolute value of recycled e-waste changed from 112,797 tonnes in 2008 to 159,198 tonnes in 2013. (Calculated from KECO internal data)

[Figure 2-6] Produced Electronics and Recycled E-Waste



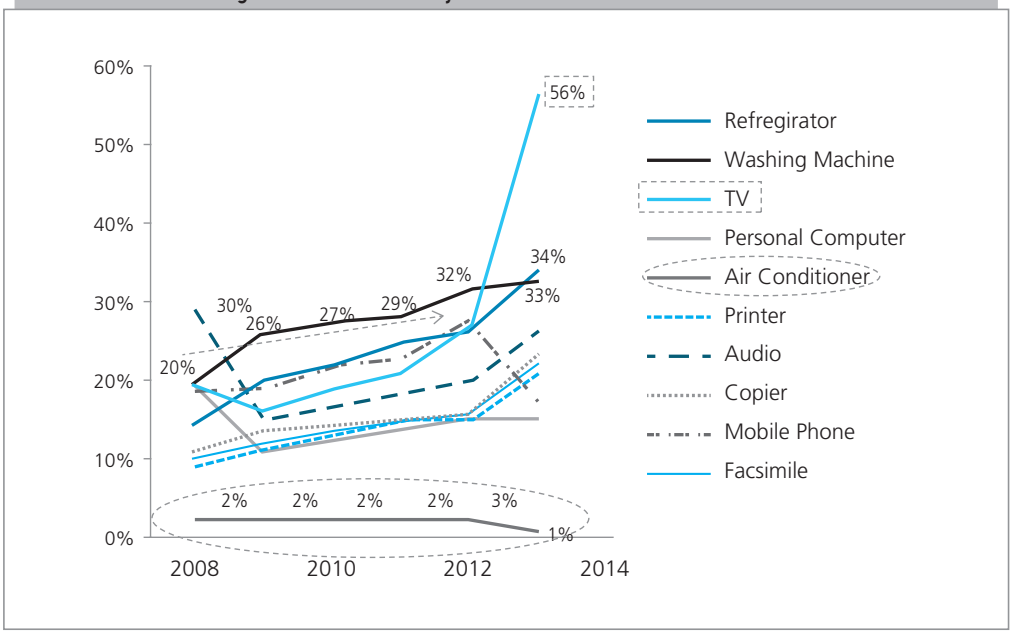
Source: calculated from KECO internal data.

Not every electronic product experienced improved collection and recycling over time. [Figures 2-7] and [Figure 2-8] indicate low and decreasing collection rates of air conditioners and mobile phones compared to other products. According to electronics manufacturers and KECO interview, this result can be explained by rather active secondary market for these products. In fact, major online auction shops such as 11th street[15] or Auction[16] have a large section for trade of used air conditioners

15) 11st Avenue homepage: www.11st.co.kr/html/main.html.
16) Auction homepage: www.auction.co.kr/.

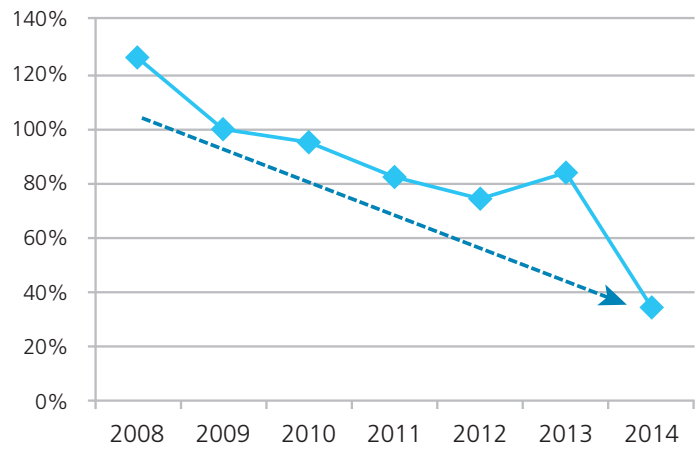
and smart phones. A KERC interview reveals that many mobile phones are also transported abroad either legally or illegally.

[Figure 2-7] Rate of Recycled WEEE to Produced Electronics



Source: calculated from KECO internal data.

[Figure 2-8] Rate of Recycled Mobile Phones to Targeted Recycling Rate



Source: calculated from KECO internal data.

Even when producers satisfied the recycling targets set by the government, the outcome was still lower than those of other developed countries. For instance, in 2013 South Korea's recycled WEEE was 2.9 kg/person, much lower than the recycled WEEE in EU – 7.1 kg/person.[17] A low rate of WEEE recycling and increasing variety and the blurry distinction between product types motivated amendments to the Law Promoting Resource Circulation of Electric and Electronic Appliance and Vehicles of July 16, 2013. Through these amendments the Ministry of Environment required that WEEE recycling statistics to be reported on per capita basis.

Furthermore, 2014 marked the introduction of 17 additional electronic products that should be regulated, adding up to total 27 WEEE. This complexity also required simplification. The new recycling categories from 2014 were large home electronics, mid-sized electronics, small-sized electronics, telecommunication devices and office appliances. This division is made based on the similarity of recycling technology. The additional purpose of such a distinction is to allow obligated companies to minimize their compliance costs by maximizing the amount of easily-recycled products in each category. (KECO internal source)

According to the Law Promoting Resource Circulation of Electric and Electronic Appliance and Vehicles, Article 16, paragraph 1, the Minister of Environment will set a five-year per capita WEEE recycling target based on the projected electronic waste supply. The related administrative branches are to set yearly recycling targets for WEEE. This law was passed in December 2014 (with a target of 3.9 kg/person) and applies from year 2015 (4.5 kg/person), for which statistics are not yet available. The long-term target of 6 kg/person will apply from 2018.[18][19][20]

3.3.3. Free Collection System

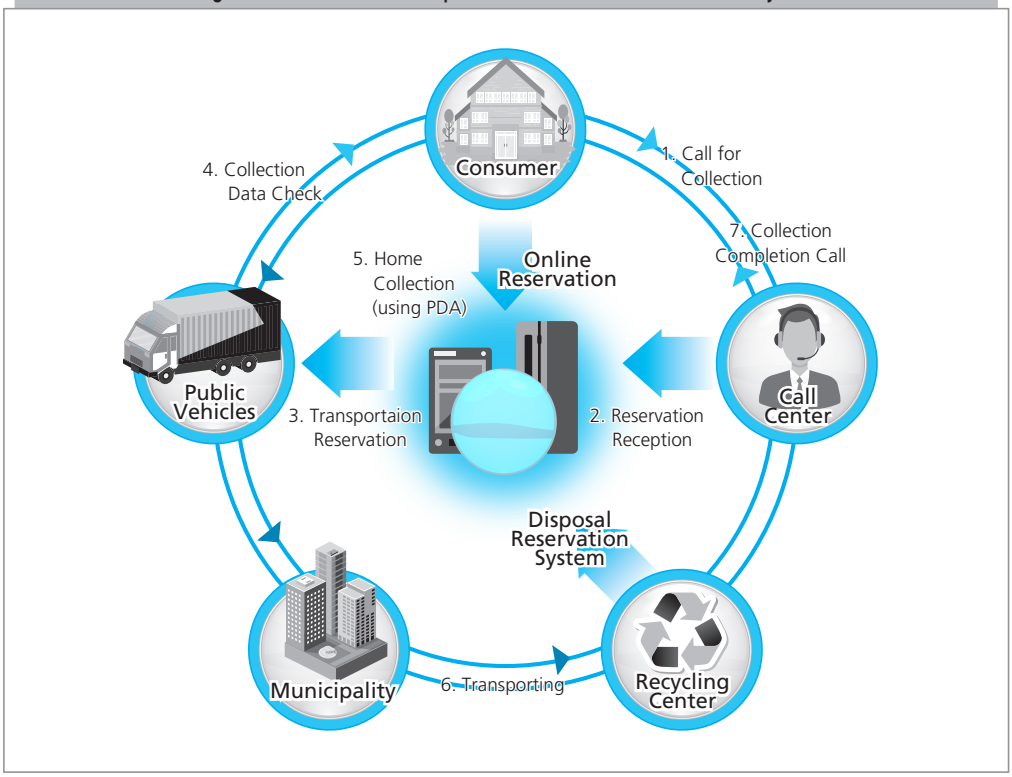
The idea of a completely free collection system was not realized until recently. In the past, it was only natural for consumers to pay only as much as they throw away. One such policy that has significantly reduced household waste was a "volume-based fee system", introduced in 1995. According to the Korea Environment Institute (2011), requiring consumers to pay for a special plastic bag for the discharge of unrecyclable waste has not only considerably decreased waste that would otherwise be buried in a landfill, but also saved costs for transportation, reclamation and incineration

17) Ministry of Environment (2014). "Free Collection of Large WEEE", p.2.
18) Ministry of Environment (Law Partially Amended on January 20, 2015, Law No. 13037) "Law Promoting Resource Circulation of Electric and Electronic Appliance and Vehicles".
19) Ministry of Environment (Implemented on December 31, 2014, Ministry of Environment Notice No. 2014-13, enacted on January 29, 2014). "Notice on the Long-term per Capita Recycling Goal for Electronic and Electrical Equipment".
20) Ministry of Environment (Implemented on December 31, 2014, Ministry of Environment Notice No. 2014-236, enacted on December 31, 2014) "Per Capita Recycling Goal for Electronic and Electrical Equipment in 2015".

equivalent to a cumulative KRW10,711,424,000,000.[21] The premise that consumer should pay for discarded large WEEE was also applied until 2013.

In the past, to throw away large home appliances in South Korea, one had to visit a regional government office and purchase a sticker for discarded waste.[22] Under this system the consumer had to pay KRW15,000 per discarded refrigerator, KRW8,000 per washing machine, KRW7,000 per air conditioner, KRW10,000 per TV, KRW10,000 for mid-sized electronic products and KRW3,000 per small-sized electronic products (Ministry of Environment, April 4, 2015 press release). Considering the inefficiency of the policy and the fact that the office is closed during weekends, the Korea Electronics Recycling Cooperative (KERC) introduced a completely free of charge WEEE collection service. This service capitalized on the strong logistics system of the conglomerates, strong IT infrastructure and GPS. The free collection scheme is introduced in [Figure 2-9], which was created based on the diagram from the EcoAS homepage.

[Figure 2-9] Schematic Representation of Free Collection System



Source: translated version from the EcoAS website (www.ecoas.or.kr/).

21) KEI (2011). "A Study on the Achievement and Improvement of Volume-based Waste Charge", p.69.
22) Ministry of Environment (2002). "A Guide to Improvement of Large Waste Discharge and Collection", p.1.

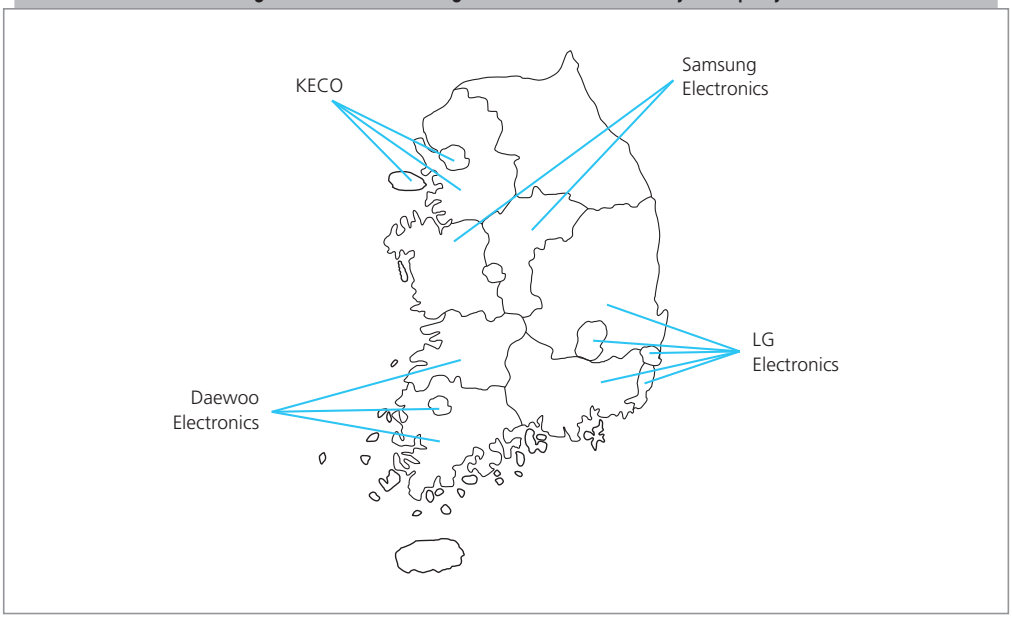
The free collection system is very consumer-friendly. According to an opinion survey of 8,601 users in 2013, 99.6 percent of consumers reported they were satisfied with this service.[23] The consumer can choose one of three collection days (Tuesday, Thursday or Saturday) and select which of the large home electronic appliances he or she will discard. Small electronic appliances (audio, microwaves, etc.) cannot be collected for free unless the consumer discards over five small appliances at a time.

The policy is relatively new since it was first introduced in major cities in 2012 and was expanded throughout the country starting from September 2014. However, according to an interview with a KERC representative, this form of door-to-door collection already accounts for about 15 percent of the total WEEE collected. In a press release from May 4, 2015, the Ministry of Environment specified that the free e-waste system contributed to a 40 percent increase in the total WEEE collected from February to March. In 2014, the number of collected units was 35,172 units and the economic benefit estimated to be KRW 53,000,000,000.

3.3.4. Diverse Collection Channels

Korean conglomerates have performed a crucial role in increasing the efficiency of electronics recycling. In fact, three major producers of electronics in the 1990s—Samsung, LG and Daewoo—divided the country into regions where they took charge

[Figure 2-10] WEEE Logistics Infrastructure by Company



Source: Map reconstructed based on POSA (2009).

23) Ministry of Environment (2014). "Free Collection of Large WEEE", p.2.

in creation of recycling infrastructure.[24] [Figure 2-10] below was drawn based on the explanation of WEEE logistics division among conglomerates (POSA [2009], p.90).

The problem is that no reliable statistics are available on the collection of WEEE by municipalities. Yet, KERC estimates that 30-40 percent of e-waste collection is done though municipalities. Until the introduction of a "free collection system," municipalities played an even more significant role in e-waste collection with 3,482 collection organizations across the country as of 2005.[25]

Another considerable recycling channel is through retailers, digital centers or service centers. In 2007, Samsung Electronics and LG Electronics operated 439 collecting points with combined collected WEEE accounting for 65-85 percent of the total WEEE amount.[26] Samsung practices social responsibility by supplying a federation of recyclers with WEEE free of charge since 2005. Collection of large appliances is available through Samsung "Digital Plazas"[27], LG's "Best Shops"[28] and service centers. Samsung has been a pioneer in the establishment of logistics for WEEE collection in 1995, participating in the voluntary agreement with the government to create regional recycling centers and WEEE recycling association in 2000 to becoming the operator of 13 recycling centers as of today (eight for large WEEE and five small WEEE).

4. Issues and Recommendations

The Bulgarian waste management system is characterized by several issues with different levels of influence, resulting in decreased system efficiency, both operational and economic. These factors range from insufficient information on environmental hazards and environmental education in the first place to history-based cultural conditions, such as alternative or irregular use and reuse of products, and longer product lifespan. In terms of financial motivation, several reasons deserve mentioning – "pay as you throw" principle in waste management taxation is not yet implemented; financial remuneration for bring-in waste collection of large household appliances, where applicable, is not a sufficient stimulus for the majority of the population. In addition, challenges in marketing campaigns, such as price discounts for return of the used WEEE upon purchasing new appliances, are linked to

24) Korea Postal Agency (2009). "Trends in Postal Business", 6(3), pp.77-93.
25) Ibid., p.87.
26) Ministry of Environment (2009). "Analysis of WEEE Recycling's Current State and Measures for Its Improvement".
27) Samsung (2013). "Free Collection of Small WEEE". Retrieved from www.samsung.com/sec/support/digitalplaza/pickup_service.html on October 21, 2015.
28) LG (2015). „WEEE Management" Retrieved from https://www.lge.co.kr/lgekr/company/about/sustainability/environment/end-of-life-products on September 20, 2015.

the households' purchasing power and the amount of these discounts compared to the prices of new products.

In relation to waste management efficiency of EPR schemes, system-related factors, such as insufficient control over households' waste discarding activities, their waste disposal habits and the lack of evolution of the municipal solid waste collection system lead to low acceptance of separate collection systems by the Bulgarian population. In particular, municipal solid waste still does not cover solely the residual non-recyclable waste, but also includes types of waste and materials for which different separate collection systems are already available such as for packaging waste.

Finally, activities of the informal sector also have a significant influence on waste collection. Certain social groups are committed to an unofficial waste collection process, which, in some cases, is related to irregular or illegal waste pretreatment activities (i.e. not environmentally sound dismantling of EEE).

4.1. System-Related

4.1.1. Mixed Municipal Solid Waste Collection System

Since 1999, Bulgaria has been divided into 28 provinces (regions). The provinces are further subdivided into 265 municipalities with different territorial and population structures. According to the 2011 census, the number of settlements in Bulgaria was 5,302, of which 257 are towns and 5,045 are villages (National Statistical Institute). Urban population covers 5,324,900 people or 73 percent, about 27 percent of the population lives in villages. The capital, Sofia, has a population of 1.3 million people, followed by Plovdiv, the second largest city with around 340,000 inhabitants.

Waste managed under the municipal solid waste system is collected through curbside collection containers, and sometimes, personalized containers for mixed solid waste for enclosed residential complexes or business buildings. The first attempts to introduce a separate collection of waste were made in 2004, with the implementation of the EPR system for packaging waste. However, in 2015 only around 180 of all municipalities in Bulgaria are provided with a separate packaging waste collection system in addition to curbside containers (MOEW experts' calculations). These packaging waste containers are operated by packaging waste recovery organizations and are separate from the local authorities. WEEE systems, on the other hand, are mainly providing collection containers to public and administrative buildings, as well as for the retail sector, while for households they provide bring-in collection centers and pick-up on demand services.

Historically the mixed municipal waste collection system was the only possible approach. Around 70 percent of municipal waste has been land filled in the past few years, leading to serious environmental problems and loss of valuable resources (Eurostat, Municipal waste statistics). According to the Waste Management Act, legal entities and individuals who discard recyclable waste, such as WEEE, into the municipal waste system containers or leave it beside the containers when it is not time for WEEE and bulky waste collection campaigns are penalized (Article 133, part 1, WMA). Despite these legislative mechanisms, such violations are often overlooked and no statistically important information from municipal authorities on these imposed fines is available. In addition, the absence of a collection system for small WEEE contributes to the situation when households dispose of small WEEE through the municipal waste system.

4.1.2. Informal Sector

The informal waste collection sector in Bulgaria is run by a particular social group, most largely composed of the Roma population. They maintain their livelihood through the collection of packaging waste and WEEE from curbside waste containers. In the case of WEEE, most of the waste collected by them is from streets or directly from households through informal campaigns, especially related to seasonal cleaning of basements and garages during spring time in residential areas or in the countryside. Having in mind the low level of households' participation in the free collection system, informal collectors comprise a significant and even primary role in the waste management chain. Competition for waste resources makes it hard for the recovery organizations to satisfy recovery and recycling quota set by law with a purely legal inflow of waste.

From a legal perspective, the informal collection sector is considered to be an unauthorized waste management activity, as all collection and transportation of waste requires a registration document for such activities (Article 35, WMA). The exemptions are admittedly provided for individuals who wish to hand in their own waste. However, the current amount of waste collected by the informal sector far exceeds the amount that can logically fall under that category. Financial opportunities for the informal waste collection sector represent the reason for its existence in the first place. The WEEE waste collection centers licensed by the law (Article 35, WMA) are designed for business-to-business waste management activities as to provide the possibility for individuals to bring-in their own waste for financial compensation. Although the received amount for every unit of WEEE is relatively low, it becomes motivational when it is calculated on a larger scale.

4.1.3. Recommendations

The issue of the informal sector should be handled in a delicate manner. On the one hand, the government needs to regain control over waste management, and on the other – to ensure the already large informal sector goes through a smooth transition from being illegal to being the desired behavior. Korea once encountered problems similar to those now faced in Bulgaria. The uncontrollable spread of junkyards before the 1990s and the resulting criminal activities were part of Korea's experience.

The first law to formally address the legal activities was implemented in 1962 (Junk-Yards Business Law)[29]. Although the law allowed for the handling of virtually any used product at that time, it also closely monitored activities of junkyards with the help of the police. The law also stipulated that the owner of the junkyard should have a stable residence, should report the type of products he or she wishes to handle, and should not have a criminal record within the past three years, among other requirements. In other words, the government made sure to incorporate junkyards under the legal framework, a necessary process especially since GDP per capita was extremely low in 1962 (US$103.57),[30] and poverty could motivate illegal activities. Even that early law incorporated instruments for the prevention of stolen goods. Article 21 of the Junk-Yards Business Law specified that in case a junkyard sells the stolen product unknowingly, the real owner can redeem full rights over the product without any cost on his side.

Over time, junkyards split in two types: the one more resembling small second-hand shops, and the remaining small groups collecting cheap paper, metal and plastic products. In essence, the former group operated as businesses and the latter as a group who could not support themselves by any other means. Since no crime was deemed possible from the trade of petty objects, the Junk-Yards Business Law was abolished in 1992 and no law oversaw the activities of junkyards until 2010, when a number of public complaints called for policy measures.

Due to public discontent with the smell and noise from junkyards, amendments to Waste Management Act required junkyards to be equipped with certain environmentally friendly facilities and mandated them to register for an official permit.[31] The amendment specifically required entities with facilities over 1,000m2 in metropolitan area and facilities over 2,000m2 in other areas that collect waste paper,

29) Junk-Yards Business Law (Established on November 1st, 1961, implemented on February 2, 1962, Law No. 764). Retrieved form www.law.go.kr/%ED%8C%90%EB%A1%80/(84%EB%8F%84343) on December 1, 2015.

30) IndexMundi (2015). "Korea - GDP per Capita". Retrieved from www.indexmundi.com/facts/korea/gdp-per-capita on December 1, 2015.

31) Act No. 10389, July 23, 2010.

wrapping material (such as plastic) and scrap metal, de facto junkyards, to obtain permits for their activities. The group of junkyards falling into this category accounts for approximately 15 percent of the total number of junkyards in Korea. This law was an important step in creating an environmentally friendly environment in large yards' facilities.

Despite progress in instilling environmental practices in large junkyards, small, family-operated counterparts that account for 75 percent are still exposing themselves and the surrounding environment to health-related risks. In a phone interview with the Waste Management Department of Korean Ministry of Environment, it was found that officials have considered financially supporting small junkyards by equipping them with environmentally friendly facilities. However, the National Assembly rejected this law stating that it might give an unfair advantage to a certain social group in need. While the claim by the National Assembly has grounds, considering the long-term benefit from eliminating environmental hazards might outweigh the presumed social justice argument.

Recent amendments to the law could, in theory, affect the financial situation of junkyards. Amendments to the Act on the Promotion of Savings and Recycling of Resources of 2013.11.23, implemented on January 1, 2014, mandated waste collecting organizations to satisfy specific yearly quotas for various types of waste. Under the amended law, businesses that bear responsibility under the EPR system have to provide financial support to these collecting companies. Similarly, Article 16 of the Act on Resource of Electrical and Electronic Equipment and Vehicles stipulates the need for EEE retailers to collect a certain amount of WEEE in accordance with the amount decided annually by the Ministry of Environment. That was a measure to ensure that collection organizations are motivated to bring in sufficient amounts of waste for recycling.

Theoretically, collection companies could then enter into a contract with large junkyards and share part of their financial compensation with junkyards if the latter assume part of companies' collection responsibility. This approach might work in Bulgaria, with additional stipulations by law, but the desired effect has yet to be seen in Korea. In Korea, collection companies have little incentive in paying junkyards since they have a sufficiently developed collection infrastructure and do not compete for waste collection.[32] Collection organizations' lack of responsibility under the law to share money with junkyards and the limited scope of collection items permitted for collection by junkyards prevents cooperation between collecting organizations and junkyards.

Korean law prohibits junkyards from collecting scrap material other than plastic,

32) Korea Association of Scrap Yard homepage: cafe.naver.com/gnscrap/122282.

paper and metal. That way the Korean government ensures that junkyards do not grow uncontrollably and do not collect hazardous waste. Bulgaria could take a similar approach and impose strong control punishments on those junkyards that collect materials other than the ones specified by law. Yet, Korean junkyards express their indignation with such restrictions since the price of legally allowed scrap has significantly decreased recently.

If Bulgaria chooses to adopt a junkyard-friendly inclusive policy, it may need to choose another approach. To alleviate the burden of the informal sector and ensure that it can sustain a living through scavenging, the Bulgarian government might allow collection of WEEE but add an additional restriction that no WEEE is handed in as a dismantled product. This will help prevent exposure to health-related problems when dealing with WEEE and other dangerous waste. Another possible approach to assuring the safe transition of the informal sector into a formal sector could be achieved by creating formal collection job opportunities to the informal sector.

A comparative analysis of Bulgaria and Korean waste collection channels clarified one of the reasons why the informal waste collection market is supplementary in the latter case. In Bulgaria's case, scavengers collect waste from curbside containers located on the streets near apartment complexes, the same location where government collection vehicles operate and special containers for various types of trash are placed. On the other hand, in Korea, scavengers collect waste near detached or row houses which lack special containers and where collection infrastructure is weak.

Generally, the row houses or detached (villa-type) houses are cheaper and consumers there more willing to sell their used products to junkyards. 40 percent of the Korean population lives in apartment complexes (type of residence in Korea, Korea Statistics 2013), where collection of waste is overseen by apartment security guard and trash should be sorted by type (volume-based, paper, plastic, metal, etc). In other words, for 60 percent of the population, junkyards are helpful, especially since there is no separate trash collection bins for small WEEE near detached houses.

As an alternative to using a free collection service on demand, it is also a common practice for people living in these detached houses to leave large WEEE in front of trash bins, so that junkyards would collect them.[33] If it were not for the junkyards, municipalities would have to spend more time and money on separating electronic trash from the general municipal trash. Likewise, Bulgaria could consider legalizing informal waste collection in certain regions/type of residence which formal public collection has a problem accessing, thereby segmenting the waste collection market

33) Association of Alternative Recycling Companies (2009). "Study on the Appropriate Management of Small WEEE Recycling", p.58.

and finding a coexisting strategy. The Ministry of Environment issued a press release on December 29, 2014 where it considered financially supporting junkyards in their collection of small WEEE.[34] However, the legal dilemma of officially giving junkyards the right to handle WEEE, as well as budgetary issues, prevented the implementation of that plan.

Korea's volume-based system helped solve the problem of municipal solid waste. Since less than 20 percent of waste is landfilled, the rest in volume-based bags are incinerated. Therefore, Korea heavily invests into research on the topic of refuse derived fuel (RDF), the practice of retrieving energy from solid waste through burning.[35] In addition, Number 3 in Attachment 5 of the Waste Management Act states that non-recycled inflammable waste should be burnt if the remaining untreated waste exceeds 100 kg/day.[36] As a result, on average between 2006 and 2010, about 66 percent of solid waste was recycled, 12 percent was burnt and 23 percent was land filled.[37]

4.2. Regulation-Related

Bulgaria, as a member state of the EU, has the obligation to transpose the legislations adopted by EU and implement the resulting measures. The realization of the EPR principle in the Bulgarian legislation into full financial and operation responsibility requires an effective and efficient waste management system. With the insufficient participation of households in the collection process in quantitative terms and the increasing targets set by the EU, the need for purchasing of waste from the private sector is growing. Meanwhile, a lack of monitoring and restrictions over informal WEEE collection poses serious environmental and social problems.

4.2.1. Environmental Hazards

There are a certain number of illegal collection sites which, subsequently to the role of informal collectors, perform illegal activities related to waste pretreatment. While for non-hazardous packaging waste this would be limited to regulation violations, in the case of WEEE dismantling, there is already a significant environmental and health risk that occurs due to the presence of particular electronic or fluid elements.

34) Ministry of Environment (2014). "WEEE Recycling Target to be 6 kg per Capita", Notice distributed on January 29, 2014.
35) Despite the relative novelty of the topic, a search in the Korean database alone generated 84 results of graduate theses since the year 2000 on the issue of RDF application to Korea.
36) Korea Waste Resource Circulation (2013). "Study on the Improvement of Companies Waste produced from Everyday Non-Business Activities", p.15.
37) Ibid., p.31.

Illegal dismantling of WEEE represents a serious issue. Informal collectors take out appliances (electronic devices and computers) from waste containers, from the street or directly from households, and oftentimes perform direct dismantling right on the streets or on personal property which is not designed for waste pretreatment operations. In the case of refrigerators, this may lead to toxic fluids leaking into the sewage system or directly into the soil, with the additional minor risk from littering or illegal disposal of parts and materials.

4.2.2. Social and Financial Losses in the Regulation of Recyclables

The informal WEEE collection sector, driven solely by financial motives, in many cases limits its interest to the most valuable materials, which leads to the loss of additional recyclable elements, the latter being left on the street or beside waste containers and, considered to be litter, ends up within the municipal waste collection system stream and landfills. This results in two subsequent issues. If WEEE cannot be tracked and its origin cannot be verified, electronic and electrical parts left from illegal dismantling can be reported as collected from households, contributing to distorted statistics. The second issue is that loss of waste's origins can aggravate criminal activity, for example, thefts of personal or public property, such as electrical and telecommunication infrastructure.

4.2.3. Recommendations

Regulation-related issues are closely tied to systematic issues, so some can be resolved with the approaches introduced in regulation-related suggestions. However, some Korean regulation practices that could help reduce the problems of the current situation in Bulgaria deserve a closer look.

First, the government systematically controls waste disposal activities by its citizens. In Korea, each apartment complex has a designated and monitored area for different types of waste. During weekdays, a person living in the apartment complex can throw away combustible waste in special volume-based plastic bags, and food waste in a designated container. In 2014, Korea introduced bio-waste containers equipped with an electronic chip based on RFID technology. Households that wish to dispose of their food waste in that container should place a card on the container's sensor to open it and then dump the food waste inside. The RFID technology automatically registers the amount of waste and the corresponding cost. All this information is simultaneously stored in a main server operated by KECO and the food waste fee is automatically added to the household's monthly bill. Consumers are directly motivated to reduce food and combustible waste since they can regularly monitor the fee for their discarded waste.[38)]

38) Ministry of Environment, Waste Management Department (2013) "Notice on Food Waste Volume-

Other waste, plastic, paper and scrap metal are thrown out on one or two designated days every week with the apartment security officer overseeing the process and explaining which recycling bin is appropriate for which type of waste. The monitoring process is further reinforced by the presence of CCTV cameras placed near recycling area. When a person is caught throwing trash illegally, he or she can be fined up to KRW1,000,000.

Second, municipalities work on supplementary measures to the regulatory approach. For instance, Uiwang City's hygiene and cleaning department, one of the cities in Gyeonggi Province not far from Seoul, is working on an environmentally friendly design to ensure each trash bin in public areas only collects the trash that it was created for. See the illustration in [Figure 2-11]. Such attempts, when properly secured, will not only motivate separate disposal in appropriate containers, but also could act as a device preventing from unauthorized collection by the informal sector.

[Figure 2-11] Trash Containers Designed for Efficient Sorting

Source: Hygiene and Cleaning Department, Uiwang City.

Based System Implementation", (Notice distributed on June 11, 2013). Retrieved from www.me.go.kr/home/web/board/read.do?boardMasterId=39andboardCategoryId=55andboardId=184785andmenuId=290 on December 5, 2015.

4.3. Culture and Education-Related

4.3.1. Insufficient Environmental Education

Environmental education in Bulgarian society is a relatively new development, and is still not widely handled by the education system. Although many initiatives and campaigns are organized annually, they seem to have a limited effect and are focused on particular groups. Youths are particularly concerned about environmental issues, such as the depletion of natural resources, bio-diversity, eco-balance, pollution, and outdated waste management concepts. Non-profit ecological organizations, as well as recovery organizations, provide different information campaigns for students in order to change their way of thinking at an early stage. It should be mentioned that most materials provide sufficient information on ecological hazards but do not elaborate on direct socio-economical added value for citizens and society in general. The latter is very important for the middle aged population.

4.3.2. Lack of Coherent and Complete Information

The presence of reliable, detailed and accessible information regarding different regulations, waste management principles, as well as concrete, useful advice are of primary importance for motivating citizens to use the EPR system. Many times the available information is fragmented as a result from information campaigns or PR positioning of different recovery organizations, or are limited to a particular type of waste. Local authorities often do not provide sufficient information on all types of waste, leaving the advertising and information responsibilities to the respective recovery organizations. Recovery organizations spend at least 5 percent of their yearly profits on information campaigns. It seems that even campaigns with wider TV, radio and Internet media coverage (i.e. for discarding large household electric appliances) have limited success in terms of collected e-waste. As a result, many households are not informed about the collection campaigns organized by municipalities at least twice a year, and about the possibility of free WEEE pick-up collection on demand.

4.3.3. Lack of Motivation to Recycle

Motivation to accept and use a particular waste management system is tightly related to one's environmentally friendly mentality and perception about additional socio-economic gains. From a historical perspective, Bulgarian households show behaviors conditioned on the limited market choice typical of the planned economy before 1989. Today, this strengthens the role of large domestic purchases (refrigerators, washing machines, etc.) not only from the direct economical perspective (concerning the economic status of most households) but insets

emotional value to the purchase related to the limited supply of household goods during the era of the planned economy. These social and psychological aspects of the consumers' choices based on economic and historical background result in several typical use/reuse phenomena.

First is the longer life span of products. Although repair and reuse activities are placed on a higher level in the waste management hierarchy, in the Bulgarian case, they may be related to a lack of financial opportunities for new purchases, unauthorized home-repair leading to malfunctioning appliances, energy ineffectiveness in operation, and even environmental and health risks. Second is alternative use or storage. Bulgarian households used to send old and malfunctioning electronics to villages where their older relatives live. Main parts of old appliances are transported to such places for reuse, specifically in many cases for storage purposes (e.g. non-working refrigerators used as garage cabinets).

4.3.4. Recommendations

Environmental education began to be introduced to South Korea through Westerners in 1970s. The Ministry of Education introduced environmental programs into elementary, middle and high school programs and it was from 1995 (the 6th National Curriculum) that environmental education should be directly or indirectly reflected in all school subjects. In addition, a separate subject called "environmental education" was introduced as an elective in middle schools since then.[39] Thousands of academic research papers on the level of environmental awareness have been conducted in Korea and campaigns have been organized over the years. South Korea has put a great deal of effort into instilling a culture of recycling into everyday life. Having a strong recycling culture can significantly reduce the costs of compliance with recycling. Environmental education in general, and recycling in particular, starts from kindergarten.

Some provincial universities in Korea have an environment education faculty in the department of education. Some prestigious universities in Korea also have graduate programs that have programs on environmental education. When students take turns cleaning the class in public schools, they also have to separate the garbage and throw it into separated trash bags. This and other practices create a strong sense that recycling and separate disposal is the natural thing to do.

Korea has only two cooperatives under the EPR system—one representing WEEE recyclers and the other packaging and container recyclers. Therefore it can deliver coherent and unified information about waste handling to households. Arguably, it

39) Lee D. (2007). "Environmental Education Curriculum". Korea Environmental Education Association, p.147.

is less motivated to present better information services since there is no competition, but having a single organization ensures information is not distorted or lost in the process of delivery. On the other hand, Bulgaria has seven cooperatives for WEEE only. This can cause information to become fragmented and confuse consumers who then become unmotivated to learn about proper recycling.

Another cultural issue preventing efficient waste collection can be the post-Soviet mentality and attachment to used goods. Though it has been about 25 years since Bulgaria's transition to a market economy, it takes time to adjust to the new economic regime. Nevertheless, Bulgaria may emphasize through campaigns and other educational programs for citizens the importance of thinking in terms of a benefit and cost analysis (BCA). Households should compare marginal benefits to marginal costs of keeping old appliances at home as opposed to the perceived benefit, if any, of having broken WEEE at home. If they realize that handing in WEEE to officials would free up space in their houses for other activities, reduce health hazards and even provide financial compensation, which can probably outweigh the (unsafe) reuse and storage value, they might as well start handing in the old and malfunctioning equipment.

For the successful implementation of the above mentioned policy measures, it is imperative that political and economic institutions match some certain criteria. Specifically, a country should be based on the ideals of strong democracy and market economy. The EPR system in general and WEEE management in particular require active support and a sense of ownership of the citizens.

Without a high level of awareness, policies targeting companies and requiring people to willingly hand in WEEE will not work. Upon Bulgaria's accession to the EU, the country adopted various policies signifying a high awareness of the waste management sector. However, Bulgaria still faces challenges in motivating her citizens and ensuring companies comply with the policy. The potential gap in the level of acceptance of the policy between Korea and Bulgaria may lie in the difference of governance of the two countries. Bulgaria generally falls behind South Korea in such categories as control of corruption, rule of law, government effectiveness and regulatory quality (World Bank's Governance Indicator).[40] Therefore, furthering the effectiveness of EPR in Bulgaria should be dependent on the long-term governmental commitment on the improvement in these sectors. This observation is equally applicable to Korea.

40) World Bank (2015). "World Governance Indicators". Retrieved from info.worldbank.org/governance/wgi/index.aspx#reports.

4.4. Economic Incentives-Related

4.4.1. Financial Remuneration and Compensation

Financial stimulation has a direct impact on citizens' motivation to participate in separate collection systems. In the private market and within the system organized by recovery organizations there is a network of waste collection centers available for companies and individuals to bring in their waste for financial compensation. It seems that for most households the financial remuneration for collected WEEE calculated on the basis of pretreatment costs and price of the materials does not represent a sufficient motivation to bring waste in.

The transportation costs and inconvenience are, in most cases, higher than the compensation received for WEEE. The frequency of generating WEEE from large household appliances WEEE is low. Most consumers do not own a suitable personal transport for such appliances, for example, refrigerators, washing machines, etc. and with a financial remuneration varying between 5-10 BGN per item, they do not see a direct added value motivation based solely on financial logic. On the other hand, collection centers are essential for informal sector waste collection, where financial remuneration provides a sufficient financial incentive.

4.4.2. Marketing Instruments

Retailers, in cooperation with recovery organizations, run separate marketing campaigns offering price discounts for new appliances if a consumer hands in the old one. Different marketing instruments, such as discount gift cards on new electronics, are offered to those who turn in large WEEE upon the new purchase. However, people still prefer to use "WEEE" as a second TV, a villa refrigerator, etc. Sometimes, the low purchase power of the population renders the gift card's maximum 5 percent discount on new items virtually useless.

4.4.3. Waste Management Municipal Taxation System

According to Bulgaria's Local Fees and Taxes Act, municipalities have the autonomy in determining the amount of waste management fees paid by households and companies in their territory (Article 66). The designated municipal budget, consisting of the total amount paid to local authorities, covers the expenses of waste management activities operated by the municipalities and additionally includes expenses for street sweeping and seasonal cleaning services.

The waste management fee represents a kind of property tax, calculated on the basis of the fiscal evaluation of a property, depending on location, size or

construction parameters. This method of calculation results in disproportionally high fees being paid by companies as compared to fees paid by consumers. As a general estimation, businesses generate 30 percent of the waste but pay around 70 percent of the fees, while households generate 70 percent of the waste in a particular territory but pay around 30 percent of the total budget.

The absence of a "Pay-As-You-Throw" principle in the calculation of waste management fees leads to decreased motivation for households to actively participate in the separate collection systems. The amount of waste generated and the way it is discarded – using the mixed municipal solid waste collection system or through the provided separate collection systems, operated by recovery organizations – do not relate to the locally paid waste management fee.

4.4.4. Recommendations

Before introducing the current volume-based system, Korea used a property tax-based approach to calculate the waste management fee. Since the 1980s, Korea divided households into six classes based on the size of their apartment, six classes for businesses and a separate criterion for companies producing a large amount of waste due to the nature of their activities. However, this system did not motivate people to reduce waste below the set criteria.

As a result, Korea switched to the present volume-based system nationwide in 1995.[41)] The processing cost of municipal solid waste was KRW 11,220 million, whereas the money received through the sale of volume-based trash bags was KRW 8,869 million. The volume-based trash bags for sale ranged from 3l to 100l while the price ranged from KRW 71 to KRW 2,285 in 2013. As of 2013, the household's share in covering the cost of implementing the volume-based policy was 24.9 percent.[42)] The volume-based system was deemed successful in Korea not only because it contributed to a reduction of waste sent to landfills, but also because it translated in significant economic benefits. From 1995 to 2009, the policy saved KRW10,711,424 million in costs associated with landfills and incineration.[43)]

For the successful implementation of a volume-based system, Bulgaria could reap lessons from Korea's historical experiences not only from an economic but also an administrative perspective. The strategic location of trash containers in Korea motivates compliance with the volume-based system. When a volume-based system

41) Yoo G. and Jeong J. (1995). "Problems with Fixed Waste Fee and Effect of Volume-Based System – with the Focus on Seoul", Korea Environmental Engineering Journal, 17(9), pp.907-912.

42) Ministry of Environment (2014). "Volume-based Waste Management Situation in 2013 Volume-based Waste Management Situation in 2013", pp.13-14.

43) KEI (2011). "Evaluation of the Progress of Volume-Based Waste Management System and Strategies for Improvement", p.69.

was first introduced in Korea in 1995, consumers naturally tried to avoid paying for volume-based bags and threw their trash in containers installed in public places such as parks, parking lots, restaurants, and bus stops.

That motivated the municipalities to reduce the number of street containers from 7,600 to 3,700 in Seoul alone.[44] Today trash bins are rarely found in any public location, which ironically contributes to the cleanliness of Korean streets. High environmental awareness motivates people to take responsibility for their trash and dispose of it at home. That contrasts with the situation in Bulgaria, where most of the curbside containers are located on public street corners [Figure 2-12]. In public containers as such, it is virtually impossible to determine the origin of the waste and who should bear the financial responsibility for its treatment. This could undermine compliance with the volume-based system in the future.

[Figure 2-12] Trash Containers in Sofia, Bulgaria

Source: Ministry of Environment and Water, Bulgaria.

In addition, considering that Bulgaria's current budget for WEEE collection is more limited as compared to Korea, Bulgaria could benefit from contracting-out (or subcontracting). That was the practice that Korea implemented in the late 1990s after the IMF financial crisis. The government had to perform a series of contractionary policies and outsource waste collection to private companies that

44) Seoul (2009). "2008 Environment White Book –Chapter 9 Waste Management". Retrieved from env.seoul.go.kr/archives/4547 on December 7, 2015, p.602.

could perform the same work at a fraction of cost and simultaneously save money on compensation to government officials (Kim and Ko, 2004). Since Bulgaria has a large unofficial collection sector, it could consider transforming the status of some scavengers into official collectors by offering them similar wages but stronger social security.

5. Conclusion

Policy cannot be perfect. What is important is that, based on the past trial and errors and previous experience from other places or countries, we can improve on the performance of a certain policy by implementing better measures. A successful implementation of the proposed suggestions will require strong democratic government based on the market economy. This study stems from the idea that true knowledge sharing can be possible between Bulgaria and Korea regarding the evaluation and potential enhancement of the extended producer responsibility system in both countries. We, the researchers involved in the project, truly hope that the EPR for WEEE in Bulgaria, which has become a critical component of waste management and circular economy policies, can evolve into an effective and efficient policy measure in the near future. Further studies on substituting the current components in EEE with the environmentally friendly ones and enhancing WEEE collection system with the goal to reduce leakage of toxic substances and to improve sustainable WEEE dismantling in Bulgaria are necessary.

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Enhancing Innovation and Accountability

Chapter 3

Building a Strategic Model for Sofia Tech Park's Development: Strategic Issues and Planning Guidelines

Building a Strategic Model for Sofia Tech Park's Development: Strategic Issues and Planning Guidelines*

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Summary

This study is undertaken to assist harnessing the innovation policy of the Bulgarian government, focusing on building a model of Sofia Tech Park's development. Sofia Tech Park and Technology Innovation Network (STP/TIN) is the first to be established in Bulgaria. Since serious bottlenecks are often observed in bringing technology into the business, many countries implement various policy instruments, among which the techpark is considered to be a strategic vehicle to promote technological innovation and nurture technology-based startups. As a best practice of Korea's techparks, we reviewed the management of the Chungnam Techno Park (CTP), and established four functional models of the CTP such as incubation, technology transfer and commercialization, business support service, and its role in regional innovation. Those functions might also have important implications for the management of the incubator in STP/TIN. The STP, as a joint stock company, owns infrastructure in the campus and collects profits from the TIN component, whose activities are financed only through project funding from national and/or EU sources.

Based on a case study of Korea's CTP, we proposed a conceptual model of STP/TIN for incubation. Such a model is expected to provide a balanced idea in its

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management from recruiting entrepreneurs to measuring performance. As STP/TIN has just begun, it seems that a general development plan should be prepared for the medium- and long-term. In so doing, we discussed the process of the planning, in which 3 C's are important, for example, coordination, consensus and commitment. In this line, some issues are highlighted which should be considered in planning. Although the STP/TIN is under the umbrella of Ministry of Economy and Energy (ME), the STP/TIN has to play a major role in coordination across the ministries, particularly the Ministry of Economy and Energy, the Ministry of Education and Science, and the Ministry of Finance, among others. The coordination will be critical because the activities of the STP/TIN include a good deal of horizontal issues. In addition, financial sources are available only through project funding, and therefore the planning capacity of the STP/TIN will be very important.

Finally, we proposed some policy issues at both the STP/TIN and government levels. We pointed out some issues to be considered at the moment for the management of the STP/TIN. The creation of an "STI policy research unit" is strongly recommended, which will then be able to undertake policy studies and strategic planning that the Park requires. On the other hand, the Bulgarian government could implement STI policies to shape a national innovation system and create an STI-friendly environment.

1. Introduction

This study is undertaken as a part of the KSP (Knowledge Sharing Program)[1)] between Korea and Bulgaria. The KSP is supported by the Ministry of Strategy and Finance (MOSF) of Korea, and "… aims to share Korea's development know-how, assisting the partner countries and working towards lessening the knowledge divide." (www.ksp.go.kr/ksp/ksp.jsp). This project would also provide, however, an opportunity to learn from each other and to improve mutual understanding.

The original work request included a number of issues; i) strategic planning and operations, ii) facilities and infrastructure development, iii) business incubation, iv) technology transfer, v) internalization, among others. It was also requested that the following issues be included in the projects; i) capacity building and institutional knowledge transfer, ii) a Sofia Tech Park JSC (STP) education/training program, and iii) on-site consulting for two years.

However, because of the time limitations for the project (seven months) and a request made during the first meeting with STP, the scope of work had to be

1) Abbreviations are listed in the glossary.

narrowed down by focusing on "strategic issues and planning guideline" as a development model of the STP and its Technology Innovation Network (TIN).

The purpose of this study is to provide policy advice to the Bulgarian government in order to assist harnessing innovation policy and developing the STP/TIN project. STP/TIN consists of several key components including a research facility, an incubator, a Science Forum and Science Experimetarium/Museum, etc. In this study, however, we focus on technology incubation given that in general the primary purpose of developing techparks is to foster technology innovation through incubation; which also coincides with the objectives of the STP/TIN project.

This study is organized as follows. Chapter 2 will discuss the theoretical backgrounds of S&T parks, with a focus both on the innovation process and regional innovation systems. In addition, we will summarize the worldwide development of S&T parks and the factors of their successes and failures. In Chapter 3, the Korean experience in developing and managing techparks will be reviewed. The management system of the Chungnam Techno Park, as a best practice in Korea, will be reviewed in detail for benchmarking the STP/TIN. Chapter 4 provides a review of the current state of the Bulgarian innovation system as relevant to the mission and goals of the STP's TIN, and an in-depth profile of the STP/TIN project. The STP/TIN is perceived as a pilot project, with significant expectations placed on it. Its aims, structure, development and functioning model are detailed. An assessment is made by and large based on documents, literature, and interviews with local experts and government officials. In Chapter 5, based on the Korean experience, we attempt to build a model for management of the STP/TIN incubation. We will also discuss guidelines for strategic planning. Finally, concluding remarks and policy suggestions at both the government and STP/TIN level will be made.

2. Theoretical Background and Development of S&T Park

There are many types of techparks around the world. These include the science park, research park, techpark, technopolis and others. There are also government-led, university-led, and business-led parks. However, it is known that the primary purpose of a techpark is to nurture technology startups, to facilitate industrial development, and hence to promote economic growth, among other functions. We review the theoretical concept of the S&T park, and success/failure factors derived from the global experiences with the development of S&T parks.

2.1. Theoretical Concept of S&T Parks

In general, technological innovation is defined as the process through which new and/or improved technologies are developed and brought into practical use. In explaining the process of technological innovation, the models have shifted from the linear, non-linear models to the complex model. This reflects the fact that technological innovation is increasingly complex. The concept of an innovation system has been introduced and enriches the understanding of technological innovation.[2)] The approach of the innovation system mostly focuses on the process of innovation, flow of knowledge, learning, and interaction of the innovation units; such as firms, universities and research institutions.

The conventional model of the innovation system places an emphasis on the interaction of innovation units and flows of knowledge in the given system. Such a model should be developed by looking into the innovation systems of advanced countries. In general, STI (science, technology and innovation) capacity of the innovation unit has been well developed in advanced countries, and thus the main concern should be placed on the dynamism of the innovation system. With greater dynamism of the system, innovation would take place more frequently.

It appears that the critical point of the model lies in that the STI capacity of the innovation unit is already built in at the advanced level. It does not assume that the level of capacity changes over time. As that is the case, what is more important is naturally to focus on investigation of the system which regulates interaction and the knowledge flow between the innovation units. It could be argued, however, that the conceptual framework of the innovation system should include the process of building STI capacity of the innovation unit as well. Knowledge or STI resources might be available in advanced countries, but this is not always so in developing countries.

Therefore, it would be worthwhile to take account of the innovation system as continuity. There would be a developed, developing and/or underdeveloped system of innovation in consideration of whether STI capacity is fully developed (or degraded). Such a view could expand the policy domain of, in particular, the government of the developing country.

The STI capacity of the innovation unit would be determined by the accumulation of R&D (R&D stocks) itself, and the STI capacity of other units. R&D manpower is also an important determinant of STI capacity. Many developing countries suffer from brain drain and hence encounter difficulties in securing R&D manpower. The manufacturing sector (growth and structure) is one of most important areas

2) For more discussion, e.g., refer to Freeman (1987).

where technological innovation takes place, and has a significant influence. The STI environment and others also have an influence on technological innovation in a way that they regulate STI activity.[3)]

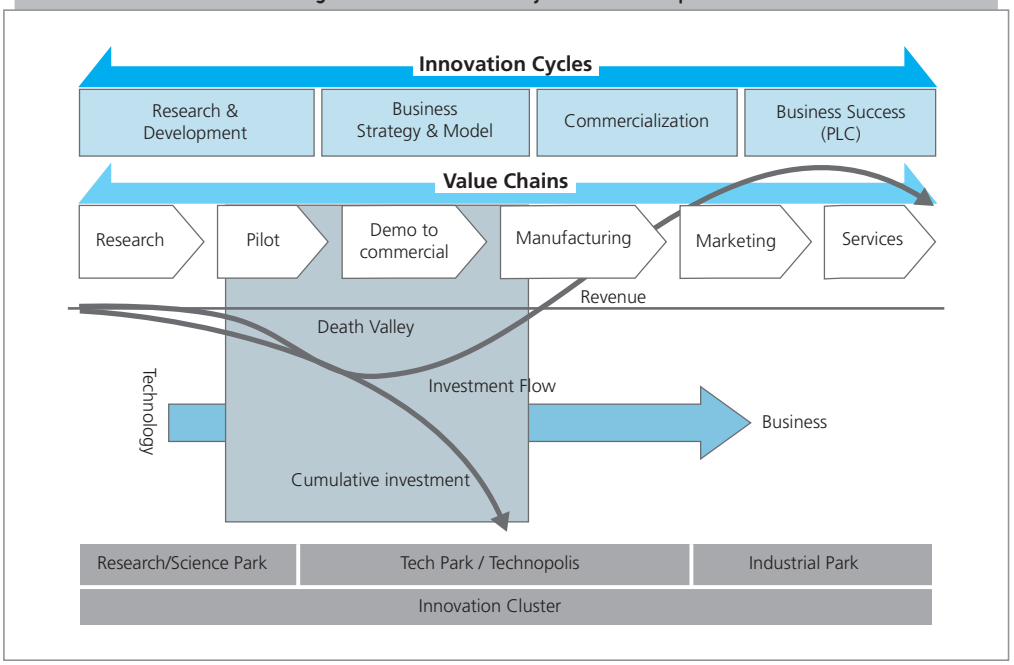
The techpark can be considered as a compressed system of innovation or a part of the innovation system. Usually, the techpark is known to be a knowledge-producing institution and firms are located together, including related organizations. Industry in the park could create and establish its own ecosystem, or link to other ecosystem for a (global) value chain. If the firm in the techpark fails to establish its own ecosystem or link to other value chains, the development strategy (of the nation or region) based on the techpark may not be effective, and therefore the industrial performance of the techpark is critical. However, the knowledge institution in the park would determine the technological competitiveness of the firm. Modern industry is developed mostly based on technological innovation, not simply on investment in conventional factors of production. If an industry is developed based on cheap labor, the industry would not be sustainable because it is very difficult to obtain a competitive edge continuously over time in a globalized world. This is why the role of a knowledge system is important, since it eventually gives rise to the technological competitiveness of the industry.

However, it is not easy to bring knowledge into application for business if the objective of the knowledge institution is different from that of the firm in a system. In most cases, the knowledge sector can hardly foresee economic consequences and/or benefits from the knowledge/technology produced, and thus the primary objective of the knowledge sector is often focused on pursuing scientific excellence, not business creation. In this line, the techpark draws attention to facilitate the fostering of the business of technology.

In view of the innovation cycle and/or value chain as shown in [Figure 1], the firm's activity can be described along the value chain, which consists of the stages of research, pilot development, demo to commercial, manufacturing, marketing, and services. Up to the point of commercialization, a sizable investment saddled with uncertainty would be incurred for a long time period, which is seldom bearable by a single firm, particularly small- and medium-sized enterprises. A firm contemplating an R&D project faces uncertainties from within and from without. The effort required to complete the R&D, the magnitude of the invention obtained and its value are all uncertain at inception. Therefore, the firm tends to reduce investment in R&D. However, after the firm successfully commercializes a new product/service and starts to make an investment in manufacturing, the firm will be able to earn revenues.

3) For more critical discussion about the innovation system, refer to T. Shin (2012).

[Figure 3-1] Innovation Cycles and Techpark



It is known that there exists a Death Valley when technology is brought into the business. In other words, the firm cannot afford to invest over the full cycle of innovation until commercialization is realized. The grey area in [Figure 3-1] denotes the Death Valley over the process of the innovation cycle. Without government intervention, the private firm may not be able to bridge this gap on its own.

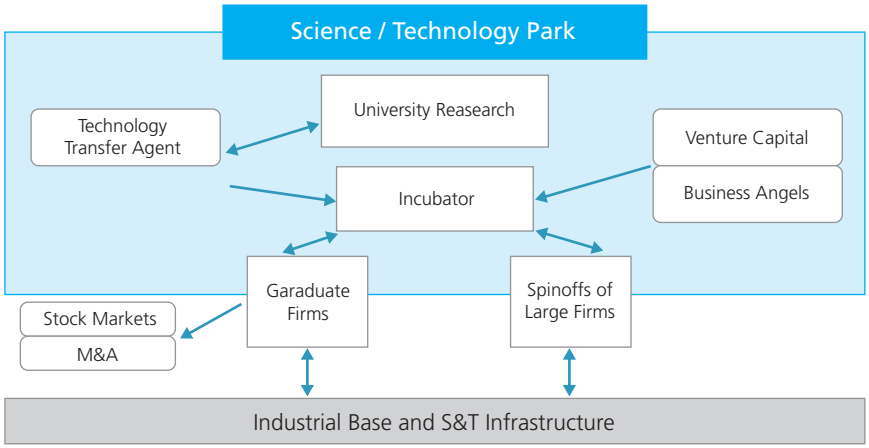
Bridging over the Death Valley, the government usually implements various innovation policies. As a strategic tool, recently the so-called techpark is often introduced for such a purpose. Using the illustration of [Figure 3-1], the park could be characterized as the science/research park, techpark, and industrial park, if we move from the left-hand side to the right. In either case, the park is developed towards the innovation cluster in the long run, embracing the entire innovation cycle, which places innovation units, related institutions and technology-based businesses. If the government places an emphasis on development of the knowledge system relatively, the science/research park would be developed at the start.[4)]

It can be said that the techpark could be an effective scheme to bring technology to business. However, conditions and environment are important. That is, the knowledge system has to be sufficiently developed to provide technological

4) A typical case was shown in Korea, in which the government established a physical complex for various research institutions at the beginning of industrialization. It had been a driving force to develop the knowledge system of Korea, and now is being reshaped to develop an innovation cluster.

opportunities, and also the industrial ecosystem for a value chain has to be innovation-friendly. Knowledge could be transferred from the knowledge hub in the region and/or from international hubs. Creating an industrial ecosystem implies whether the domestic firm could secure a share of the market. Otherwise, the economic consequences of the techpark would be limited.

[Figure 3-2] Techpark and Regional Innovation System



Source: Revised from OECD (1997).

In a system approach, the techpark could be also explained with the framework of the regional/national innovation system, in which its primary function is the incubation of technology startups. A schematic presentation is shown in [Figure 3-2]. In most advanced countries, techparks include universities, incubators, innovation-related institutions and others in a place. The techpark as an incubating facility plays a critical role in the development of the local/regional economy. The entrepreneur with a business idea might be incubated in the techpark based on screening and evaluating his/her business plan. In the techpark, the tenant firm can be assisted by various support programs, such as business strategy, technological development, financing, marketing and others. During incubation, if the tenant firm meets the exit criterion, it will graduate and move into the regional industrial base. Or it could be purchased by a large firm through the M&Amarket. Successful startups may be also able to register in the stock market. In such ways, the entrepreneur and/or investors such as business angels and venture capital can earn returns on their investment. On the other hand, successful startups may grow up and facilitate economic growth in the region.

In this line, recently in many developing countries the techpark is taken into consideration as a strategic vehicle (or a hub) to stimulate not only industrial innovation, but also development of the knowledge system in the long run. If such a hub is successfully developed, it would facilitate the regional and/or national economy eventually moving towards a knowledge-based economy, and hence secure economic sustainability. However, it can be said that the performance of techpark would be highly dependent on the STI environment, which regulates technological innovation. There are a number of factors influencing the STI environment; these include STI capacity of the innovation unit, framework condition, entrepreneurship, and cultural background, etc.

2.2. Development of S&T Park: Some Cases

As an example of an S&T park, Silicon Valley in California pioneered the concept of an innovation cluster beginning in the early 1950s. Tsukuba Science City in Japan was developed in the late 1960s; in 1970s, Sophia Antipolis in France and Daedeok Science Town in Korea. In the following, we briefly discuss these cases.

Silicon Valley was born out of a combination of several contributing factors, such as university research, entrepreneurship, venture capital and others. The leadership of Stanford University was especially important in the early development. During the 1940s and 1950s, it is known that Professor Frederick Terman encouraged faculty and graduates to start their own business. He deserves credit for nurturing the creation of such companies as Hewlett-Packard, Varian Associates, and other high-tech firms, until so-called Silicon Valley grew up around the Stanford campus. Professor Terman is often considered to be "the father of Silicon Valley." His insight, dedication and leadership were critical to initiate the Valley as an innovation cluster. In addition, other factors played an important role Silicon Valley's success, such as R&D, entrepreneurship, venture capital/angels, and a business-friendly environment.

Tsukuba Science City represents one of the world's largest coordinated attempts to develop the knowledge institutions intensively. The University of Tsukuba and 46 public basic scientific research laboratories began in the 1970s. By 2000, 60 national research institutes and two universities had been grouped into the zones of: higher education and training, construction research, physical science and engineering research, biological and agricultural research, and common (public) facilities. Those zones are surrounded by more than 240 private research organizations. However, it is pointed out that Tsukuba Science City is not successful in fostering development of technology-based businesses due to a lack of linkage between the research institution and industry.

Sophia Antipolis is a technology park in France which was created and built

from 1970– to 1984. The park accommodates primarily business enterprises in the fields of computing, electronics, pharmacology and biotechnology. Several learning institutions are also located in the park area, along with the European headquarters of W3C (World Wide Web Consortium) and the European Telecommunications Standards Institute. To promote interaction between tenants, networking and cross fertilization of ideas, the basic concept was "bringing together people and making them meet," which would bring added value and generate innovation. Many professional clubs began to launch, such as the Sophia Business Angels Club, the Sophia Nordic Link, Art Sophia, and Telecom Valley, etc. Senator Pierre Laffitte is known as the founder of Sophia Antipolis, whose insight and dedication underpin the park's creation (www.sophia-antipolis.org/index.php/s ophia-antipolis/le-parc).

Daedeok Science Town is the R&D district in Daejeon, developed by the Korean government since 1973. Daedeok Innopolis grew up out of the R&D sector. Major research institutes in the public and private sector make up this science cluster. In the course of Korea's economic development, it played a critical role in building up R&D capacity and brought major innovations in the late 1980s and early 1990s. Further investment is being made to reshape the Daedeok Science Town into an innovation cluster.

Since the 1980s, S&T park development has been actively pursued in Asia, Africa, Europe and Latin America, among other regions. The principal purpose of S&T park development is to promote economic development as the world moves into a knowledge-based economy. S&T park development and achievement are influenced by various factors. We observe that some are successful; some are not.

Main factors for successful development are:

- Dedication and leadership of participants from universities and business (or government)
- Interaction between research organizations and industries in developing new technology-based business
- Sustained government policy creating an STI-friendly environment including infrastructure and human resources
- Developed NIS/RIS: increased STI inputs and outputs
- Cultural/social backgrounds nurturing entrepreneurship

Some factors are often pointed out when successful achievement is not exhibited:

- Strong dependence on government support which is inconsistent
- Lack of innovation culture and resources; particularly entrepreneurship
- Lack of network of innovation units between universities, business and government
- Low STI capacity
- Underdeveloped industrial eco-system

3. Korean Experiences: S&T Parks

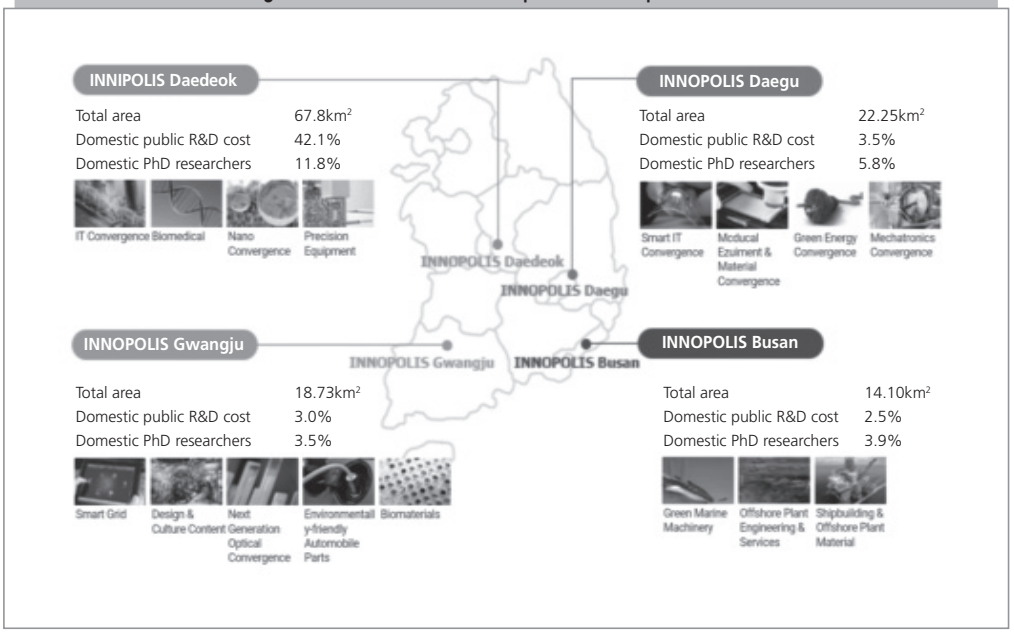
In this section, we will review techparks in Korea. There are two types of parks; the research park and techno-park. The research park is now under remodeling towards an innovation cluster, while the techno-park is the main facility for incubating technology startups. We also review the management of Chungnam Techno Park (CTP) as a best practice for a benchmarking to STP/TIN.

3.1. Overview of S&T Parks

3.1.1. R&D Special Zones: Innopolis

The R&D Special Zones are also called "Innopolis". Innopolis is now under the umbrella of MSIP (Ministry of Science, ICT, and Future Planning). There are four R&D Special Zones in Korea including Daedeok, Gwangju, Daegu and Busan. R&D Special Zones in Gwangju, Daegu and Busan were created in a different way from Daedeok. Daedeok R&D Special Zone has developed based on the platform of Daedeok Science Town which was established in the 1970s. Meanwhile, the others do not have such a platform, and therefore the R&D capacity of other zones falls behind to a large extent.

[Figure 3-3] Overview of Innopolis (R&D Special Zones)



Source: www.innopolis.or.kr/eng_sub0201.

The R&D Special Zone in Daedeok includes 25 GRIs and 35 corporate research institutes. More than 11.8 percent of Korean researchers with a Ph.D. degree in the fields of science and engineering work in Daedeok. The R&D Special Zone in Daedeok has been managed by "Daedeok Innopolis" since 2005. Daedeok Innopolis and its partner institutions supported technology transfer of more than 900 cases so far between domestic/global stakeholders; 31 of the startups are registered on KOSDAQ—technology stock market. On the other hand, the number of internationally registered patents exceeds 10,000.

Other R&D Special Zones are recently established:

- Gwangju was designated as an R&D Special Zone (Gwangju Innopolis) by the Korean Government in January 2011. Gwangju Innopolis focuses on the fields of next generation photonics, smart grids, green cars with eco-components and materials, and design/culture technology.
- Innopolis Daegu specializes in the fields of smart IT, green energy, mechatronics and medical science, etc.
- Innopolis Busan was designated in November 2012 in order to promote the Busan area as an R&D hub for the offshore plant industry and a business center.

The R&D Special Zone, just like the techno-park, aims to grow towards an innovation cluster by fostering development of technology-based startups. This approach is pursued by the Ministry of Science, ICT and Future Planning (MSIP). It can be said that the R&D Special Zone is developed in a science-push approach (starting from S&T policy) while the techno-park is developed in a demand-pull approach (started from industrial policy). However, they are in the same domain in terms of policy, but pursued by different policy-making units.

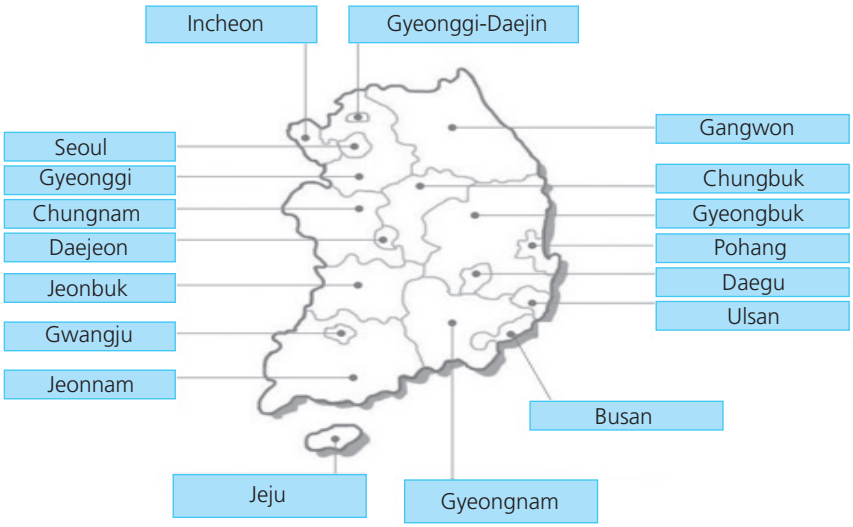
3.1.2. Techno-park

The "techno-park" refers to an industrial and technological complex in Korea where STI resources such as human and technological resources, etc., are gathered in a single place. It also denotes a co-location of land, buildings and facilities that are provided by businesses, universities, research labs, and local/central governments

As the Ministry of Industry changed its policy direction from conventional industrial policy towards industrial technology development from the early 1990s, it began to build techno-parks across the country, starting with establishing technological infrastructure to support businesses. The techno-park focuses on development of S&T-based firms by building networks of local businesses, universities, research institution and governments. As of 2015, 18 techno-parks in 16 cities/provinces take the initiative in the development of local industries.[5)]

5) eng.technopark.kr/eng/technopark/about.php?pn=1andsn=1.

[Figure 3-4] Location of Techno-Parks in Korea



Source: www.ctp.or.kr/.

〈Table 3-1〉 Establishment of Techno-Parks

No.	Names	Year	Location	Specialization Areas	Homepages
1	Chungnam TP	1995	Cheonan-si	Automotive, electronics, bio, display, information and video	www.ctp.or.kr/
2	Gyeonggi TP	1997	Ansan-si	ICT, automotive, robotics, bio-tech	www.gtp.or.kr/
3	Gwangju TP	1997	Gwangju-si	Automotive, bio-materials, electronics, robotics, 3D	www.gjtp.or.kr/
4	Daegu TP	1998	Daegu-si	Nano, mobile, bio-health, Korean medicine	www.ttp.org/dtp/DtpMain.dtp
5	Pohang TP	1999	Pohang-si	Metal,energyparts/materials, bio, S/W	www.pohangtp.org/
6	Gyeongnam TP	2000	Changwon-si	Intelligent machinery, material/parts, aero-space, ship-building, ICT	www,gntp.or.kr/
7	Gangwon TP	2002	Chuncheon-si	New materials, ceramics, energy, bio	www.gwtp.or.kr/
8	Daejeon TP	2002	Daejeon	IT, bio, nano	www.daejeontp.or.kr/index.php
9	Chungbuk TP	2003	Cheongju-si	Bio, solar energy, electronics, machinery, semi-conductor	www.cbtp.or.kr/

〈Table 3-1〉 continued

No.	Names	Year	Location	Specialization Areas	Homepages
10	Jeonnam TP	2003	Suncheon-si	New materials, ceramics, laser, polymer	www.jntp.or.kr/
11	Ulsan TP	2003	Ulsan-si	Chemical, auto parts	www.utp.or.kr/
12	Seoul TP	2004	Seoul	Microsystem packaging, next generation packaging,	www.seoultp.or.kr/
13	Gyeongbuk TP	2006	Gyeongsan-si	Digital parts, energy, fabrication,bio, mobile	www.ktp.or.kr/
14	Jeonbuk TP	2007	Jeonju-si	Automotive, machinery, green energy, foods, new materials	www.jbtp.or.kr/
15	Incheon TP	2010	Incheon-si	Auto parts, nano-materials, bio-industry	www.itp.or.kr/
16	Busan TP	2010	Busan-si	Intelligent machinery, precision parts, die-casting/furnace, digital contents, bio-health,	www.btp.or.kr/
17	Jeju TP	2011	Jeju-si	bio-convergence, marine bio	www.jejutp.or.kr/index.htm
18	Gyeonggi-Daejin TP	2014	Pocheon-si	Environment	gdtp.or.kr/index.php

Source: based on homepage of the respective techno-park.

The function of the techno-park includes strategic/policy planning, developing technology-based SMEs and local networks, among others. The strategic/policy planning focuses on making strategy and policy for regional industrial development and supporting business strategy formulation for the local firms. Meanwhile, in order to develop technology-based SMEs, the techno-park is building infrastructure and a business-friendly environment to efficiently bring about technological innovation. It also implements various support programs for technology transfer and commercialization. To support business activities of tenant SMEs, the techno-park facilitates experimentation, testing, and production equipment/facilities, which can be rented at lower costs. In addition, the techno-park also provides services for management consulting and domestic/overseas marketing; and human resource development is another objective pursued by the techno-park. It networks related institutions in the region, which would lead to public-private partnership for technological innovation. Networking also facilitates exchanges between innovation units in the region.

The mission and goal of the techno-park in Korea is primarily regional economic development, making use of the techno-park as a regional innovation hub. Sizable investment has been made to build 18 techno-parks across the country. For

development and support of the techno-park, the government enacted a special law, "Act on Special Cases Concerning Support of Techno-parks." (See Appendix). It has been about 15 years since the first techno-park was established. Only a few of them are considered to exhibit good practices.

3.2. A Case Study: Chungnam Techno Park

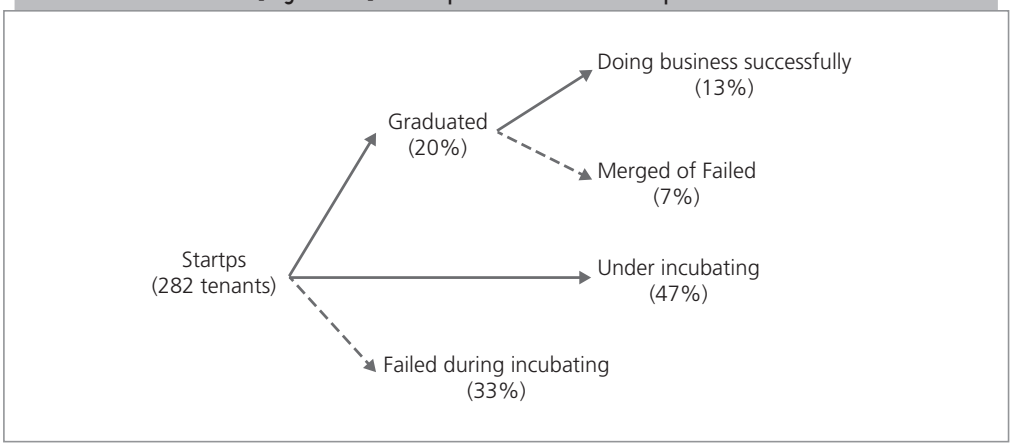
3.2.1. Overview and Development of Chungnam Techno Park

3.2.1.1. Overview of CTP's Activities

Chungnam Techno Park (CTP) is located in the middle of South Korea. It was established in 1997 and today is known as a best practice of Korea's techno-parks. The CTP is an organization that develops technology-based business and also that brings R&D results into business by creating an R&BD eco-system, and hence make a contribution to the regional economic development of the province of Chungnam.

In the region, there are global enterprises such as Hyundai Motors and Samsung Electronics. There are also 36 colleges/universities, and 623 public and corporate research institutes. With such a favorable environment, the CTP plays a role as a regional innovation platform.

[Figure 3-5] Development Paths of Startups in CTP



Source: H.M. Kim (2015).

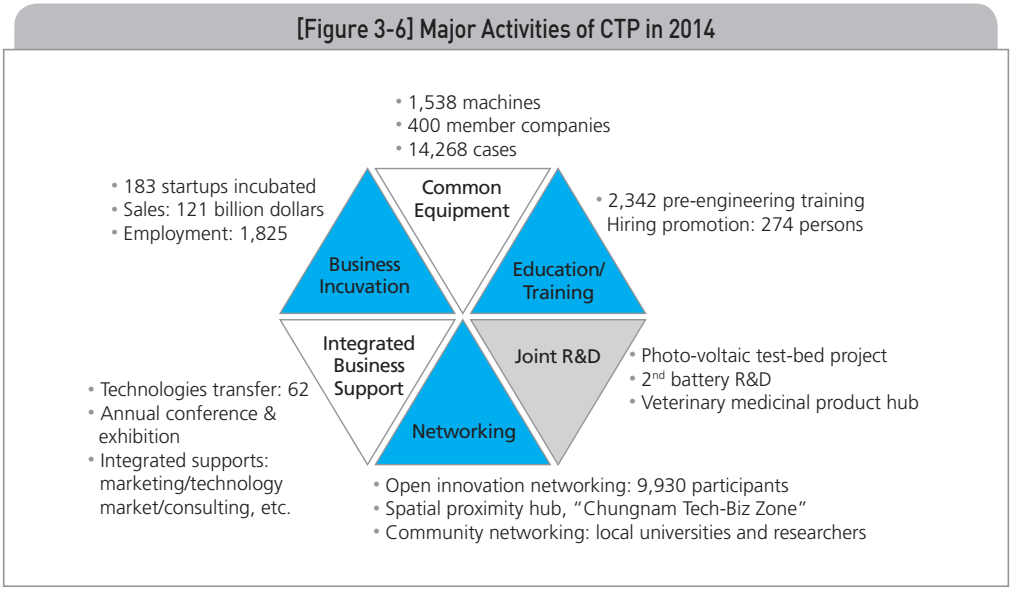
The CTP has graduated about 600 startups in the last 15 years. It is estimated that about 100 graduate firms successfully registered on the Korean stock market. (Interview with CTP staff). This is a remarkable performance when taking into consideration that technology business incubation has to overcome a number of

difficulties. For example, during the period 2000– to 2009, the total number of tenant startups was 282. Out of these, 33 percent failed during the incubation process, while 20 percent graduated successfully, as shown in [Figure 3-5].[6)]

In 2014, 183 startups were under incubation whose sales amounted to US$121 million and employed 1,825 people. For business incubation, the startup is selected usually on the basis of financial status and technological potential. The CTP runs a technology database of technologies to be transferred and technology-owners. For the dissemination of technological and business information, various conferences and exhibitions are held annually, where SMEs and technology-owners can contact each other. On the other hand, integrated business support is provided along the stages of the value chain[7)], for example, from business model development to marketing and services

CTP brings together universities, research institutes and startups/other enterprises. In 2014, 9,930 innovation units participated in the CTP innovation network. One of most powerful methods to link the innovation units, for example, linking SMEs to universities and/or research institutes (R&D) used at CTP is joint R&D. To this end, CTP creates consortia of enterprises, universities and research institutes. After their creation, the consortia submit research proposals to the central/local government research fund.

[Figure 3-6] Major Activities of CTP in 2014



Source: H.M. Kim (2015).

6) This is actually a remarkably successful performance as compared to a less than 10 percent success rate of venture businesses across the country.

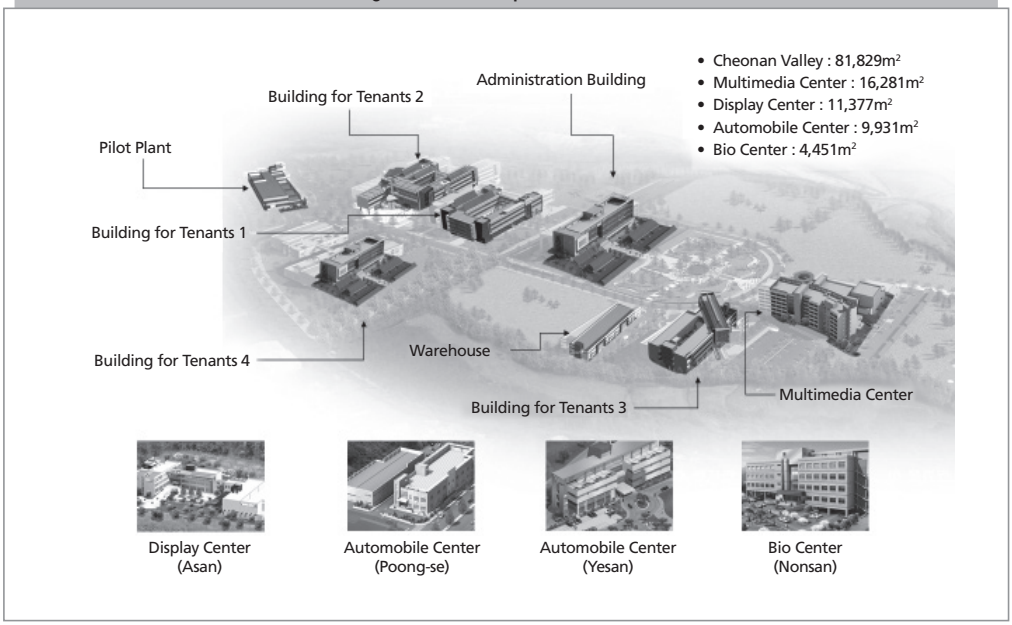
7) See [Figure 3-6].

For example, some joint R&D projects are undertaken in the areas of photo-voltaics, the secondary battery cell and veterinary medicinal products. In addition, education and training programs provided opportunities for employing 274 persons in 2014 and training pre-engineering 2,342 persons in 2014. CTP installs 1,538 machines, and 400 member companies consumed 14,268 rental cases of equipment services in 2014.

3.2.1.2. CTP's Development

When the CTP was established in 1995 as a pilot project of Korea's techno-park, the idea was initiated by professors in local universities. It then drew the attention of the local government, which eventually decided to actively support the development of the techno-park. The joint efforts of university professors and local government played an important role for implementation of the initial idea. The CTP was able to begin to invite startups after a land grant of 18.5 hectares was made by the local government. Meanwhile, 11 professors from various universities were invited to convene a research team for the master plan of CTP. The project manager was Professor Hwang Hee-Yung, who used to be a professor at Seoul National University and transferred to a local university for the development of CTP. His dedication and leadership played a critical role in the CTP's development.

[Figure 3-7] Campus Plan of CTP

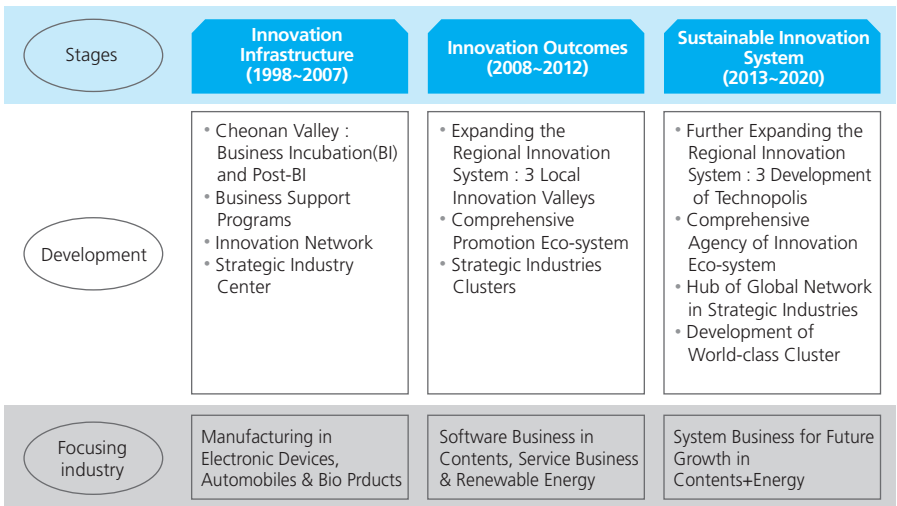


Source: www.ctp.or.kr/.

The master plan for CTP included the role of the CTP with regard to the regional industrial development based on analysis of region-specific industry, creation of regional innovation network, and roadmaps for long-term development of CTP, etc. The master plan underpinned the development of CTP for more than 10 years.

From the start, the CTP made roadmaps for the long-term development, which indicated "what to do, in which direction" over time. In the first stage from 1999– to 2007, in the course of development the creation of an innovation infrastructure was envisaged in the region. This included business incubation facilities/programs, and business support programs. In the second stage from 2008– to 2012, the CTP started to produce innovation outcomes in the areas of the regional strategic industries such as automotive, displays, media contents, and agro-biotechnology. Three innovation clusters were developed in the region; Valleys of Cheonan City, Asan City, and Yesan County. In the third stage from 2012– through to 2020, attention is being paid to sustainable growth of the CTP. Three valleys had to develop towards "Technolopolis" as an urban area including technology and residence for sustainable development of CTP.

[Figure 3-8] Roadmaps of CTP Development



Source: Revised from H.M. Kim (2015).

The CTP is the model of a network-based techno-park in Korea. SMEs are supported by the techno-park in cooperation and collaboration with the central/local government, universities and research institutes. The regional innovation network includes 17 universities in the region, of which experts had actively participated

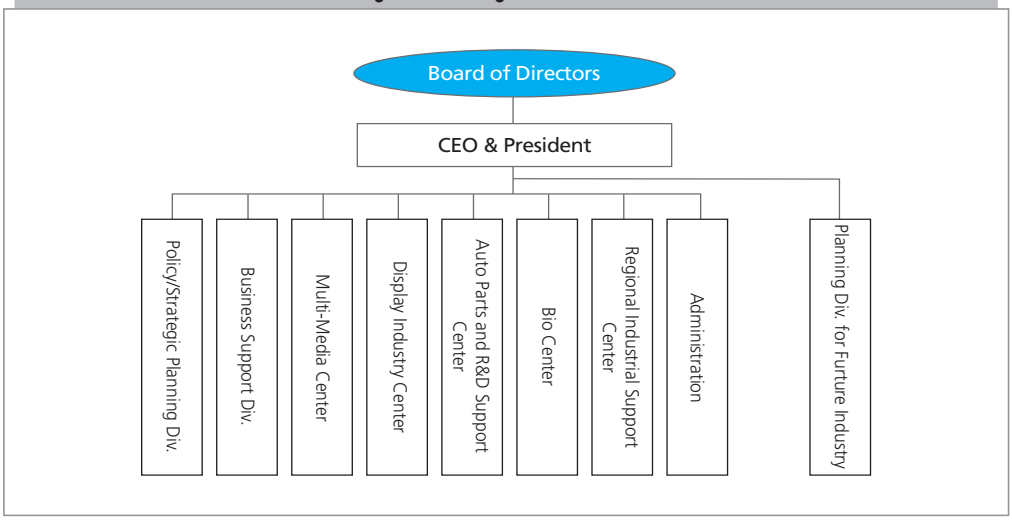
from the beginning. The total investment for the first ten years amounted to about US$200 million from the various sources such as central/local government, universities, industry, and others.

The goals of the CTP are to be; i) hub of business, logistics, and marine industry, ii) hub of culture and tourism, iii) hub of environment and agriculture, and iv) hub of high-quality life and welfare. That is, the CTP aims to play a role as an innovation intermediary in promoting business development through cooperation between universities and industries, and hence promoting the regional economy.

3.2.2. Organization and Main Business

In general, the organization of an institution clearly represents its roles and major activities. The CTP has two Divisions and five Centers; Policy/Strategic Planning Division, Business Support Division, Multi-media/Display/Auto Parts/Bio Centers, and Regional Industry Support Center. The Divisions are related to strategy formulation and management, while the Centers have the research and production equipment/facilities. The units function as follows.

[Figure 3-9] Organization of CTP



Source: www.ctp.or.kr/.

The Policy/Strategic Planning and Business Support divisions play an important role in social sciences approach to "what to do" and "how to do" with regard to the mission of CTP. The Planning Division for Future Industry is a special unit, but similar to the Policy/Strategic Planning Division. The Division's mandate is to build up a cooperative system between industry and universities, and to envision prospective

industries in the region, and also to foster strategic industries through R&D support for local industries such as the electronics/information and auto parts industry. It is also the core capacity in planning and evaluating the development of Chungnam's local industries, and builds an industry-university network. Meanwhile, the Business Support Division promotes exchanges between industry and universities to develop technology-based businesses, and provides various services such as management counselling, marketing, technology transfer, finance, and others.

There are four centers for technology business incubation (TBI). The Multi-Media Center is a foothold established for fostering the contemporary culture industry. The Center activates networks between the community's innovative actors. On the other hand, it provides technological assistance with equipment and nurtures specialized manpower in order to support developing technology for high-tech digital content. The Display Industry Center specializes in supporting the display industry, and manages R&D for display parts, materials and equipment technology. It builds a display R&D cluster by undertaking various kinds of support through R&D not only for tenant firms, but also for other related firms and organizations R&Dby operating a precision measuring lab, a reliability evaluation lab, an optic feature evaluation lab, and environmental authentication room.

〈Table 3-2〉 Main Businesses by Units

Units	Main Businesses
Policy/ Strategic Planning	(1) Policy research, • Establishing a local industry promotion plan and building up a local innovation system in Chungnam • Establishment of a mid-and long-term development strategy industries, and making proposals for their integration • Introduction of updated technology and building up a cooperative system with overseas research institutes through international exchange • Survey for local industry distribution regarding their innovative capacities and R&D resources, and building up a DB (2) Business evaluation, • Planning, selection, confirming and evaluation of the specialized technological development tasks pertaining to the strategic industries • Completing an industrial technology map relating to local strategic industries, cultivating and planning mid- and long-term R&D • Building up a system for engagement between industry production fields and R&D fields related to community strategic industries • Building up a network centered on mainstream community technology innovation • Survey and analysis of the status of community strategic industries and their integration rate, and innovative resources (3) Supporting technology development projects in strategic industries in Chungnam Province, • Development projects for technology-leading industrial community • Development and planning technologies for community strategic industries • Developing a technology project consisting local industries • Technology development project for fostering a local platform

〈Table 3-2〉 continued

Units	Main Businesses
Business Support Division	(1) Nurturing startup companies • To attract and nurture SMEs, and venture companies that have promising new technologies: technology and management consulting, customized coupons, business matchmaking, training, etc. • Matchmaking the support programs provided by companies in "Cheonan Valley" with university incubation centers • Contests between student business incubation clubs: Promoting business incubation that employs new technology and ideas (2) Supporting technology commercialization and R&D • Undertaking technology business incubation projects for start-up companies that have promising new technology • Performing &D using the technology infrastructure, solving technical difficulties • Performing R&D to improve existing technologies, providing R&D package expenses for government technology development • Supporting regional innovation centers in Chungcheongnam-do(Chungnam) and promoting exchange between them, and the use of the technology infrastructure (3) Supporting business • Matching financial funds and capital with client companies • Managing a contact center and providing comprehensive consulting services in which experts pay site visits to solve problems, including recommending government support, capital, human resources, and equipment to client companies • Supporting global marketing; investigating overseas market trends for promising small-sized and medium-sized companies and venture companies, and finding new trading partners. • Procuring machining equipment / facilities such as high-speed machine tools and assemblies, and helping companies to utilize them • To operate Chungnam Technology Transfer Center; performing technology consulting, development, evaluation, and marketing • To promote Chungnam's Regional Industries (RIS); supporting commercialization and marketing in fields such as the senior-friendly industry, the ginseng and herb-industry, and the automobile parts industry • Nurturing human resources suitable for regional businesses and providing funds for technology development
Multi-Media Center	(1) Supporting starting up, incubating new films, and helping their businesses • Manage the Chungnam digital content festival • Manage the Chungnam digital content investment competition • Supporting business of model cases of new films (2) Education and training • Education to enhance the technological capabilities of existing employees • Nurturing technical manpower to be customized by enterprises • Conduct technology seminars and academic debates (3) Consulting and technical support for digital content • Providing consulting and technology to medium and small sized enterprises • Support for co-development of technology by industry and universities • Support for both domestic and international marketing(including public promotion) and cultivating new markets • Fund support in business and technology development (4) Support for the use of public equipment and facilities • Support for manufacturing digital content and using laboratory equipment

〈Table 3-2〉 continued

Units	Main Businesses
	• Survey the demand for public use multi-media • Opening conference halls, seminar rooms and lecture rooms (5) Networking between industry and universities • Operating the Chungnam contemporary culture industry cooperation team • Operating a specialist DB for the contemporary culture industry • Operating a specialist forum composed of industry and universities
Display Industry Center	• Support for test production (localization of core parts) and for equipment utilizing technology • Fostering and supporting enterprises and nurturing specialists in display • Build up a cluster through networking between industries, universities and research centers
Auto Parts R&D Support Center	• Providing R&D space for automobile parts manufacturing enterprises • Support for equipment for developing advanced technology and securing reliable long-life components/products; available for high-tech development equipment, virtual simulation, vehicle network, simulation, HALT, complex vibration testers, etc. • Build up a cluster through networking between industry universities and researchers; guest engineering systems, nurturing team
Bio Center	• Joint operation of new regionally specified program, pioneer and wide-link program and non-R&D projects with industry-university-research institute-government. • Establishing a hub for livestock medication • Supporting green bio-technology development • Fostering spa and anti-aging convergence life-care industry. • Business planning for inland high-tech industry zone
Regional Industrial Support Center	(1) Electronics and IT equipment industry • Support for build-up of a technological platform for shaping the cluster • Developing a strategy for fostering the localization of part materials and equipment, and enterprise support services (2) Contemporary culture industry • Building a platform for manufacturing ubiquitous digital content • Planning and evaluation of enterprise R&D pertaining to the contemporary culture industry
Training Center	• Nurturing specialized manpower for securing the competitiveness of local industry • Development of human resources at every level of the organization • Mitigating youth unemployment through education in specialized fields of the local platform industries • Support employment through vocational training in specialized fields engaging with local industry • Building up a network for human resources development in local industry • Establishment of a future-oriented human resource development strategy in close cooperation with industry, universities, and relevant organizations • Education courses – Techno-CEO – Project-managing staff in local area – Middle manager capacity enhancing course – Enhancement of foreign language ability – Employee's job improvement (accounting, personnel, general administration) – Community employment and developing human resources • Technology training projects for science and engineering major applicants

Source: www.ctp.or.kr.

The Auto Parts R&D Support Center is supporting the R&D activities of auto parts manufacturing companies, and provides auto parts-related companies. The Bio Center supports and fosters bio companies through supporting commercialization, such as formulating R&D projects for technological development, marketing, prototype production and others in the area of agriculture and livestock. The CTP also manages other organizations such as the Regional Industrial Support Center and Training Center (See <Table 3-2>).

3.3. Functional Models of CTP

Broadly speaking, there are four major functions of the CTP, including technology incubation, technology transfer and commercialization, business support programs, and being the innovation hub of the regional innovation system. Below we discuss those CTP functions in detail.

3.3.1. Technology Business Incubation

Business incubation is considered a tool to meet the various needs of the region/nation, such as job creation, fostering an entrepreneurial climate in the community, technology commercialization, identifying potential (spin-in or spin-out) business opportunities, business promotion, development of local industry clusters, and/or community revitalization.

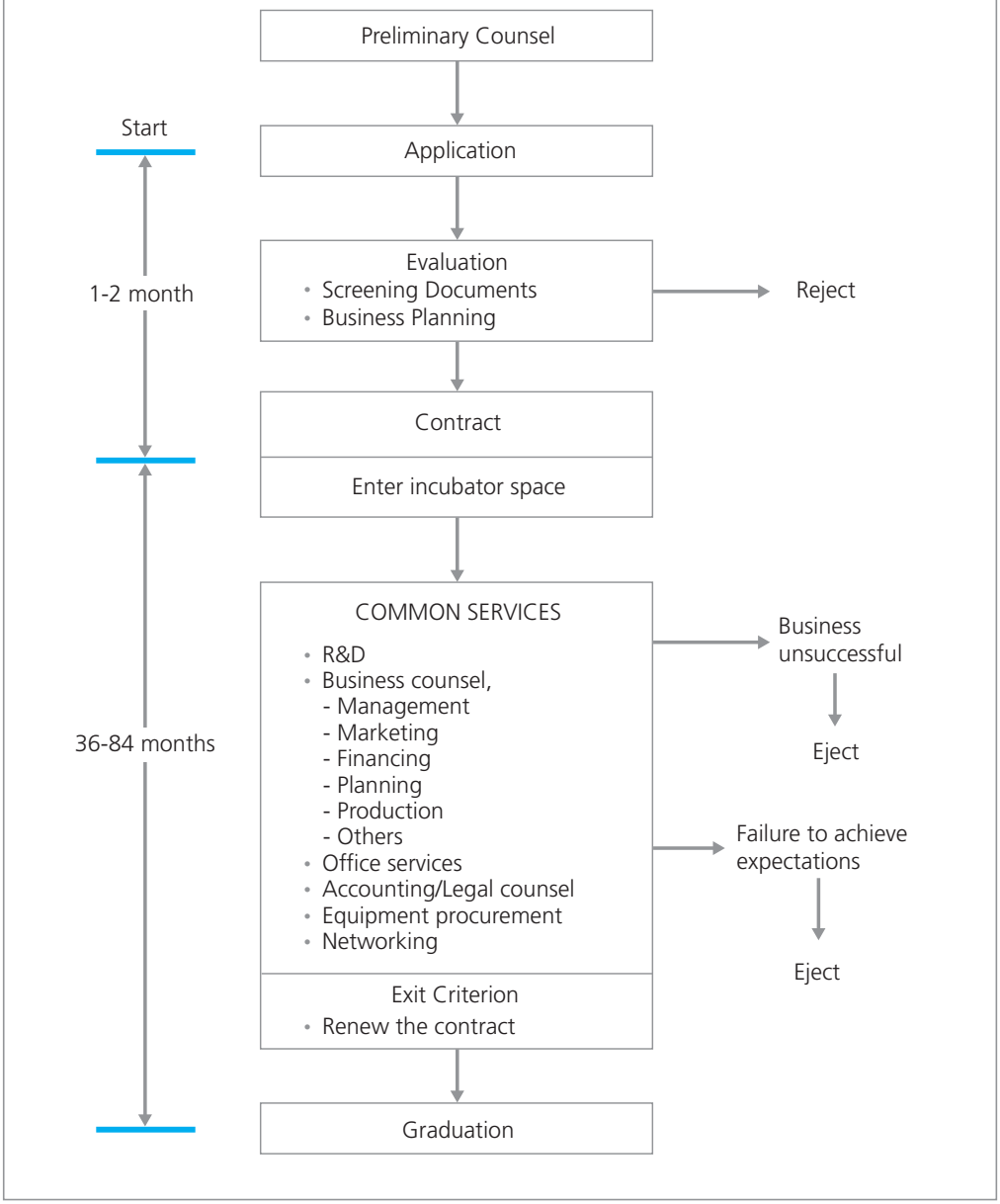
Potential tenant firms which want to join a business incubation program must apply for admission. Criteria of acceptance vary from program to program, but in general only those with viable business ideas and a workable business plan are admitted.[8] The amount of time a company spends in an incubation program would vary widely depending on a number of factors, including the type of business and the entrepreneur's capacity/expertise. For example, life science bears long R&D cycles and the firm in this field requires more time in the incubation program relative to other manufacturing companies that can immediately produce and bring a product to market.

The CTP invites tenant startups on a contractual base. Once the tenant firm moves into the incubation facility, it is allowed to stay for three years, and then an additional two-year contract is renewable twice. Therefore, the tenant firm may stay in the incubation facility for up to 84 months. The incubation program imposes graduation requirements, such as the company's sales/revenues or the number of employers, rather than duration. During the tenant firm's stay in the incubator, the CTP provides various equipment and business support programs, such as R&D,

8) Occasionally incubation provides consulting services for business planning before the applicant firm is admitted.

business counselling, office services, networking, and others.

[Figure 3-10] Incubation Process: CTP



Source: Drawn using UNESCO (2006), p.62.

〈Table 3-3〉 Progression of Services Needed

Pre-incubation	In-wall incubation	Out-wall incubation	Post-incubation
• Hot desks • Business-plan assistance • Validation of entrepreneur potential	• Counsel and training • Facilitation and networking • Workspace and shared facilities	• Mentoring • Prestigious address • Preferred access to seminars, publications, etc.	• Consulting links to incubator and clients • Reciprocal support as alumni

Source: UNESCO (2006).

During the incubation phase, if the company does not achieve a significantly successful financial state, the tenant firm would be ejected from the facility. In addition, if the tenant firm does not meet the criteria given by the CTP, it would be also ejected from the incubation program. After successful incubation, the tenant firm is graduated from the facility. The graduate firm would make its own production site and/or move into the industrial base in the region. It could also be sold to a large firm through the M&A market, by which the entrepreneur and/or investors will exit with returns. Either way, such a successful incubation will eventually contribute to job creation and value-added production in the region.

As shown in <Table 3-3>, additional services can be provided according to the incubation progression such as pre-incubation, in-wall incubation, out-wall incubation and post-incubation. This is an illustration which can be modified to the situation facing the techno-park.

3.3.2. Technology Transfer and Commercialization

Simply speaking, technology transfer endorses over the IPR of a specific technology for commercialization. The difficulty lies in that the firm does not know who has suitable/promising technology, while the owner institution of the IPR cannot find his/her customer firm. [Figure 3-11] shows the process of technology transfer. This includes R&D, technology value assessment, technology marketing, technology transfer, and commercialization and post-contract management.

At the R&D stage, the patent assets will be inspected and an analysis of the patent maps will demonstrate the potential of the patent. Based on the inspection and patent analysis, a technology value can be assessed. Then, there will be two ways to make the technology transfer—joint R&D and technology marketing.

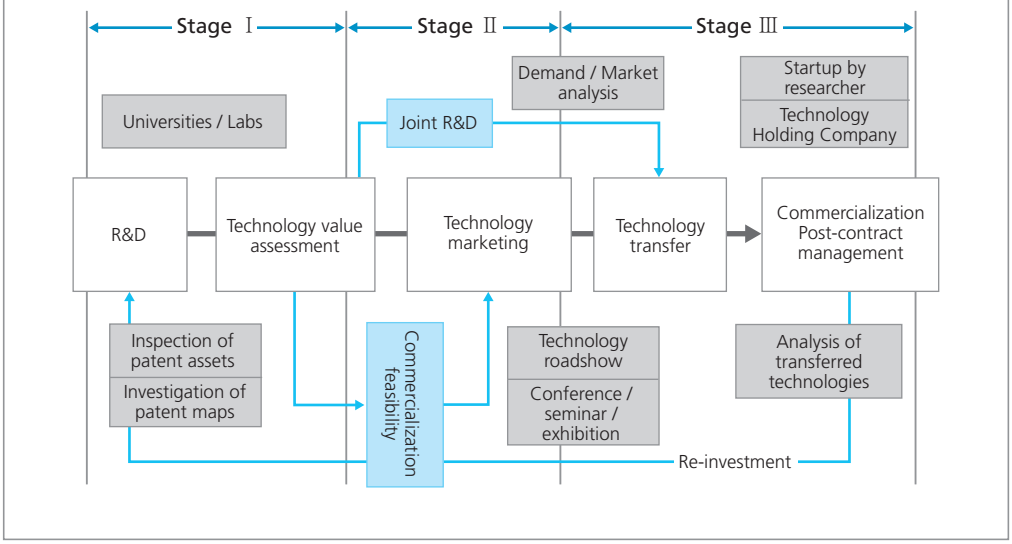
Joint R&D can be undertaken based on the contract between the firm and technology provider institution. In this case, the firm's needs are well reflected in cooperation with the technology provider institution. Otherwise, the technology

provider institution (or intermediary) would investigate the commercial viability of his/her own technology (IPR), and then undertake technology marketing to identify the customer firm.

Once the technology is transferred to the customer firm, the technology provider institution will make an analysis of the transferred technology and feedback. Reinvestment can be made back into the research activity. On the other hand, the technology provider institution may spin off the startup by the researcher, or establish a technology holding company (THC). If we divide such a process into three stages, the techno-park usually plays a role as a middleman at Stage II.

At a national level, there exists the Korea Technology Transfer Center (KTTC) to facilitate technology transfer from the technology providers to SMEs. KTTC usually plays a role as a middleman with a database. KTTC reviews the technology, estimates the commercial viability, the market and industry trends; and identify potential licensees or partners. On the other hand, KTTC provides the technology valuation service. That is, KTTC investigates feasibility on early-stage technologies through market, technical/economic analysis, and undertakes business and technology valuation. In addition, KTTC also provides mergers and acquisitions service. KTTC promotes M&A between large-scale enterprises and lab ventures, and provides services for finding a partner for a contract.

[Figure 3-11] Process of Technology Transfer



Likewise, techno-parks and universities also have a special organization for the same purpose, for example, the Technology Transfer Center (TTC) and the Technology Licensing Office (TLO). Those organizations compile a database of technologies to be transferred and provides technology marketing through various events such as technology roadshows, conferences/seminars, and exhibitions.

On the other hand, the government encourages universities and techno-parks to install a Technology Holdings Company (THC). The THC identifies technology developed by the knowledge institutions or organizations. It conveys information about this over to business incubators to develop a business model. The THC creates a subsidiary company for this business model through a contract with the technology provider. In so doing, the THC creates a new startup.

3.3.3. Business Support Program

After the tenant firm moves into the incubation facilities, business support programs are available. The business support program may differ along with the value chain over which the startup engages; that is, the startup would follow a growth path such as a technology start-up with a business model → technology development → product development → commercialization → manufacturing/market-ing.[9] Then, the management issue can be addressed according to each stage of the path. For example, the management issue of cash flow may change along with the growth path; such as initial fund → technology development fund → comercializetion fund → mass production fund, etc. Financing each case will be made in a different way. If so, the business support program can provide counsel on the corresponding case.

For example, [Figure 3-12] shows a matrix of the growth path of issues facing a startup company. Using such a matrix, a manual could be made for a business support program. The quality of business support services has to be developed and enhanced according to changes in the industry and overall business environment. The techno-park may modify and use such a scheme for their own business support services.

The CTP provides an integrated business service. The business service is customized for the tenant firm according to its growth path and/or value chain momentum. That is, according to the growth path, the startup can draw up expected management issues in advance, and receive appropriate services to cope with expected challenges, thereby avoiding myopic management.

9) Refer to [Figure 3-1].

[Figure 3-12] Matrix for Business Support Services

Management Issues

Growth Paths

	Preliminary Diagnosis	Cash-flow	External Environment	Internal Environment	Business Strategy	Financial Statement
Start-up	Possibility of business success	Initial funds	Initial environment	Initial capacity	Initial strategy	Future profit struction
Technoligical development	Technological capacity	Technology development funds	Tech development environment	Developing capacity	Tech development strategy	Future profit structure
Product development	Technological competitive-ness	Commercializa-tion funds	Potencial of new market	Commercializa-tion capacity	New business strategy	Future profit structurd
Manufacturing	Availability of mass production	Mass production funds	Condition of production system	Mass production capacity	Mass production strategy	Future profit structure
growth	Business competitiveness	Future cash-flow	Success factors	Core competence	Business strategy	Future profit structure
Initial public operating (IPO)	IPO feasibility	Cash-flow after IPO	Analysis of IPO market	IPO progression capability	IPO strategy	Future profit structure

Source: Revised from H.M. Kim (2015).

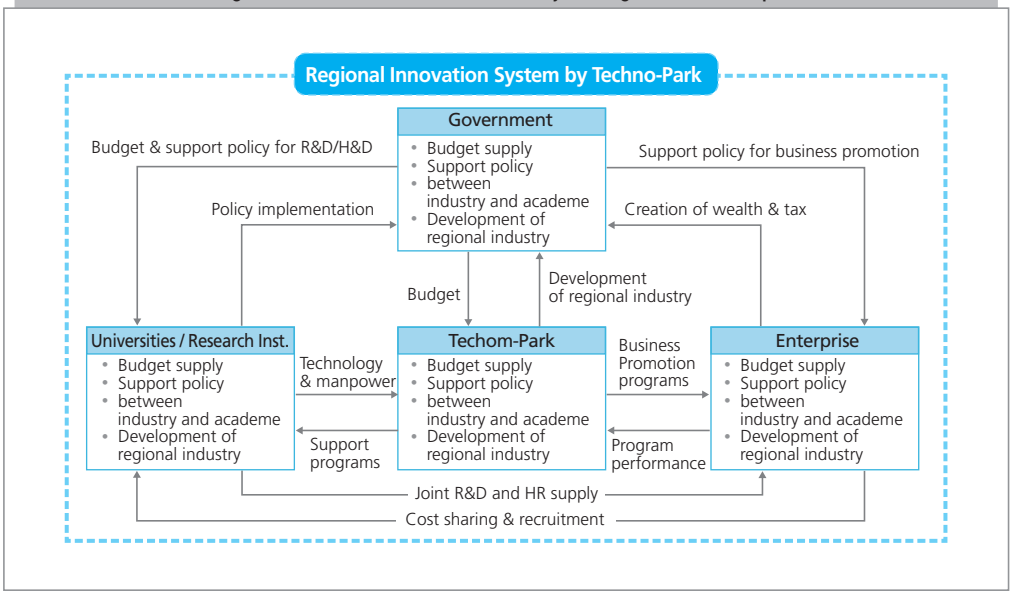
3.3.4. Regional Innovation System

The regional innovation system is a network of the innovation units of universities, research institutes, enterprises, government, and other related institutions/organizations in a given region. They are placed in the same region and interact with each other, and lead innovation activities and hence the economic development in the region. In such a system, the techpark can play a role as a network hub.

The techno-park can build a network including leaders of government, universities, business associations, business service organizations, and venture capital/angels. Based on the network, the techno-park could build a platform of development of a business support program, and create innovation-friendly environment in favor of technology startups. [Figure 3-13] exhibits schematically how the local network is structured.

The core business of the techno-park is technology business incubation, technology transfer and commercialization, and human resource development. In fostering such businesses, cooperation between local innovation units is necessary.

[Figure 3-13] Innovation Platform by Chungnam Techno-park



Source: H.K. Kim (2015).

Finally, Asheim and Gertler (2004) point out; "..... Regional innovation systems are not sufficient on their own to remain competitive in a globalizing economy. Production systems seem to be more important innovation system at the regional level. Thus local firms must also have access to national and supra national innovation systems, as well as to corporate innovation systems from the local firms that have been brought. This line of reasoning is followed to a point where the regional innovation system expands beyond its own boundaries through a process of economic integration and globalization." Thus, the techno-park could be an innovation hub in the region, building a regional network and connecting it to other networks, domestic or foreign.

4. Assessment of the Current State of Bulgaria's Innovation System and Sofia Tech Park

For the last decade, Bulgaria has been one of the fastest growing Eastern European economies. The country became a Member State of the European Union in 2007. Prior to that, Bulgaria's economy witnessed a long transition period. The accession in the European Union coincided with the global financial crisis which affected the Bulgarian economy severely through a collapse in European exports.

Today a more stable economic and political situation has emerged. Currently Bulgaria has one of the lowest rates of public debt and budget deficits (<Table 3-4>), among the member states. Bulgaria is the EU Member State with the lowest income tax on individuals (10%) and with the lowest corporate income tax (10%). The Currency Board allows the maintenance of price stability by ensuring the stability of the national currency (lev) (Innovation Strategy 2014-2020).

〈Table 3-4〉 Economic Snapshot: Bulgaria in 2014

Variables	Units	2014
GDP	EUR 1 billion	42.1
Exports	EUR 1 billion	22.1
Net FDI	% of GDP	3.2
GDP growth	%	1.7
Unemployment	%	10.6
Inflation rate	%	-1.6
Government deficit	% of GDP	-1.5
Government debt	% of GDP	18.9
Current account balance	% of GDP	0.0
Long-term Credit Ratings		
• Moody's	Baa2 stable	
• S&P	BB+ stable	
• Fitch	BBB- stable	

Source: Bulgarian National Bank; www.investbg.government.bg/en/pages/economic-structure-111.html.

In the latest edition of the Global Competitiveness Report of the World Economic Forum, Bulgaria is ranked 54th. The areas where Bulgaria ranked highest are in the "Efficiency enhancers" subindex, which includes higher education (64th), the labor market (68th), goods market efficiency (61st), financial markets (59th) and technological readiness. The latter is where the country has ranked best (38th).

4.1. Bulgaria's Innovation System

Bulgaria is the home of an innovation ecosystem in transition. The last few years saw the active development of the entrepreneurial community that cultivated a favorable environment for startup ventures.

The Peer Review of the Bulgarian Research and Innovation system, released by the European Commission in September 2015, determined that the innovation ecosystem in the country is comprised of existing islands of excellence, which however

are not successfully connected to the public research organizations (PRO). The report provides examples of the successful entrepreneurial hubs Eleven and LAUNCHub, which are internationally recognized as examples of Best Practice, but are almost completely unconnected to the higher education institutions (HE) and the research system.

The review outlined a lack of shared research infrastructure and a lack of transparency to encourage sharing between organizations. The report recognizes Sofia Tech Park (STP) as an initiative providing a perfect pilot case for testing the developing ecosystem in the country. The report adds that research institutes which are an integral part of a healthy innovation ecosystem are in need of the critical mass of skilled human capital to enable their functioning in a sustainable manner. The paper goes on to conclude that the Bulgarian innovation landscape is fragmented and characterized by a strong separation between the public and private sector activities.

4.1.1. STI Activities

The Peer Review of the Bulgarian Research and Innovation system notes that the STP will serve as a test bed, playing a crucial role in identifying gaps, barriers and blockages and bringing to the forefront all the management issues involved in dealing with technology transfer and knowledge exchange.

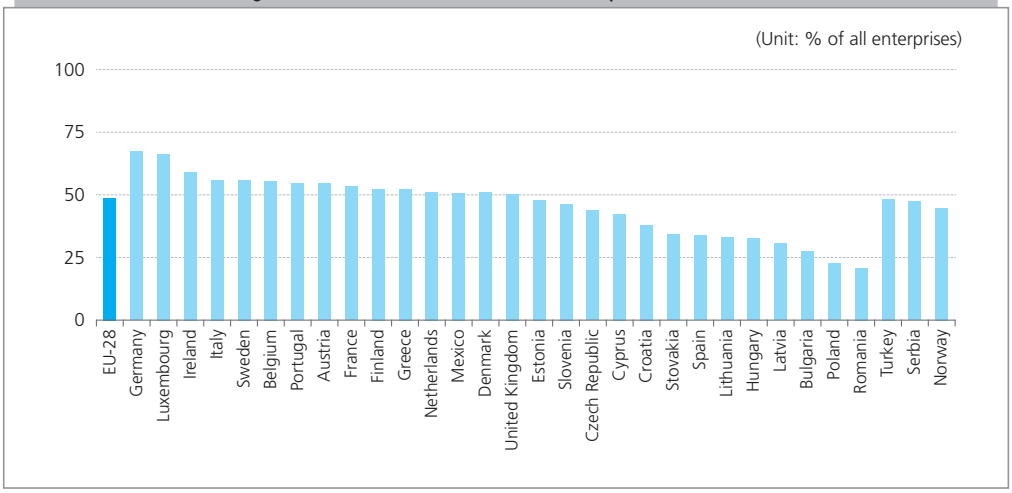
According to a Eurostat survey covering the period from 2010 to 2012, Bulgaria ranks as one of the countries with the smallest number of innovative enterprises among all EU Member States. The list shows that the highest shares of innovative enterprises were observed in Germany (66.9% of all enterprises), Luxembourg (66.1%), Ireland (58.7%) and Italy (56.1%). The lowest shares were recorded in Bulgaria (27.4%), Poland (23.0%) and Romania (20.7%).

A breakdown of the innovative enterprises in Bulgaria shows that innovation activity is somewhat limited to larger companies, while the small and medium enterprises (SMEs) employ a more traditional approach to their operations. Generally, the innovative SMEs develop innovative products or processes for their own use, but do not collaborate with external partners. Their innovations usually focus on labor cost reductions, and to a much lesser extent on technology improvements.

Data by Bulgarian Ministry of Economy shows that 16 percent of Bulgarian SMEs engaged in innovation processes for the period 2004 to 2008, which represents the lowest percentage within EU. In keeping with the rest of Europe, SMEs in Bulgaria have a significant contribution to the economy, generating more than 60 percent of the value added, 67 percent of the turnover, and 75 percent of the employment

among all of the enterprises.[10)]

[Figure 3-14] Share of Innovative Enterprises, 2010–2012



Note: The survey reference period covers the three years from 2010 to 2012.
Source: Eurostat (on-line data code: inn_cis8_type); ec.europa.eu/eurostat/statistics-exlained/index.php/File:Share_of_innovative_enterprises,_2010%E2%80%9312_(%C2%B9)_(%25_of_all_enterprises)_YB15.png

A newer set of data revealed in the Innovation Union Scoreboard for 2015, which was developed for the European Commission, indicates that innovation performance has been steadily increasing since Bulgaria joined the EU. However, there was a strong decline in 2012 and 2013, followed by an increase again in 2014. Performance relative to the EU declined from 46 percent in 2011 to 37 percent in 2013, and is at 41 percent for 2014.

For 2015 the Innovation Union Scoreboard lists Bulgaria as a leader in innovation performance growth for 2015, along with the United Kingdom, Ireland, Poland, Latvia, and Malta. The scoreboard has determined that Bulgaria's relative strengths are in Human Resources and Intellectual Assets, noting that the country has high levels of highly educated people and performs well in applying for Community trademarks and designs. Linkages and entrepreneurship and finance and support are the main weaknesses, in particular due to very low venture capital investments.

For 17 out of 22 indicators growth has been positive, most notably for Community designs with a growth rate of 61 percent. But growth has also been high in Community trademarks (29%), R&D expenditures in the business sector (19%), Public-private co-publications (14%) and new doctorate graduates (10%). Strong declines in performance are observed in Venture capital investment (-28%), and Sales share of

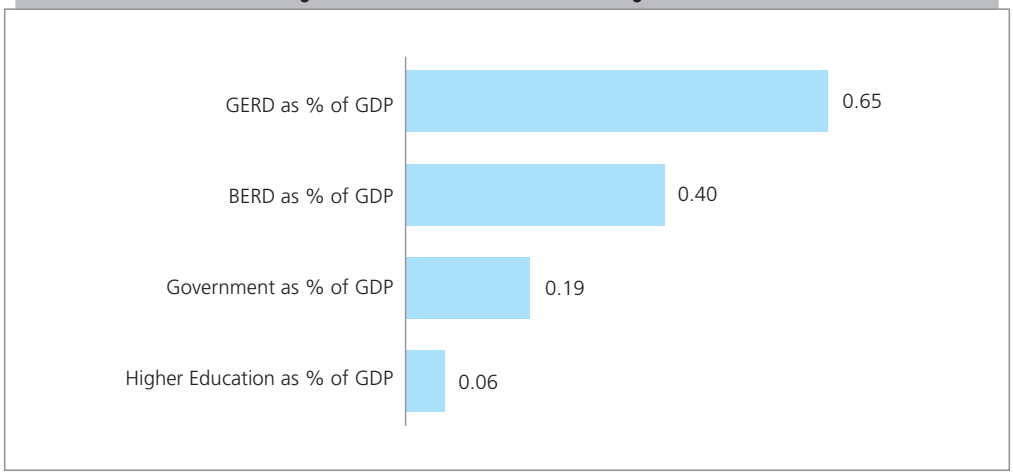
10) European Commission, Innovation Strategy for Smart Specialization 2014-2020, p.32.

new innovations (-12%).

Although a number of indicators point to the conclusion that innovation capacity of Bulgarian companies has improved after the accession of Bulgaria to the European Union and the start of the operational program "Competitiveness," the achievements appear to be far below the potential the country has. This is evident by the statistic showing that Bulgarian companies are spending 0.39% of GDP on R&D, as compared with 1.31% in EU—for example, the percentage is about 3 times lower.

As shown in [Figure 3-15], the ratio of R&D investment to GDP is less than 1 percent. Bulgaria's gross domestic expenditure on R&D (GERD) has been decreasing to about 0.65 percent of GDP in 2013 from about 2.16 percent in 1990. Roughly, this is about four times less than the EU-27 average.[11)]

[Figure 3-15] R&D Investment in Bulgaria: 2013



Source: European Commission (2015), p.19.

The decline in public R&D intensity contrasts sharply with the rapidly growing private R&D and in particular foreign R&D investments in Bulgaria. In the period before EU accession, business enterprise expenditure (BERD) rose rapidly. Between 1998 and 2007, total BERD rose steadily from initially 12 million EUR to 43.5 million EUR. This trend was primarily due to a rise in domestic BERD, while foreign BERD (without the services sector) remained fairly stagnant. Focusing on the more recent period in which BERD effectively exploded from 43.5 million in 2007 to EUR 163 million in 2013, the growth in BERD concentrated practically solely in R&D services.

11) See European Commission (2011), p.2. In general, STI capacity is determined by accumulation of R&D, i.e., R&D stock. The ratio of R&D investment to GDP represents the willingness or effort to building STI capacity.

Today Bulgarian BERD appears concentrated for more than 70 percent in just one sector, the "professional, scientific and technical activities; administrative and support service activities" and in particular M72 Scientific Research and Development. That category includes many things: clinical trials performed by foreign multinationals in Bulgaria, EC-funded research projects (in 2012 some EUR 8.1 million) as well as numerous other R&D support investments for private, often foreign firms. From the available statistical evidence, one may observe that the contribution of such R&D service activities has been particularly substantial in Bulgaria.

Business expenditure on R&D (GERD) is about 0.40 percent of GDP in 2013. In the coming years, a substantial increase in R&D spending, both in absolute and relative terms, will be instrumental for Bulgaria in order to raise its industrial competitiveness and create high-quality jobs. Being aware of the need to raise R&D investment, the Bulgarian government approved a national target for R&D investment to 1.5 percent of GDP in 2020.

To see a sustainable effect from the role of the business sector, domestic or foreign, in increasing overall investment in R&D in Bulgaria, it will be essential for public funding in research and innovation to come more in line with what other countries of the level of development of Bulgaria spend as a percentage of R&D. To promote BERD, the government should proactively implement support policies such as tax incentives and other support programs. (European Commission 2015, p.19).

Looking at the issue from an alternative standpoint, in terms of researchers, Bulgaria has 4.43 FTE researchers per 1,000 labor force compared with an EU average of 10.55 FTE researchers. The number of new doctoral graduates per 1,000 population is only 0.6 whereas the EU average is 1.7. However, the significant number of researchers employed in the system implies potential to raise the quality of the scientific production, if the necessary reforms should be adopted. (European Commission 2015, p.43).

Overall, Bulgaria scores low in terms of high-quality scientific publications. Scientific publications in Bulgaria are 5.7 within the top 10 percent most cited publications worldwide as a percentage of total scientific publications of the country, while that of the EU is 11.6. As a result, Bulgaria's current scientific and technological performance hinders its capacity to move towards more knowledge intensive and higher value-added activities (European Commission 2011, pp.1-2).

Patents as outputs indicator of the innovation system in Bulgaria can be referred to in <Table 3-5> and <Table 3-6>, compared to another four European countries in terms of patents granted by the United States Patent and Trademark Office and the European Patent Office. The analysis of the Bulgarian patent activity in

front of the European Patent Office shows that during the last decade the yearly average has been equal to the issuance of four– to five patents to Bulgarian applicants. Approximately 40 percent of the issued patents are concentrated in five technological areas—mechanics, lighting, heating, motors and pumps (10 patents), special machines (4 patents), pharmacy (4 patents) and medical equipment (3 patents).

The Bulgarian patent activity in front of the US Patent and Trade Mark Office is significantly higher. During the period 2000 to –2012, 208 American patents were issued (compared with 744 submitted applications) to Bulgarian applicants. The predominant areas under which patents were issued to Bulgarian applicants include computer systems for data transfer and processing (19%), management of data bases or data structures (18%), software development, installation and management (14%).[12)]

〈Table 3-5〉 Patents Granted by USPTO (per million inhabitants)

	2007	2008	2009	2010	2011
Bulgaria	6	16	36	58	43
Hungary	47	66	46	91	100
Romania	11	12	8	16	34
Turkey	19	16	19	29	41
Croatia	15	14	16	9	16
Finland	850	824	864	1143	951

Source: World Bank (2013), p.47.

〈Table 3-6〉 Patents Granted by EPO (per million inhabitants)

	2007	2008	2009	2010	2011
Bulgaria	0.8	0.5	0.7	0.4	1.1
Hungary	3.5	4.8	3.8	5.8	4.6
Romania	0.2	0.3	0.2	0.1	0.1
Turkey	0.5	0.7	0.8	1.2	1.3
Croatia	3.2	2.9	3.4	2.3	1.1
Finland	144	154.3	124.3	126.6	109

Source: ibid.

12) European Commission (2014), pp.36-37.

IPR support in Bulgaria has focused mainly on patenting.[13] However, the rise of service sectors such as ICT and creative services has increased the importance of copyright, trade secrets, and related rights. The traditional focus of the copyright system on artists, musicians, and writers has expanded in the current economic context to include the protection of software and multimedia. For the vast number of businesses operating in such industries, royalty revenues from the licensing of their copyrighted works is a significant source of income (World Bank 2013, p.52).

According to a recent assessment of Bulgaria's innovation capacity, 30 percent of the entrepreneurs in the Bulgarian ecosystem declare sufficient financial resources for intellectual property registration. The share of the industrial SMEs with own registered trademark in Bulgaria or abroad is 42 percent. The share of the micro enterprises with such registration is 27 percent; that of the small and of the medium-sized enterprises is respectively 47 percent and 61 percent. The enterprises which own national patents are 20 percent. Twelve percent of all micro enterprises have registered patents. For small enterprises the number is rising to 21 percent and for the medium ones it is 32 percent. The share of the micro enterprises, which have declared financial resources to register intellectual property, is 20 percent. This share of the small companies is 31 percent, and of the medium - 43 percent (European Commission 2014, p.34).

Analysis conducted in key recent reports confirm the notion of an existing gap between research and business. Two of these reports are the 'Input for Bulgaria's Research and Innovation Strategies for Smart Specialization February 2013' and work by HEInnovate dated December 2014.

13) Bulgarian legislation in the area of intellectual property protection is broadly in line with EU directives in all significant areas. Legislation on patent protection and registration of utility models is well developed and covers the key areas of new discoveries, scientific theories, and mathematical methods. Despite the sound regulatory framework, the IPR system in Bulgaria remains largely unused by entrepreneurs and academics, due in part to the costs and complexity of the Bulgarian and European patenting processes. Because of real and perceived barriers in using the system, SMEs often use alternative means to protect their innovations, including secrecy, exploitation of lead-time advantages, moving rapidly up the learning curve, use of complementary sales and service capabilities, technical complexity, as well as ongoing innovation relationships based on trust and use of trademarks to differentiate their products from those of imitators. Even universities and public R&D institutes, which have the resources to produce valuable intellectual property, lack the framework and experience to properly control and manage their innovations. Formal rules are, however, beginning to be adopted. (World Bank Report 2013, p.50).

〈Table 3-7〉 Global Innovation Index (2015)

	Index (Score 0–100, or value)	Rank
(1) Global Innovation Index	42.2	39
(2) Innovation Output Sub-Index	38.2	35
(3) Innovation Input Sub-Index	46.1	49
(4) Innovation Efficiency Ratio	0.8	21
(5) By Factors		
• Institutions	69.7	45
• Human capital and research	32.2	58
• Infrastructure	43.3	53
• Market sophistication	48.9	61
• Business sophistication	36.4	60
• Knowledge and technology outputs	27.8	102
• Creative outputs	41.1	34

Note: GII 2015 covers 141 economies around the world and uses 79 indicators across a range of themes.
Source: Cornell University, INSEAD, and WIPO (2015), p.180.

A recent World Bank thematic report (2013) highlighted that streamlining the IPR application process and reducing transaction costs would greatly facilitate IPR use by inventors, researchers, entrepreneurs and SMEs. The report points to Australia, Spain and France as countries with exemplary programs to streamline the IPR process which Bulgaria can emulate.[14)]

The 2015 Global Innovation Index (GII) of Bulgaria is 42.2, lower than the average of Europe (48.0); and its rank is 39 out of 141 countries; the innovation output index is 38.2 (rank of 35), while the innovation input index is 46.1 (rank of 49). The innovation efficiency index (the ratio of innovation output index to input index) is 0.8 (rank of 21), which indicates higher efficiency relative to other countries in the middle-income group. In estimation of the innovation index, there are seven groups of variable. Of these, the ranks of market sophistication, business sophistication, and knowledge and technology output are relatively lower than ranks of other variables. Low scores of GII indices may imply that the institutional framework conditions could be more serious issues in promoting technological innovation. It is noted that the rank of creative output is highest among seven groups of variables (<Table 3-7>).

In brief, STI activity and its performance currently need to be enhanced for Bulgaria to move towards sustainable growth in its knowledge-based economy. The

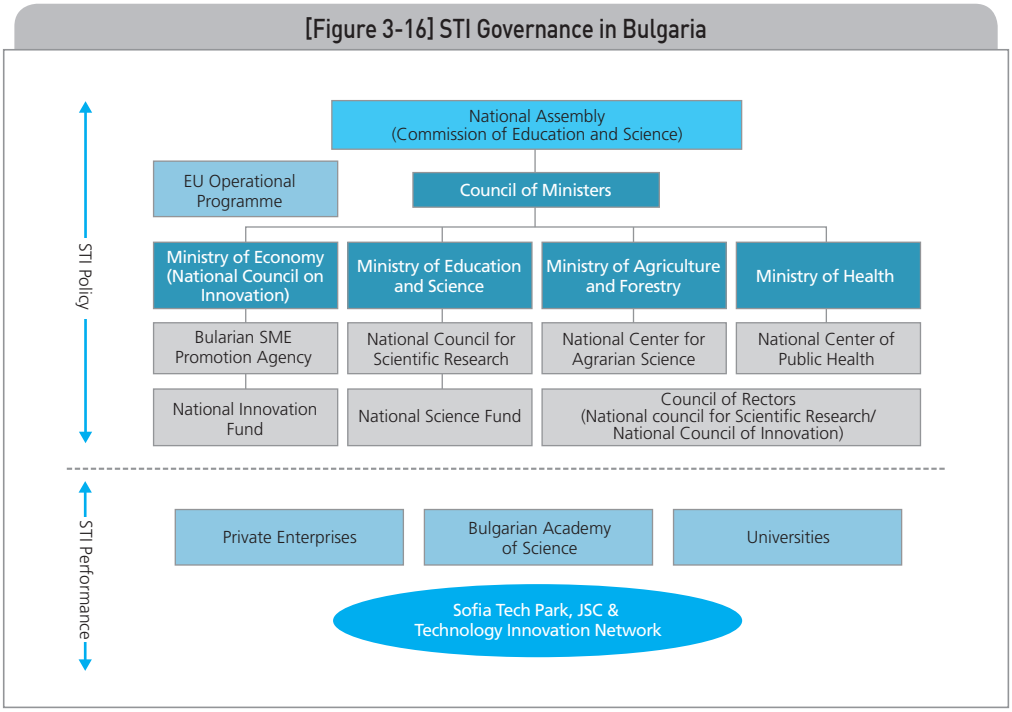
14) World Bank (2013), p.51.

Bulgarian government, however, has become increasingly aware of the importance of science, technology and innovation investment and best practices governance for bolstering economic development. And yet, as a study by the World Bank shows, the aptitude for innovations of the Bulgarian companies is positive and that generally those who invest in R&D and technological infrastructure see their production increasing together with their innovation efforts, regardless of whether the company is new to the market or is an established enterprise.

4.1.2. STI Governance

According to the Bulgarian STI governance structure, the highest policy-making body in research in Bulgaria is the Commission of Education and Science at the Bulgarian Parliament. The Council of Ministers endorses the most important strategic documents in Bulgaria's research policy. However, the political responsibility for designing and implementing the national R&D policy is with two ministries: The Ministry of Education and Science (MES) and the Ministry of Economy (ME). Other ministries, which oversee sectoral government research organizations, also participate in the setting of research policy and implementation in their respective domains—the Ministry of Agriculture and Food, the Ministry of Healthcare and others.

[Figure 3-16] STI Governance in Bulgaria



Source: Revised from Damianova, Z. and R. Stefanov (2009).

The current system of competitive allocation of resources is relatively recent and funding for R&I remains fragmented and unpredictable at various levels. Two funds were created in 2004, one for science and the other for innovation. The National Science Fund (NSF) has sponsored basic and applied research activity and training in the public sector. The National Innovation Fund (NIF) has financed applied research, development and innovation activities, including technology transfer. The two funds have relatively limited resources, are managed independently and have autonomous objectives and targets, without any strict coordinating mechanism in place. As a result, limited resources are dispersed across a large number of projects without clear reference to their social and economic impact.

The National Science Fund (NSF) is overseen by the National Council for Scientific Research at MES. The responsibilities of NSF encompass: i) implementation of the national research policy, and of the European research policy in Bulgaria; ii) provision of international expertise during the evaluation of project proposals, on which are based subsequent funding allocation; and iii) working out specific schemes to support the national research potential—such as support for young researchers, research infrastructure, and the preparation of research projects.

The NSF has an Executive Committee composed of scientists and an executive director. The system functions on an irregular basis, with unpredictable budgets and irregular calls for proposals. Hence, researchers cannot predict when they would be able to submit an application for funding. This reduces their ability to plan and coordinate their research activity (European Commission 2015, pp.27-28).

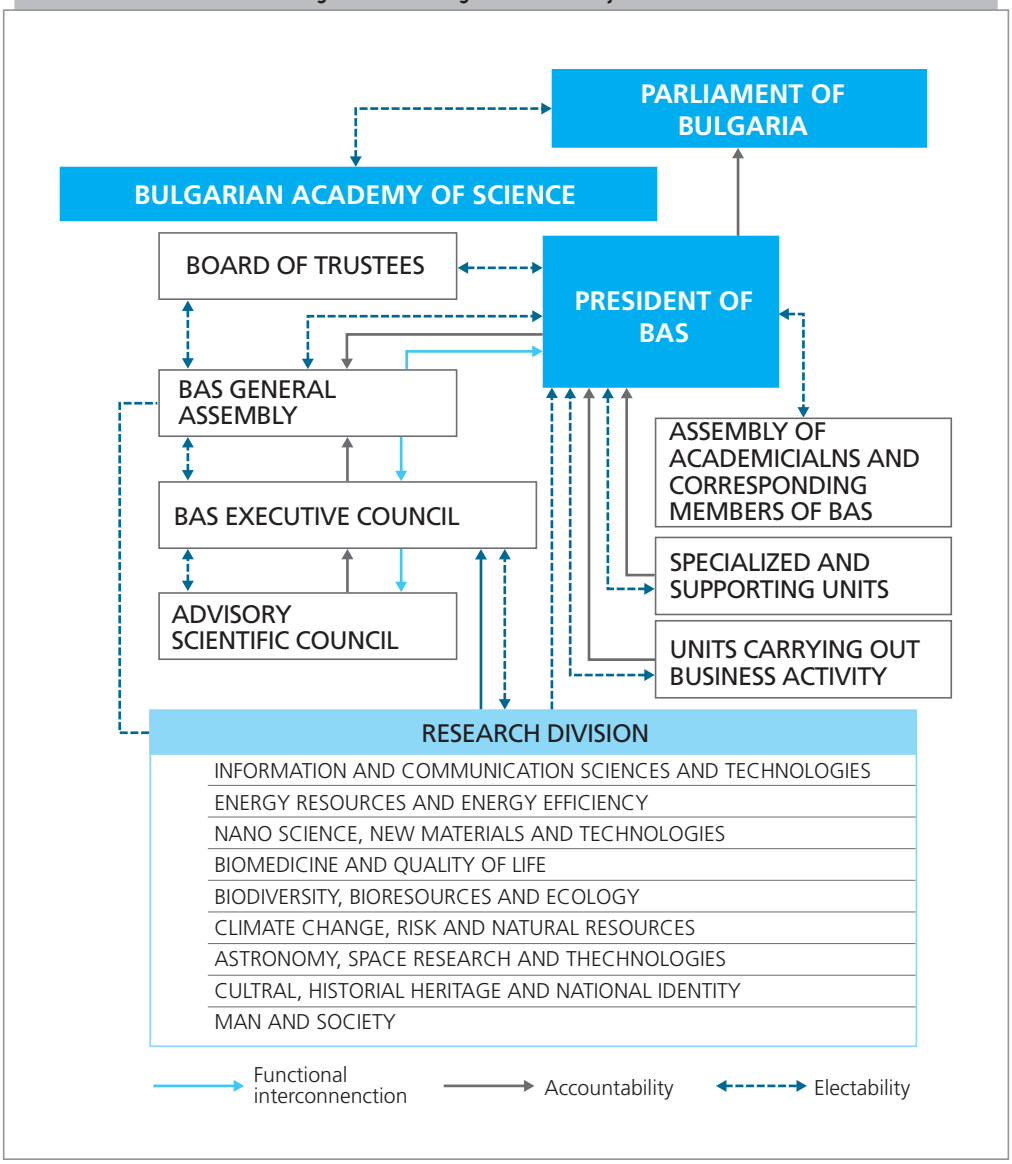
The budget of NSF for 2008[15] has quadrupled in comparison to the previous year, and the total amount earmarked for its programs is approximately EUR 30.68 million (BGN 60 million), which enhances the importance of the NSF for strengthening the national R&D system. The NSF budget for 2008 represents 25.3 percent of GERD for 2006.

The National Innovation Fund is a program under the Bulgarian SME Promotion Agency (BSMEPA) at ME. The NIF, unlike the NSF as a funding agency, appears only to be a financial dimension within the BSMEPA. The direct objective of the fund is to encourage the implementation of R&D projects in the private sector with the aim of creating new or developing existing products, processes or services for improving enterprise technological levels and innovative potential, and promoting the dynamics of the innovative processes. (*Op. cit.*, p.46).

The NIF lacks a multi-annual planning capacity. It seems not to have designed synergy with the EU Framework Program for "Research and Innovation Horizon

15) Latest full available year.

[Figure 3-17] Bulgarian Academy of Science



Source: Bulgaria Academy of Science, Directory 2011.

2020" into their programs. (*Op. cit*., p.28). The European Commission (2015) suggests the development of an independent agency capable of designing and implementing multi-annual research programs. MES is now considering a merger of the NSF and NIF.

As the main government instrument for direct financial support for business R&D, the NIF secured the budget of approximately EUR 10.23 million (BGN 20 million) for 2008.[16] The financing of the NIF from the budget increased steadily from approximately EUR 2.81 million in 2005 (BGN 5.5 million). The NIF requires that businesses provide 50 percent co-financing to the projects it supports, which has resulted in the funding of projects worth EUR 25.60 million (BGN 50 million) over the period 2005-2007.

The main research institutions in the country are; i) the Bulgarian Academy of Sciences (BAS), an autonomous budget funded public research organization with 76 research institutes, laboratories, centers, and specialized units; ii) the Agricultural Academy, a government research organization of the Ministry of Agriculture and Food, which encompasses 21 research institutes, 13 regional service centers for applied science, as well as one national agro-biology park, a Centre for Scientific and Engineering Information and the National Agricultural Museum; iii) higher education institutions—51 universities, higher education schools and colleges.

Within the realm of higher education and scientific research, the Council of Rectors participates in the formulation of state policy. It protects the higher education institutions' interests and represents them as a stakeholder group at the national and international level. It facilitates the organization and implementation of joint initiatives with other university and non-university organizations, working to the advantage of academics and students. Since 1989, Bulgaria's higher education sector has undergone a major transformation towards the academic and institutional autonomy of universities (European Commission 2015, p.46).

BAS has eight main sections in sciences, more broadly grouped under three main branches: natural, mathematical and engineering sciences, biological, medical and agrarian sciences and social sciences, humanities and art. Each consists of independent scientific institutes, laboratories and other sections. Accordingly, most public research organizations (PROs) are under the umbrella of BAS.

Thus, an important challenge of the Bulgarian S&T system is its overall fragmentation, as reflected by the large number of research organizations, e.g. universities, research institutes and organizations of the Bulgarian Academy of Science, in which the bottom-up approach is common in the formulation of R&D projects. As compared to Korea's experience, where the top-down approach dominates the scientific and economic development at the national and regional level, improving efficiency of R&I carried out within the public domain will requires policy alignment, simplification and focusing. It seems, according to the governance structure, that the government's STI policy has a limited capacity to mobilizing

16) Latest full available year.

existing STI resources, particularly R&D organizations and manpower, to address scalably critical socio-economic issues and to achieve innovation-driven economic development across traditional and emerging industries and across Bulgaria's regions.

4.1.3. SWOT Analysis Snapshot

A high-level analysis of strengths/weaknesses and opportunities/threats influencing STI activities in Bulgaria is presented in <Table 3-8> below.

〈Table 3-8〉 SWOT Analysis

STRENGTHS	WEAKNESSES
• High share of university graduates • Tradition in the fundamental research • Highly qualified researchers in the field of physics, chemistry, computer technologies and biotechnologies • A member of the EU • Government's awareness of the importance of STI development • Inflows of FDI	• Inefficiency of STI governance for coordination of horizontal issues: lack of effective mechanisms for priority setting, and no integration between the research and innovation policy at the national level • Low shares of GERD and BERD/GDP • Limited business-academia cooperation • Brain drain and aging of highly qualified professors and researchers • Low GDP share of manufacturing industry and weak industrial ecosystem
OPPORTUNITIES	**THREATS**
• Innovation and entrepreneurial culture of the young generation • Bulgarian Diaspora scientists and potential of brain circulation • Increasing global research collaboration trends and open innovation	• Opportunities for qualified researchers to work abroad with better conditions • Rapid change in global STI environment • Accelerationof the cycle of technological innovation • Deepening globalization and competition

In terms of weakness, first of all, R&D investment in both the public and private sectors is very low. Low R&D investment is one of reasons that the educational system—particularly in science and engineering—is losing ground. Limited innovation dynamics is exhibited by a decreasing share in the manufacturing sector, which would not stimulate the need for science, technology and innovation. It seems that the innovation network is not well developed between academia and industry. At a government level, the reactive attitude of the government might hinder an increase in STI activity and hence industrial competitiveness, and STI governance seems to be inefficient for coordination of horizontal issues, including priority-setting and the integration of innovation policies, etc.

In view of the STI environment, significant international cooperation in the region

is actively being pursued. It could also be pointed out that the Bulgarian diaspora of young scientists would provide an opportunity in the long run for brain circulation, by which an innovation network would be reinforced in the future. Meanwhile, rapid change in the STI environment and acceleration of the cycle of technological innovation are factors that threaten STI development in Bulgaria, a country faced with severe competition in the globalized world market.

On the positive side, the strong tradition in fundamental research in such areas as physics, chemistry, computer engineering and biotechnologies is a leading national STI asset. As a member country of the EU, Bulgaria also has access to EU innovation resources under the Horizon 2020, ERC, COSME, Erasmus + and multiple other networking and funding schemes for research and innovation support, which if tapped into successfully can propel the nation's R&D and innovation system.

4.2. STP and TIN Project[17)]

4.2.1. Current Position of STP/TIN Development

4.2.1.1. The Purpose of the STP/TIN Project

Sofia Tech Park JSC (STP) and its Technology and Innovation Network (TIN) together make up Bulgaria's first science and technology park.

Created as a large-scale development EU- funded pilot project, STP/TIN is designed to advance client-oriented research, market-oriented innovation and technology growth in Bulgaria. It has been executed thus far as a government-led semi-specialized science and technology park in the fields of ICT, life sciences, energy and clean technologies. TIN's development is well aligned with national strategies in the areas of innovation, economic development, science and education.

The STP was established in 2012 as a 100 percent state-owned enterprise with the following key Project Phase 1 goal: to develop and build the first science and technology park in Bulgaria—the Technology and Innovation Network (TIN). This phase was successfully completed in December 2015 when TIN officially opened its doors.

The objectives for developing STP/TIN were to:

- Strengthen the competitiveness of science and entrepreneurship in Bulgaria by improving the exchange of knowledge between academia and the business

17) Sofia Tech Park JSC (STP) is the owner of the infrastructure, as a legal entity, while the Technology Innovation Network (TIN) is an innovation network (on-site and/or off-site), including programs and activities.

community.
- Become a platform for the development of start-up companies and innovative ideas.
- Accelerate the process of commercialization of research.

STP/TIN will continue to be developed over the next five to ten years. In its core area, through public funding, STP/TIN will serve as an innovative intermediary for providing facilities and services for researchers, spin-offs, start-ups, emerging innovative companies and SMEs under research, development and innovation EU framework or de minimis regulation.[18)]

The key components of STP/TIN are:
- A laboratory complex consisting of 11 on-site laboratories in the fields of ICT, life sciences and energy, developer to address the unmet R&D&I needs of the academic and business community.
- An incubator hosting innovative startup and spin-off companies, a range of business- and innovation-support services to accelerate their development.
- A forum hosting R&D&I events; international and national.
- A museum—the Experimentarium—where visitors can interact with science and technology and get an insight into the activities of the Park's tenants.

STP/TIN was created as a strategic national pilot project. STP/TIN is envisioned to be a leverage project, linked in with a national strategy for smart economic specialization and on-going efforts to re-energize Bulgaria's performance as a regional innovation hub. In a nutshell, STP/TIN is a government-led project to create an innovation platform where members of the innovation ecosystem in Bulgaria can meet, share ideas and collaborate.

The capital was chosen as its site due to its strong comparative advantages as a potential innovation platform. Sofia has the highest national economic growth rate and potential, the highest concentration of universities, researchers, start-up businesses and local and multinational R&D companies.

Closely linked with key national strategies in the areas of economic development and research specialization for the period 2014 to –2020, STP/TIN is anticipated to play a significant role in technology transfer, developing science-industry partnerships, forming and nurturing new business ventures, and attracting scientists, researchers, knowledge-based companies and professionals from different sectors. It will also aim to increase the competitiveness of Bulgarian scientists and entrepreneurs through improving knowledge exchange between the academia and the business

18) A restriction of up to 20% of capacity use for commercial purposes will be a key factor to be accommodated.

community, facilitating start-up companies and innovation ideas and disseminating scientific research.

Through public funding and partnering with research institutes, universities and the Bulgarian Academy of Sciences (BAS), STP/TIN will be the intermediary of the core scientific infrastructure and technological space which will target the wide dissemination of knowledge and innovation to all interested parties, from start-ups and local SMEs to regional and international emerging and established innovative companies.

TIN is also expected to have a regional role as a catalyzing factor for innovation- and research-driven growth and regional and international cooperation. The mission of STP/TIN is:

- To become a prestigious location for global, regional and national researchers and innovative companies in Bulgaria and on the Balkans;
- To enhance the innovation system and new technologies development by supporting businesses aiming to strengthen the economy of knowledge in the country;
- To unite the efforts of business and science that are focused on the development and implementation of projects in the fields of information and communication technologies, life sciences and green energy—the three main focus areas of the park.

The objectives of STP/TIN are:

- Strengthening the competitiveness of science and entrepreneurship in Bulgaria by improving the exchange of knowledge between academia and the business community.
- Becoming a platform for the development of start-up companies and innovative ideas.
- Accelerating the process of commercialization of research.

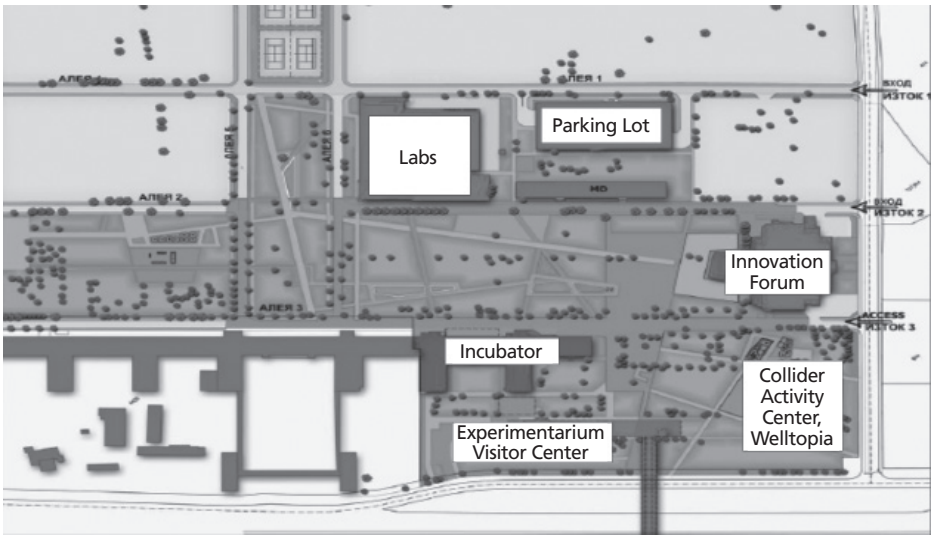
4.2.1.2. Physical Development

STP's/TIN's development started in 2012 with its legal constitution as a state company under the Ministry of the Economy. The planning phase, site selection and site consolidation also began in 2012. By December 2015 STP's core construction phase was completed. At that point the STP project had produced over 35,000 m^2 of new and renovated buildings, housing 11 equipped research laboratories, an incubator, an Innovation Forum (geared towards lecture/education/discussion activities), a technology demonstration space (Experimentarium/museum), offices and recreation areas.

The first phase (2012–2015) of the STP project was financed under the 2007– to 2013 "Operational Program Innovation and Competitiveness" at a total cost of about 50 million euro. Of this, roughly 65 percent was spent on preparing the terrain and infrastructure, renovation of existing buildings, and construction of new buildings for the purposes of STP. Another 25 percent was invested in furnishing the 11 scientific labs with equipment, and 10 percent in satellite scientific conferences and innovation-focused events.

The STP/TIN site was initially the property of the Ministry of Defense, and the existing buildings housed military barracks, sections of the joint military command, army command and others. In 2013 the land, a total of 270,000 square meters, was handed over by the Ministry of Defense to the Ministry of the Economy for the purpose of constructing the STP. Construction of the STP began in May 2014.

[Figure 3-18] Plan of TIN



Major facilities of the Park are the incubator, Innovation Forum, Experimentarium/ museum, and Research Labs, etc. The functional goals of the Museum – the Experimentarium incubator will be to gather the entire startup ecosystem of Sofia. It will host technology startups and spin-off companies, which will have access to modern office space and a range of business- and innovation-support services to accelerate their development.

The Innovation Forum will be the meeting place of the science and technology

park. Through hosting events related to science, technology, education and entrepreneurship, the Forum will attempt to improve communication between academia, business and society.

The Experimentarium/Museum will be the place where visitors can interact with science and technology and get an insight into the activities of the Park's tenants. It will serve as a demonstration space for incubated companies or partners of the science and technology park.

Finally, the laboratory complex will consist of 11 laboratories in the fields of ICT, life sciences and energy. The following labs will be established:

- Biopharmaceutical Lab Complex (BioPharma), comprising:
  - In vitro laboratory for evaluation of biological activity and toxicity
  - Formulation development and characterization with In Silico design
  - Laboratory for extraction of natural products and synthesis of bioactive compounds
- High Performance Computing (HPC) Lab
- Micro Nano Lab
- Bioinformatics (BioInfo Tech)
- Virtual and Augmented Reality Lab
- 3D Laboratory for Rapid Prototyping
- Artificial Intelligence and CAD Systems Lab
- Intelligent Communication Structures Lab
- Cybersecurity Lab

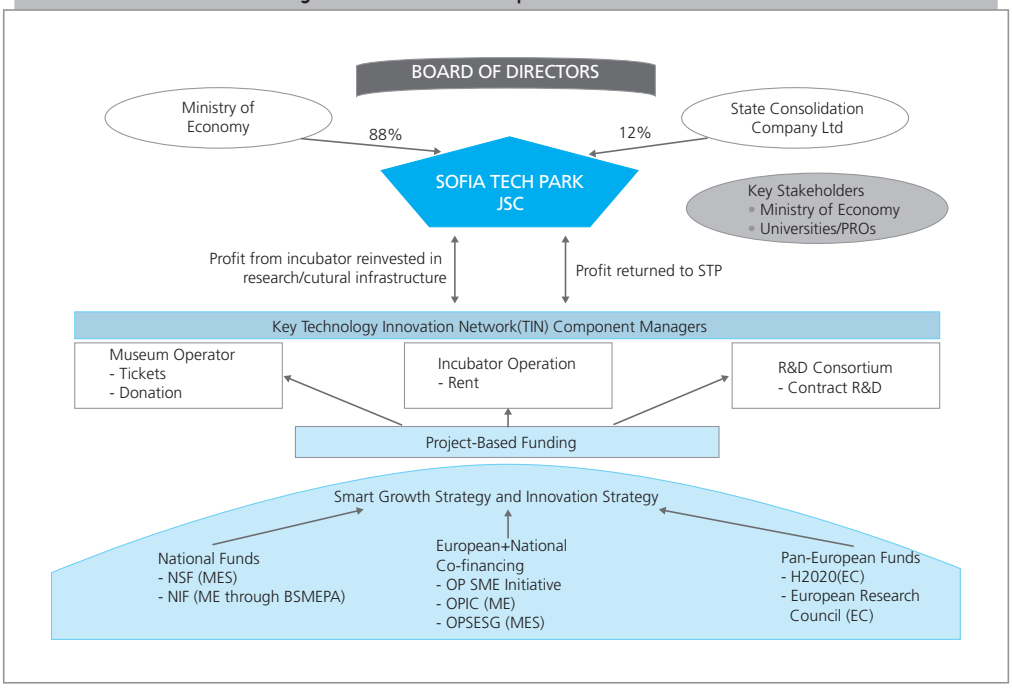
4.2.2. Management Plan

4.2.2.1. Operational Framework

As shown in [Figure 3-19], the STP is a joint stock company, where shareholders are the Ministry of Economy (88%) and the State Consolidation Company Ltd (12%). It is governed by the board of directors. The STP owns infrastructure and does not rely on a dedicated government budget. It will receive profits from the operation of facilities, such as incubators (rent), research labs (contract R&D), museum (tickets and donations) and others. That is, the STP provides infrastructure, and each of identified TIN component is managed by competitively selected qualified operator. Each TIN component has an individual governing structure that includes options for actively involving key stakeholders; for example, the research steering board includes representatives of the STP, ME, Bulgarian Small and Medium Enterprises Promotion Agency and academic/research organizations.

On the other hand, TIN components such as the incubator, the research labs, and the museum, will be operated according to its own programs through project-based funding. The project-based funding will be made in accordance with the national development strategy, for example, Smart Growth Strategy and Innovation Strategy.

[Figure 3-19] STP/TIN: Operational Framework



The STP will develop TIN through partnership with private and public partners. It has already established cooperation with several leading universities, the Bulgarian Academy of Science (BAS), business clusters, large international companies, Sofia Municipality, Ministry of Education and Science, NGOs and others institutions.

The government could make policy interventions in the STP/TIN through its funding stream. The availability of funds would depend on the planning capacity of the TIN component operator, for example, the capacity to develop services and programs.

Although at present no additional facility construction at the STP site is planned, the STP may, by attracting new institutional partners, acquire additional, in particular off-site, facilities for joint use.

4.2.2.2. Financing/Funding

Sofia Tech Park JSC, by default, does not rely on an allocated government budget, as there is no dedicated legislation for the financing of the company. Currently, STP/TIN can finance part of its future operations and development by applying for three sources, such as the National, EU+National and Pan-EU sources. There are two national sources for funding; i.e., NIF and NSF, about which we have discussed in the previous section.

STP/TIN can also apply for the following funding schemes: EU Structural Funds in Bulgaria. There are two major schemes, Operational Program Innovation and Competitiveness (OPIC) and Operational Program Science and Education for Intelligent Growth (OPSEIG).

Operational Program Innovation and Competitiveness (1.39 billion euros):

OPIC in 2014 through 2020 aims to boost economic growth and increase productivity, above all of SMEs. Special attention is paid to cooperation between business and research networks, and to enhancing entrepreneurship in Bulgaria. Financial instruments including bank loans, guarantees and equity investments will also play a role in achieving those objectives.

Operational Program Science and Education for Smart Growth (673 million euros):

OPSEIG in 2014 through 2020 aims to help strengthen research and innovation, general and higher education, and vocational training in Bulgaria. Investment will be focused on: i) developing centers of excellence and centers of competence as hubs of high-quality research and innovation, and ii) promoting the quality of higher education, modernization of vocational education and life-long learning, and measures to improve qualifications of researchers, teachers, lecturers and supporting their mobility and career opportunities.

On the other hand, the Consortium—the managing body of the Labs and Forum—can independently finance part of its future operations and development by applying for the following funding schemes: i) Horizon 2020, which is the biggest EU Research and Innovation Program with nearly 80 billion euros of funding over seven years (2014– to 2020); ii) Operational Program "Science and Education for Smart Growth" (above); and iii) National Science Fund

Indirectly, "customers" of the STP can also benefit from the Operational Program and National Innovation Fund. The Operational Program "Initiatives on SME" secures 102 million euros, since October 13, 2015. It is a joint program of the European Commission and the European Investment Bank for financial instruments for SMEs through the 2014– to 2020 programming period. The main objective is a rapid

increase in lending to SMEs at EU level to achieve a significant impact on stimulating SME finance, economic growth, job creation and strengthening the contribution of the European Structural and Investment Funds (ESIS) to the instruments at EU level. On the other hand, NIF funds scientific R&D projects is also available. The maximum grant is BGN 500,000 (EUR 255,623) for a period of implementation from 12 to 36 months. For those projects the maximum grant is up to BGN 50,000 (EUR 25,562) for a period of implementation up to one year.

4.2.2.3. Major Stakeholders

The STP has established partnerships with different organizations and institutions that will help achieving its main goal—increasing the competitiveness of Bulgarian science and business by building an ecosystem for R&D and innovation support, and developing a sustainable environment for experience and knowledge exchange and technology incubation.

All partner institutions contributed significantly to make TIN a reality, to assist in creating a common data base for the available scientific equipment in Bulgaria, to help creating useful contacts and partnerships with third parties on topics of mutual interest and to participate actively in initiatives of the STP. Those partners are:

- Sofia University
- Bulgarian Academy of Sciences
- Technical University - Sofia
- Medical University - Sofia
- University of National and World Economy
- VUZF University
- ICT Cluster
- European Software Institute - Center Eastern Europe
- Agro-bio institute
- Electric Vehicles Industrial Cluster

At an international level, the STP is also partnering with the Italian Association of Science and Technology Parks (APSTI), and also a member of IASP (International Association of Science Parks and Areas of Innovations).

Since 2014 Sofia Tech Park JSC (STP) has been representing the science and technology park in IASP – the International Association of Science Parks and Areas of Innovation. The IASP membership provides the STP with access to the largest network of science and technology parks. The STP has the opportunity to form partnerships with some of its members for the exchange of knowledge and experience, participation in joint projects and initiatives, etc. In 2016, when the

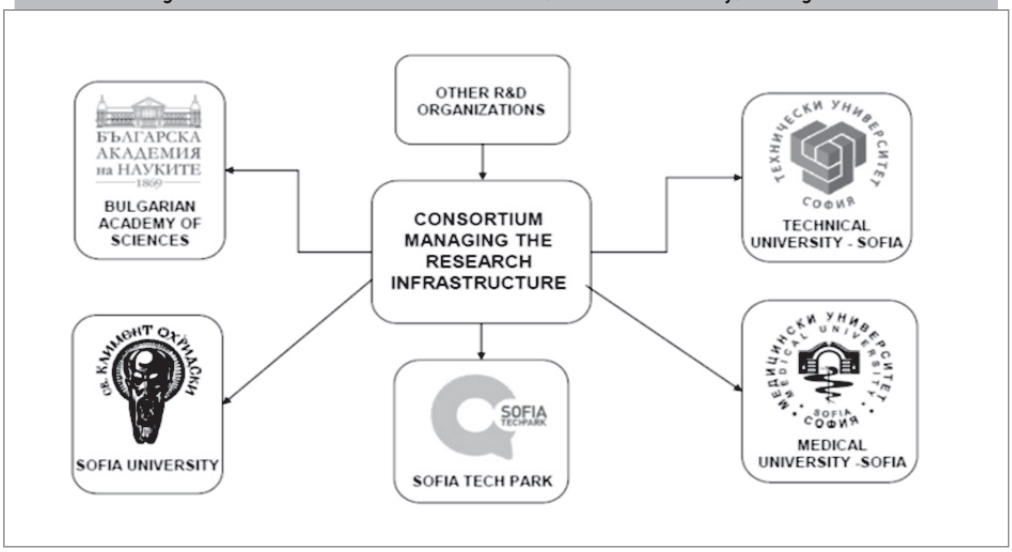
entire infrastructure of TIN is operational, the STP will seek to upgrade its affiliate membership to full capacity.

4.2.2.4. Management: Incubation and Labs

The STP is responsible for the construction and equipment of the infrastructure for incubation. It will select the incubator manager and specialized services providers through open and transparent procedure. Eligible applicants will be only not-for-profit legal entities. In addition, for the provision of specialized services, the STP should select providers of the innovation advisory services and innovation support services. The incubator manager is responsible for the detailing of criteria for selection of the startups to be incubated taking into account the areas for the creation of innovations developed by the Lab Consortium.

The process of selection of startups to be incubated and to access the incubation program of the incubator will be closely linked to the priority areas of the STP, i.e., ICT, life science and energy. Through public funding the future tenants of the STP will have access to modern research infrastructure; and the start-up companies, entering the incubator, will benefit from a number of services to help their growth and development. The incubator manager will also implement various programs to encourage exchanges among researchers and institutions, start-ups and mature companies inside and/or outside the Park as well as develop a voucher system (if applicable) to access the network of co-locations of scientific research labs within the universities and BAS. The combination of incentives, concentration of research

[Figure 3-20] Labs and Innovation Forum (Conference facility) Management



Source: sofiatech.bg/.

infrastructure, closeness and cooperation with BAS and universities, stimulating environment, educational activities, and technology transfer centre and well-educated workforce will further develop the innovative ecosystem.

The management of research labs is rather complicated. The management plan of the research labs will be made by the consortium, including various stakeholders such as the Bulgarian Academy of Science, Sofia University, Medical University-Sofia, Technical University-Sofia, STP and others. The consortium appoints the operator of the research facilities, who is in charge of management. The consortium will conduct independent fundamental and applied research, the results from which will be widely disseminated, and will manage the research infrastructure.[19] This will cover 80 percent of entire research facility.[20] The consortium will be allowed to use the remaining 20 percent. Therefore, it might not be enough for the entity to run its own R&D program. It could be instead used for the purpose of incubation.[21]

Some 80 percent of the lab facilities will be used for the open research, innovation and technology transfer. For such a purpose, coordination between the Ministry of Education and Ministry of Economy has to be made, to balance the Ministry of Economy's priority in industrial development and economic growth, and the Ministry of Education and Science objective to support research and education.[22]

The objectives of the consortium will be supported by the functioning of a Science Expert Council. It will provide expertise and advocacy to the overall operation and long-term strategic planning. Members will include distinguished science and innovation leaders and the managers of the lab units.

In this context the development of a new institutional and policy framework for promoting innovation would support TIN in its mission. The review of the existing legal and council structure would help, as would the provision and information campaign on the incentive and tax reductions developed to attract and sustain STI development. Such efforts at a government level will ensure the successful development of the innovation ecosystem and TIN's transition into self-sustainability.

19) The method of formulating research projects would not take a top-down approach (interview at MES).
20) Since the consortium can intervene in the management of the research labs, it might be difficult to reflect the needs of enterprise in formulation of research projects. It would be more likely to reflect the interests of scientists.
21) This may not enough for the incubated startups, so that the pressure of demand for additional incubation facilities, such as R&D and production, etc., would be increased.
22) It can be emphasized that the research labs would play an important role in the sense of knowledge production and dissemination by which technological innovation takes place. It is also expected that lab researchers could be potential entrepreneurs for the technology startups.

4.2.2.5. Museum / Experimentarium

The main task of the Science Center (Museum/Experimentarium) is to encourage the interest of young people (children, school-age youths and university students) in careers in the fields of science, technology, engineering and mathematics (STEM). This center will enhance the already existing successful children's museum, Muzeiko, which opened in 2015 in Sofia, taking STEM education a step further. Visitors to the museum will have the opportunity to engage with interactive exhibitions dedicated to science and technology, which in turn will aim to spark their curiosity. In addition, the museum will offer visitors a rich activity program, including workshops, demonstrations, lectures, presentations and other events, which encourage practical skills and promote the principle of hands-on learning.

The content of the Museum/Experimentarium will be developed jointly with STP partners, who are dedicated to encouraging the interest of young people in science and technology. Up to this point STP has attracted the following partners:

- National Polytechnic Museum with which the STP has signed a Memorandum of Understanding for the exchange of museum exhibits and expert capacity, the creation of joint exhibitions, participation in collaborative projects and initiatives, etc.
- TechnoLogica – a Bulgarian software company, which is currently developing TechnoMagicLand – an interactive kids' exhibition dedicated to science and technology.
- Walltopia and Chaos Group – Bulgarian companies interested in participating with the museum by creating interactive installations.

In addition, the STP will plan to take advantage of the expert capacity of its academic partners – Sofia University "St. Kliment Ohridski", the Medical University of Sofia, the Technical University of Sofia and the Bulgarian Academy of Science (BAS).

The STP has already undertaken steps for the design, manufacture and installation of a permanent museum exhibition, which will be created and installed within the next 18 months.

In the first half of 2016 the STP will strive to become a member of ECSITE – the European network of science centers and museums. This will allow the museum to enrich its activity program by participating in European and international projects jointly with other science centers and museums in Europe. In addition, ECSITE membership will give the STP an opportunity to find partners for the exchange of travelling exhibitions, as well as for the collaborative creation of interactive exhibitions and museum programs.

5. Guidelines for Planning

5.1. A Conceptual Model of STP/TIN: Technology Business Incubation

Now, based on our investigation of the practices of the Chungnam Techno Park, we developed a conceptual model for the STP focusing on technology business incubation.[23] It needs to be emphasized that one of the key missions of the STP is nurturing technology startups, by which technological innovation is brought in and hence promotes industrial development.

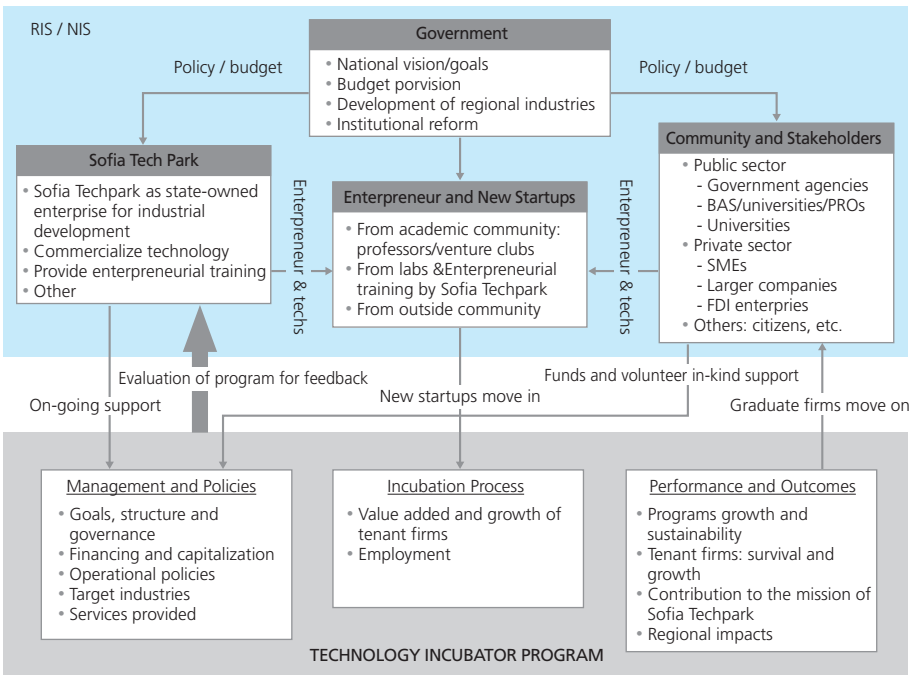
An illustration of the conceptual model of the STP can be shown in [Figure 3-21], combining the regional/national innovation system with the STP incubation program. The concept builds upon practices of the Chungnam Techno Park and others. The RIS/NIS is defined as a combination of the knowledge system and industrial eco-system. Practically, RIS/NIS here in the upper part of [Figure 3-21], represented by a network of the government, the STP, and community and stakeholders. Out of this system, entrepreneurs are nurtured and willing to start his/her own business bringing technological innovation

In the lower part of the suggested model – suggested as a canvass to be detailed and filled by the key stakeholders in the STP/TIN project – is described the incubation program, with the main variables shown – such as management and policies, incubation process, and performance and outcomes.

The policies and management will need to focus on the incubation process, in which the startups produce value added services, create jobs, and grow. The policies and management include goals, structure and governance, financing and capitalization, target industries, and services provided, etc. The performance and outcomes of the incubation program can be assessed by program growth and sustainability, tenant firms (survival and growth), contribution to the mission of the STP, regional impact, and others.

23) The management model for labs and museum, etc., could be developed in a similar way, but in a more simplified manner.

[Figure 3-21] Conceptual Model of STP: Incubation[1)]



Note: 1) This chart is developed based on work by H. K. Kim (2015) and S. A. Mian (1997).

STP/TIN programs/activities will be funded based on projects, so that the government budget will be a source of the funding. If the STP is recognized as a strategic vehicle for Bulgaria's economic development and/or industrialization, government engagement in STP management is necessary. The government will influence the system and actors via its STI policies and budget.

Entrepreneurs will be produced by the academic community, venture clubs, industry, and others. The STP and stakeholders will also provide entrepreneurs and technologies. Entrepreneurs might establish new startups and then move into the STP incubation facilities. Once they have moved in, the new startups would be provided with various support programs.

The performance of the incubation program will be eventually measured by survival and growth of the tenant firms; in turn the regional impact and contribution to the mission of the STP. As indicated in the national strategy and objectives of STP/TIN, the STP's economic consequences would be prioritized among others. Thus this implies that technology business incubation is the most important factor in bringing about the success of the STP. This model might provide a balanced idea how the STP

works for incubating technology startups.

5.2. Guidelines for Planning

Given the history and current state of STI in Bulgaria, to take the STP/TIN to a successful self-sustaining mode, the government will need to develop, jointly with the STP/TIN, a comprehensive medium- and long-term development plan. If it is prioritized, [Figure 3-22] can be referred to as a backbone to identify how to move forward with technology incubation. However, to achieve the long-term vision of the STP/TIN, it will be necessary to expand the strategies and transparency in managing the STP/TIN, by which a sustained increase in investment would be possible.

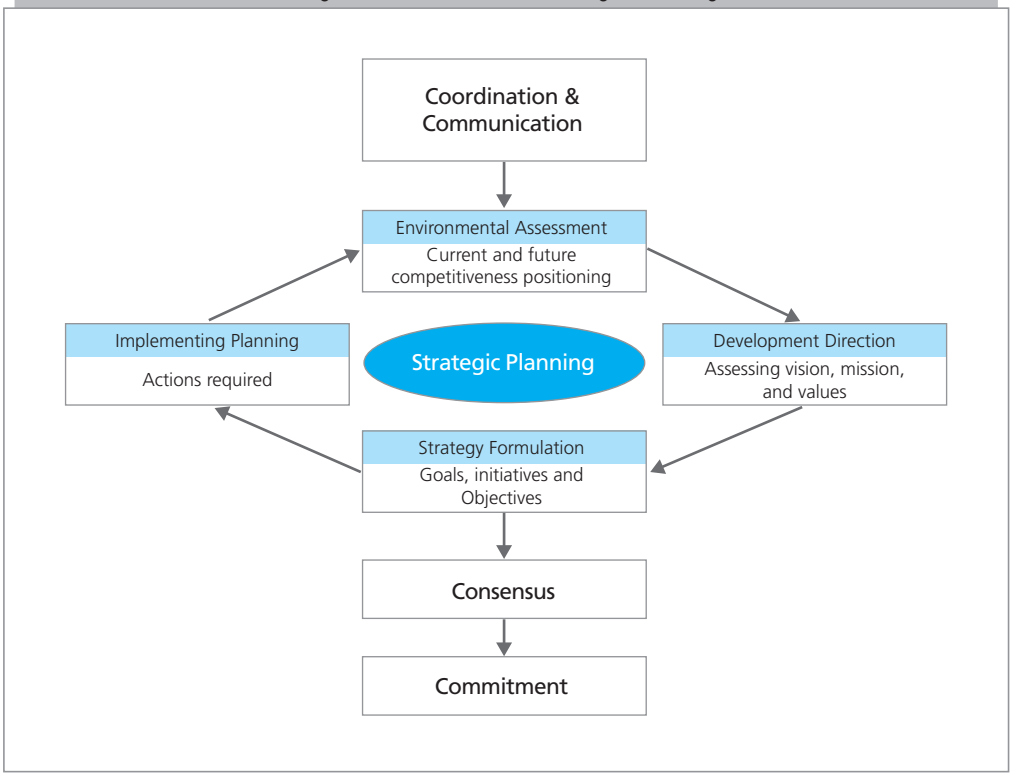
5.2.1. The Process of Planning

Various organizations in the public/private sectors are involved as stakeholders in the operation of TIN. This is because STI governance in Bulgaria has a decentralized structure. As the knowledge-based economy advances, the integration of policy implementation at a government level is increasingly required. However, S&T-based innovation often becomes a priority of most line ministries, as science and technology are related to various socio-economic issues.

In the previous discussion, it was pointed out that there was "no obvious horizontal coordination" in the STI system. The decision-making process is not integrated, and is working in silos to old sectoral policy structures, without an operational horizontal coordination mechanism, or common strategy or vision. (European Commission 2015, p.16). There two important ministries in Bulgaria's STI policies. The Ministry of Education and Science is responsible for public research organizations, whose contribution to innovation is essential, particularly for smart specialization. Meanwhile, the Ministry of Economy and BSMEPA pay attention to facilitating economic growth through innovation promotion of SMEs. It appears, however, the Ministry of Education and Science is more concerned with recovering a solid foundation for education of science and engineering, which at the moment suffers from brain drain. If so, the two ministries have different objectives in pursuing their policies, that is, the priorities of the two ministries do not coincide with national development strategy, for which STP/TIN is considered a policy instrument. Coordination between different ministries is essential to implement target-oriented or problem-solving approaches in pursuing national strategy. In so doing, allocation of public funding through pooling resources would be possible.[24)]

24) In the mid-1990s, the Korean government introduced an inter-ministerial R&D project titled "G7 Projects," of which the target was that Korea's S&T level should rank one of G7 levels in targeted areas. Costly and time-consuming foresight was carried out with several hundreds of S&T experts participating. Ultimately, 11 projects were selected with inter-ministerial coordination and consensus-building. The outcomes were evaluated and turned out to be successful. Since then, the Korean

[Figure 3-22] Process of Strategic Planning



In most cases of policy-making and planning at a government level, the 3 C's are necessary to make them effective: i.e., coordination/communication, consensus, and commitment.[25] That is, the planning team has to identify the stakeholder at a decision-making level, and through mutual communication coordinate ideas about the STP in terms of vision, mission, development direction, goals and objectives, resource allocation, and others. Such coordination and communication between the stakeholders at a higher level will have an important influence on the process of planning. In the Bulgarian government, the Ministry of Finance is responsible for macro-economic policy and budget allocation, while the MES and the ME are responsible for research policy and industrial policy, respectively. Those three ministries play a critical role in decision-making over the development of STP/TIN.

Based on coordination between high-level governance, the next step is to proceed to strategic planning. This includes four steps: environmental assessment, development direction, strategy formulation, and implementation of the plan;

government was able to start to formulate large-scale organized R&D projects, through which R&D investment of the public sector rapidly increased, and such increases in public RandD signaled the private sector in expectation formulation and stimulated corporate R&D.

25) For more discussion, refer to T. Shin (1998, 1999).

and thereafter feedback. In the first step, an environmental assessment reveals the strategic issues of the nation. Based on an assessment and trend analysis, weakness and opportunities for, say, economic development could be addressed, by which the development direction and goals/objectives of the national economy are identified. In addition, the role and mission of the STP/TIN could be derived with regard to such national goals.

Therefore, in the second step, the vision, mission and value of the STP/TIN could be developed in proper alignment with national goals. As pointed out earlier, "TIN's development is well aligned with the national strategies in the areas of innovation, economic development, science and education." The coincidence of the values pursued by the national economy and the STP/TIN is important, because it justifies sustained investment in developing the STP in the future.

In the third step, strategy formulation includes goals, initiatives and objectives for a given time period. To achieve these goals, there could be alternative pathways, i.e., strategies which imply selection and focus. Depending on the strategy, there are cases where structural reform is required. This is followed by strategy formulation where relevant initiatives can be suggested and in turn the objective of each initiative should be set within the time frame.

In the final step, actions are formulated and implemented, according to the initiative and selected strategy. After these actions are implemented, they have to be evaluated and generate feedback for the next plan. Actions have to be formulated with budget allocation in mind. What is important at this point is to develop performance indicators for evaluation and feedback.

During the process of strategic planning, frequent interaction between stakeholders might be necessary for coordinating and fine-tuning horizontal issues. Such interactions build up the relevancy and common interest of the plan. On the other hand, more experts participating in the planning is better. It can be said that the STI development of Bulgaria would be eventually made by experts living within their national borders, nonetheless the country is an open economy. Therefore, it is important to make use of collective wisdom, which makes the development plan sustainable and consistent.

Lastly, a consensus has to be built not only among the major stakeholders but also with the public. It is easier to reach a consensus among a small number of stakeholders, and it becomes more difficult as the number increases. It might be desirable that when the strategic planning is completed, the plan should be presented to the public for consensus building. Since no single authority can manage to implement horizontal issues/policies effectively, consensus building is the only

way to obtain a boost to consistently implement the plan. It will also bring the commitment of related stakeholders.

As a final note, it should be pointed out that strategic planning increasingly requires a complex social process, which is costly and time-consuming. However, if such costs are avoided, sustained and consistent implementation of the plan would not be possible

5.2.2. Issues to be Considered[26)]

When the planning is undertaken, we might consider the following issues for the development of the STP/TIN.

(1) Vision / Goals and objectives / Direction of development / Strategies
(2) Assessment of STI activity/environment, and RIS/NIS
  – Macro-economic analysis/framework condition
  – Industrial analysis
  – STI capacity: university, research institute, enterprise, and RIS/NIS, etc.
  – Analysis of national strategies, including Bulgaria 2020 and Smart Specialization Strategy, etc.
(3) Structure and governance
  – Structured process of decision-making
  – Coordination of horizontal issues
  – Priority setting
(4) Scope of STP/TIN business
  – R&D
  – Business incubation
  – Technology transfer and commercialization
  – Others
(5) Technology incubation strategy
  – Pre-incubation
  – In-wall incubation
  – Out-wall incubation
  – Post-incubation: exit strategy (M&A Strategy, registration of stock market, etc.)
  – Business support programs
    - Value chains of startups
    - Contact points/program for enterprises with experts
    - Network-learning programs
    - Technology management programs for CEOs

26) For more discussion, also refer to H.M. Kim (2015). Those issues are just an example, and in practice they could be adjusted according to the development strategy of STP/TIN.

(6) Technology transfer and commercialization
  – Technology Transfer Center (TTC)
  – Technology Licensing Office (TLO)
  – Technology Holdings Company (THC)
(7) Regional/national innovation system
  – Concept of regional innovation platform
  – STP/TIN as a hub of RIS/NIS
  – Requirement of regional/national innovation ecology
  – Techpark network in Bulgaria and at a global level
(8) Time table and budget
  – Time schedule of each program
  – Funding schemes for each program

6. Concluding Remarks and Policy Suggestions

So far, we have discussed the development of Korea's techno-park, Bulgarian STI activities and the development of the STP/TIN, after reviewing theoretical background using a number of global cases of development of science/technology parks. Since the STP/TIN has now completed the first stage of its construction, and is now at the beginning of its second—expansion and operations—stage, a management concept and future development plan are necessary. Thus, we looked into the Korean experience, particularly the case of Chungnam Techno Park as a best practice, and drew some implications, policy suggestions and a guideline for strategic planning.

In Bulgaria's innovation system, it seems that the STI capacity of the innovation unit is not well developed. The domestic manufacturing industry keeps losing its share of GDP, which in turn means science, technology and innovation are not actively created. Bulgaria is faced with serious difficulties in bringing about technological innovation to increase the competitiveness of its domestic industry and to create job opportunities. First of all, R&D investment accounts for a very small portion of GDP, and a brain drain threatens the maintenance of the foundations of science and engineering. In addition, the manufacturing industry is overwhelmed by FDI enterprises.

The STI governance of Bulgaria is substantially decentralized. The Ministry of Education and Science is responsible for research policy in the public sector. The Ministry of Economy and Energy is responsible for industrial policy, while the Ministry of Finance develops macro-economic policy and budget allocation. The coordination of horizontal issues is made by the Council of Ministers.

S&T policy seems to be very passive and reactive, and furthermore pays little attention to technological innovation. The concept of R&D management is not properly introduced for public R&D. Research projects are selected in a bottom-up approach, as opposed to a top-down approach. Target-oriented research is not formulated/undertaken to cope with socio-economic issues. This implies that the systematic/organized and strategic approach for the socio-economic challenge does not exist. Most research organizations are under the umbrella of the Bulgarian Academy of Science, which enjoys autonomy to a large extent.

The process of decision-making is fragmented and has a strong silo-effect. Coordination for the horizontal issue proceeds in the Council of Ministers, and no other coordination body exists for STI development which requires collaboration between the Ministry of Economy, Ministry of Education/Science and Ministry of Finance. The governance structure of the public sector is not well designed for STI development and further industrial competitiveness.

Under such circumstances, the STP/TIN is firstly established to bring in technological innovation and play a role as an innovation hub in the region, nurturing technology-based startups. It is expected that the government will keep implementing policies for improvement of the STI environment at a national level. However, the STP has to make careful plans for successful long-term development. This is because the government may have an influence on STP development through project funding, so that the planning capacity of the STP cannot be overemphasized.

It seems that the STP/TIN will be managed more or less independently. The governance of the STP is decentralized, and there exist many stakeholders regarding STP and TIN components. In the beginning, such a decentralized system might cause difficulties for a strategic approach, which implies selecting and focusing. STP/TIN will be highly dependent on funding sources, which will determine the direction of STP/TIN development. Because of such decentralization of the management, STP should create an organization for STI policy research. This organization will keep studying, developing, evaluating and planning the programs and performance of STP/TIN. It can also provide an interpretation of the mission, objectives, strategies and roles of STP/TIN (and its further extension) in the course of the industrialization of Bulgaria, which enables it to communicate with policy-makers of the Government/National Assembly.

The STP/TIN has the facilities for research and incubation, among others, and 80 percent of research labs will be employed for undertaking open research following EU regulations (permitting 20 percent commercial research). As we have discussed in the Korean case of CTP's Centers for the various areas of specialization, incubation requires research/production facilities. However, the incubation component of TIN

has only office space, and a voucher system will be implemented for use of research facilities on and off campus. Therefore, if there is no strong linkage between research labs and tenant SMEs, the incubation would face many difficulties in bringing about technological innovation. Thus, it is recommended that STP/TIN managers develop various programs and projects to link them; such as joint R&D projects, lab extensions, technical assistance, and the like.

On the other hand, we propose a conceptual model for the STP/TIN's technology incubation be elaborated in detail, including major variables to be considered. It might provide a balanced plan and approach to development and management of STP/TIN. We place an emphasis on technology incubation because it is thought that the success of the STP/TIN would be determined by the performance of the incubator, i.e., economic consequences of STP/TIN.

All in all, it seems that the success of the STP/TIN is more likely to be influenced by the leadership and commitment of the Bulgarian government. As discussed in STI governance, the STP/TIN is just a STI performer, which is under the influence of the STI policy-making body.

In the following, we make some policy suggestions at both STP/TIN and government levels;

6.1. Management and Policies for STP/TIN

The following are suggestions for the management of the STP/TIN. It is recommended, first of all, that the STP/TIN should create an "STI policy research unit" which will be able to undertake policies studies and strategic planning that the Park requires.

- Medium- and long-term development plan of the Sofia Tech Park
  - Development roadmaps, including programs/activities, infrastructure, research and production facilities, and others
  - Linkage between the plan and the national strategies

- Incubation
  - Entry criterion: business plan, financial state, and technological potential
  - Recruitment of tenant startups
  - Office provision

- R&D
  - Securing R&D fund for utilizing 20 percent of labs capacity
  - Joint R&D: linking startups, labs, university, PROs and others

- Management plan of R&D projects

- Technology transfer and commercialization
  - Needs survey for industrial technologies
  - Database of technologies to be transferred: stock-taking of patents owned by universities/PROs (or overseas sources)
  - Technology marketing plan

- Business support programs
  - Survey of needs for business support services created by the tenant firms
  - Support plan for technology development and commercialization, financing, marketing and networking, etc.

- Regional/national innovation system
  - Networking between industry, university, PROs and other related institutions in the region
  - Network-learning programs in the strategic areas of ICT, life science and energy
  - Plan for public relations: vision, mission, objective and activities of STP/TIN as hub of regional/national innovation system

- Others
  - Establishing "STI policy research unit" in STP/TIN
  - Studying institutional reform for innovation-friendly environment
  - Promotion for recruiting tenants.

6.2. Policy Suggestions at a Government Level

- Increase in R&D investment

An increase in government R&D investment will stimulate private R&D, and hence the STI environment will improve at a national level. The government should keep the target to increase R&D investment to 1.5 percent by 2020.

- Pursuing target-oriented R&D projects

A top-down approach is necessary to strengthen the linkage of STI policies to a national strategy such as Bulgaria Horizon 2020 and Smart Specialization, etc. Such policies will eventually increase the technological competitiveness of the industry. This is also a preferable approach to strongly link between research labs and startups.

- Implementing R&D management system

To increase rationality and transparency, it is necessary to implement an R&D management system in which an evaluation and feedback system plays a central

role. In so doing, large-scale R&D could be undertaken to tackle socio-economic issues. R&D management includes technology foresight, planning, budget control, evaluation, and others.

- Improvement of government policy capacity

It is necessary to improve the coordination system for horizontal issues. This also implies a reform of STI governance at a government level. In addition, redesigning scientific support instruments to target collaborative and mission-oriented research by building the capacity of existing research teams and facilitating the creation of public-private research consortia.

- Government leadership for STP development

Now that the STP seems to be a flagship project to bring technological innovation with modern facilities, the success of the STP will signal the RTDI landscape of Bulgaria significantly. Government leadership is essential in developing the STP as a hub of innovation network in the region/nation. The Bulgarian government may take account of the STP as a strategic vehicle in economic development.

Glossary

BAS	Bulgarian Academy of Science
BERD	Business expenditure in R&D
BSMEPA	Bulgarian SME Promotion Agency
CTP	Chungnam Techno Park
EC	European Commission
EPO	European Patent Office
ESIS	European Structural and Investment Funds
EU	European Union
FTE	Full-time equivalent
GDP	Gross domestic product
GERD	Gross expenditure in R&D
GII	Global Innovation Index
H2020	Horizon 2020: EU Research and Innovation program 2014–2020
IASP	International Association of Science Parks and Areas of Innovations
ICT	Information and communication technology
IPR	Intellectual property right
KOSDAQ	Korean Securities Dealers Automated Quotations
KSP	Knowledge Sharing Program
KTTC	Korea Technology Transfer Center
M&A	Merger and acquisition
ME	Ministry of Economy and Energy
MES	Ministry of Education and Science
MISP	Ministry of Science, ICT and Future Planning
MOSF	Ministry of Strategy and Finance
MOTIE	Ministry of Trade, Industry and Energy
NGO	Non-Government Organization
NIF	National Innovation Fund
NIS	National innovation system
NSF	National Science Fund
OP	Operational Program
OPIC	Operational Program, Innovation and Competitiveness
OPSESG	Operational Program Science and Education for Smart Growth
PRO	Public research organization
R&D	Research and development
R&I	Research and innovation
RIS	Regional innovation system
RTDI	Research, technology development and innovation
S&T	Science and technology
SME	Small- and medium-sized enterprise
STI	Science, technology and innovation

STP	Sofia Tech Park JSC: as a legal entity, the owner of the infrastructure
TBI	Technology business incubation
THC	Technology Holding Company
TIN	Technology Innovation Network:
TLO	Technology Licensing Office
TTC	Technology Transfer Center
USPTO	US Patent and Trademark Office
W3C	World Wide Web Consortium

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Appendix

ACT ON SPECIAL CASES CONCERNING SUPPORT OF TECHNOPARKS

[Enforcement Date 14. Apr, 2011.] [Act No.10589, 14. Apr, 2011., Partial Amendment]

CHAPTER I GENERAL PROVISIONS

Article 1 (Purpose)

The purpose of this Act is to contribute to the stimulation of regional economies and the promotion of national competitiveness by clustering human and physical resources of enterprises, universities, research institutes, etc. in certain places to jointly develop technology and by bringing about regional innovation under close connections and collaboration among such entities.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

Article 2 (Definitions)

The terms used in this Act shall be defined as follows:

1. The term "Technopark" means a cluster of land, buildings, facilities, etc. which functions as a base of regional innovation so that enterprises, universities, research institutes, local governments, and other entities can jointly conduct the following business activities:
   (a) Establishment of a cooperative system among enterprises, universities, research institutes, and local governments or supportive institutions for technology or corporate management with the aim of creating, utilizing, and expanding the capability of regional development according to respective local conditions and characteristics in the aspects of development of human resources, development of science and technology, industrial production, and business support;
   (b) Assistance to the establishment of regional development strategies in industries and technology;
   (c) Joint research or development and the transfer and commercialization of technology;
   (d) Education and training of human resources for industries and technology;
   (e) Distribution of information about industries and technology;
   (f) Protection and fostering of new technology and business start-ups;
   (g) Supply of facilities for joint research and development;
   (h) Test production;
   (i) Production and sale of commodities utilizing the outcomes of research or development;
   (j) Other activities specified by Ordinance of the Ministry of Knowledge Economy to commercialize technology and stimulate a cooperative system between

enterprises, universities, research institutes, local governments or supportive institutions for technology or corporate management.

2. The term "urban factories" means urban factories prescribed in Article 28 of the Industrial Cluster Development and Factory Establishment Act.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

CHAPTER II DEVELOPMENT, ETC. OF TECHNOPARKS

Article 3 (Establishment of Plan for Development of Technoparks)

(1) The Minister of Knowledge Economy shall establish, and publicly notify a plan for the development of Technoparks to facilitate the development thereof.

(2) Matters necessary for the establishment of the plan for the development of Technoparks shall be prescribed by Presidential Decree.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

Article 4 (Designation of Project Implementers)

(1) The Minister of Knowledge Economy may designate a person who shall develop and operate a Technopark (hereinafter referred to as "project implementer").

(2) Matters necessary for the qualifications, etc. for designation of project implementers under paragraph (1) shall be prescribed by Presidential Decree.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

Article 5 (Applications, etc. for Designation as Project Implementers)

(1) Any person who intends to be designated as a project implementer shall file an application for designation as a project implementer with the Minister of Knowledge Economy.

(2) Any person who files an application for designation as a project implementer pursuant to paragraph (1) shall be a corporation.

(3) When a corporation under paragraph (2) appoints its executives, it shall evenly select persons who have abundant experience in the respective areas of technology, business management, and public administration, from among those who has served, or are serving, for an enterprise, university, research institute, etc.

(4) Except as otherwise stipulated in this Act, the provisions of the Civil Act governing incorporated foundations shall apply mutatis mutandis to the corporations under paragraph (2).

(5) Matters necessary for the procedures regarding applications for the designation as a project implementer shall be prescribed by Ordinance of the Ministry of Knowledge Economy.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

Article 5-2 (Revocation, etc. of Designation of Project Implementers)

(1) Where a project implementer designated as prescribed in Article 4 (1) falls under any of the following subparagraphs, the Minister of Knowledge Economy may revoke such designation, suspend construction, rebuild or remove manmade structures, or take other necessary measures: Provided, That in cases falling under subparagraph 1, he/she shall revoke such designation:
   1. Where the project implementer has been designated by deceit or other fraudulent means;
   2. Where the project implementer fails to construct and operate a Technopark by not later than five years from the date of designation as a project implementer;
   3. Where the project implementer no longer meets the qualifications for designation under Article 4 (2).

(2) Where the Minister of Knowledge Economy revokes the designation of a project implementer as provided in paragraph (1), he/she shall hold a hearing.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

Article 6 (Procedure for Development of Technoparks)

Notwithstanding Articles 3 and 4, if an industrial complex or a regional comprehensive development district is required when promoting the development of a Technopark, such Technopark may be designated and developed as a national industrial complex, a general industrial complex, or an up-to-date city industrial complex under the Industrial Sites and Development Act and may be developed as a regional comprehensive development district under the Balanced Regional Development and Support for Local Small and Medium Enterprises Act.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

Article 7 (Operating Guidelines forTechnoparks)

The Minister of Knowledge Economy shall establish and publicly notify guidelines regulating fundamental matters concerning the operation of Technoparks, as provided in Presidential Decree. The foregoing shall also apply to amendments of such guidelines.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

Article 7-2 (Evaluation of Management Accomplishments)

(1) The Minister of Knowledge Economy may evaluate the management accomplishments of project implementers every year.

(2) The Minister of Knowledge Economy may request the project implementers to submit data prescribed by Presidential Decree, such as a report on the management accomplishments of the previous year to evaluate management accomplishments prescribed in paragraph (1).

(3) The Minister of Knowledge Economy may recommend the project implementer

who has shown poor management accomplishments as a result of evaluation of management accomplishments under paragraph (1) to take measures, etc. in relation to human resources management or budget necessary for the improvement of management.

(4) Methods of evaluating management accomplishments prescribed in paragraph (1), procedures therefor and any other necessary matters shall be prescribed by Presidential Decree.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

CHAPTER Ⅲ MEASURES FOR SMOOTH SUPPLY OF SITES

Article 8 (Special Case for Establishment, etc. of Factories)

(1) Notwithstanding Article 2 of the Industrial Cluster Development and Factory Establishment Act and Article 2 of the Industrial Sites and Development Act, any facility for test production prescribed by Presidential Decree and installed inside a Technopark (excluding Technoparks developed in accordance with the procedure for the designation of national industrial complexes, general industrial complexes, or up-to-date city industrial complexes pursuant to Article 6) in order to carry on test production referred to in subparagraph 1 (h) of Article 2 is deemed excluded from the scope of factories.

(2) An enterprise prescribed by Presidential Decree, which has relocated to a Technopark developed and is in operation in an area, other than the areas prescribed by Presidential Decree, to perform the production and sale of commodities utilizing the outcomes of research or development prescribed in subparagraph 1 (i) of Article 2, among the specific-use areas prescribed in Article 36 of the National Land Planning and Utilization Act, may, notwithstanding the following subparagraphs, establish an urban factory prescribed by Presidential Decree in such Technopark insofar as it does not pose a threat to structural safety:

1. Article 19 (1) of the Building Act;
2. Article 76 (1) of the National Land Planning and Utilization Act;
3. Articles 6 and 9 of the Act on Designation and Management of Free Economic Zones.

(3) An enterprise intending to establish an urban factory as prescribed in paragraph (2) shall obtain approval from a project implementer, and the project implementer shall obtain confirmation on the structural safety of the building from the Governor of a Special Self-Governing Province or the head of a Si/Gun/Gu (referring to the head of an autonomous Gu;) before granting such approval.

(4) The total area of an urban factory established in accordance with paragraph (2) (referring to the sum of areas of respective factories, if two or more urban factories exist) shall not exceed the area calculated by multiplying the total floor area of

all buildings within the relevant Technopark by the rate prescribed by Presidential Decree.

(5) The Governor of a Special Self-Governing Province, the head of a Si/Gun/Gu (referring to the head of an autonomous Gu) shall, upon receiving an application for registration of an urban factory established in accordance with paragraph (2) from an enterprise that has relocated into a Technopark, shall register the factory in accordance with Article 16 of the Industrial Cluster Development and Factory Establishment Act.

(6) Except as otherwise prescribed in paragraphs (2) through (5), matters concerning the establishment and operation of urban factories and any other necessary matters shall be prescribed by Presidential Decree.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

Article 9 (Restrictions on Installation of Facilities and Occupancy)

(1) The Minister of Knowledge Economy may impose restrictions on installation, inside a Technopark, of any building or facility, other than buildings or facilities necessary for carrying on the activities referred to in the items of subparagraph 1 of Article 2, as prescribed by Presidential Decree.

(2) The Minister of Knowledge Economy may impose restrictions on the occupancy, within a Technopark, of any person, other than those related to the activities referred to in the items of subparagraph 1 of Article 2, as prescribed by Presidential Decree.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

Article 10 (Sale, etc. of State or Public Property)

(1) Notwithstanding the State Property Act or the Public Property and Commodity Management Act, the State or any local government may sell or lease any State or public property to a project implementer or a person who relocates into a Technopark (hereinafter referred to as "occupant") based on a free contract if deemed necessary for the development or operation of a Technopark: Provided, That such property may be gratuitously leased to a project implementer, which is a non-profit corporation.

(2) Notwithstanding Article 18 of the State Property Act, Article 13, 19, or 28 of the Public Property and Commodity Management Act, and the Higher Education Act or the Private School Act, the State, any local government, or the educational foundation of a private school may lease part of any State or public land or part of the site of a university or college to a project implementer or an occupant to build a building or any other permanent structure thereon. In such cases, the condition that such building or structure shall be donated to the State, the local government, or the educational foundation, or that the land or the site of the school shall be

reinstated, upon expiration of the lease contract, shall be attached to the lease.

(3) The educational foundation of a private school may lease part of the site of a university or college gratuitously to a project implementer which is a non-profit corporation, when it leases part of the site pursuant to paragraph (2).

(4) No occupant may lease any structure built pursuant to paragraph (2) to a third party.

(5) Notwithstanding Article 30 (2) of the State Property Act, Article 20 (3) of the Public Property and Commodity Management Act, and the Higher Education Act or the Private School Act, any project implementer may allow another person who intends to use a structure built in accordance with paragraph (2) for the same purpose as the purpose of lease to use it or profit therefrom.

(6) Matters concerning the lease method, selling price, rent, lease term of State or public property or the site of a private school prescribed in paragraphs (1) through (3) and other matters concerning the sale or lease, for rent or rent-free, of State or public property or the site of a private school shall be prescribed by Presidential Decree.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

Article 10-2 (Cancellation of Gratuitous Lease)

The State or any local government may cancel gratuitous lease referred to in the proviso to paragraph (1) of Article 10 or paragraph (3) of the same Article if any of the following events occurs:

1. Where the purposes of the gratuitous lease have been achieved;
2. Where a project implementer has used State or public property for any purpose other than the purposes of gratuitous lease;
3. Where a project implementer has violated any condition of gratuitous lease.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

Article 11 (Subsidization of Facility Costs)

The State or a local government may either fully or partially subsidize facility costs incurred in connection with the development of an industrial technology complex.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

Article 12 (Special Cases concerning Prohibition, etc. of Building Construction)

Notwithstanding Article 76 (1) of the National Land Planning and Utilization Act, prohibition and restriction of building construction within a Technopark shall be governed by an industrial complex development plan (referring to industrial complex development plans referred to in Articles 6, 7 and 7-2 of the Industrial Sites and Development Act) and a master plan for the management of an industrial complex (referring to master plans for the management of an industrial complex under Article 33 of the Industrial Cluster Development and Factory Establishment Act).

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

Article 13 (Establishment of Infrastructure)

The State or a local government shall give priority to supporting the establishment of infrastructure, such as roads, water supply systems, and sewerage systems, for the smooth development of a Technopark.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

Article 14 (Promotion of Informatization, etc.)

(1) The State or a local government may provide support for matters necessary for facilitating informatization, such as the progress of information technology of Technoparks and the establishment and use of an information and communications network amongst Technoparks.

(2) Any person who has a private telecommunications system installed in accordance with Article 64 of the Telecommunications Business Act may, if he/she has any spare facility, may allow a project implementer to use the spare facility.

(3) Matters necessary for the use of any spare facility prescribed in paragraph (2) shall be prescribed by Presidential Decree.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

Article 15 (Assumption of Cost of Installing Electric Facilities)

Article 24 of the Act on Special Measures for the Deregulation of Corporate Activities, which stipulates special cases related to the assumption of cost for industrial complex development projects, shall apply mutatis mutandis to the installation of electric facilities in Technoparks developed in accordance with the procedure for the designation of a national industrial complex, a general industrial complex, or an up-to-date city industrial complex pursuant to Article 6, to the assumption of cost thereof, etc.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

Article 16 (Exemption, etc. from Various Charges)

(1) Each Technopark is exempt from the following charges:

1. Development charges referred to in Article 5 of the Restitution of Development Gains Act;
2. Development costs of substitute forest resources referred to in Article 19 of the Management of Mountainous Districts Act;
3. Farmland preservation charges referred to in Article 38 of the Farmland Act;
4. Development costs of substitute grasslands referred to in Article 23 of the Grassland Act;
5. Traffic inducement charges referred to in Article 36 of the Urban Traffic Improvement Promotion Act.

(2) The owner of a facility or the operator of any business within a Technopark is exempt from traffic inducement charges referred to in Article 36 of the Urban Traffic Improvement Promotion Act.
(3) Notwithstanding Article 9 of the Culture and Arts Promotion Act, any person who intends to erect a building within a Technopark may choose not to install any artistic decoration.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

CHAPTER Ⅳ MEASURES FOR SMOOTH FUNDING

Article 17 (Contributions, etc. by State and Local Governments)

(1) The State or a local government may contribute funds to a project implementer in order to support the development and operation of a Technopark.
(2) A public institution referred to in Article 4 of the Act on the Management of Public Institutions (hereinafter referred to as "public institutions"), Government-contributed institution, or Government-funded institution, etc. that is related to the projects of a Technopark may contribute funds to a project implementer.
(3) A national school referred to in Article 3 of the Higher Education Act or an industry-academic cooperation foundation, established in a national school, under Article 25 of the Promotion of Industrial Education and Industry-Academic Cooperation Act, which participates in the development and operation of a Technopark,may contribute part of the expenditure from the account of the school supporting association of such national school (referring to an account, other than the National Treasury accounts, which autonomously prepares and executes the revenue and expenditure budgets with sources of revenue, such as membership fees of the supporting association and earnings from profit-making projects, for the creation of an atmosphere conducive to academic pursuit and the improvement of educational conditions) or part of the disbursement of the relevant industry-academic cooperation foundation prescribed in Article 32 of the Promotion of Industrial Education and Industry-Academic Cooperation Act to the project implementer to support the development and operation of the Technopark.
(4) Matters necessary for the granting, use, and management of the contributions referred to in paragraphs (1) through (3) shall be prescribed by Presidential Decree.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

Article 18 (Contribution, etc. of Property by Private Schools, etc.)

(1) Notwithstanding Article 28 of the Private School Act, the educational foundation of a private school may contribute or sell infrastructure facilities for research (hereinafter referred to as "research infrastructure"), such as research facilities and equipment for testing and evaluation that have been installed with subsidies from the State or

a local government, to a project implementer.

(2) Any person (excluding the educational foundation of a private school) who has any research infrastructure installed with subsidies from the State or a local government may contribute or sell such research infrastructure to a project implementer.

(3) Any private school referred to in Article 3 of the Higher Education Act or any industry-academic cooperation foundation, established in a private school, referred to in Article 25 of the Promotion of Industrial Education and Industry-Academic Cooperation Act, which participates in the development and operation of a Technopark, may contribute part of the expenditure from the account belonging to the duties of corporations under Article 29 (1) of the Private School Act of the relevant private school or part of the disbursement of the relevant industry-academic cooperation foundation prescribed in Article 32 of the Promotion of Industrial Education and Industry-Academic Cooperation Act, to any project implementer to support the development and operation of the Technopark.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

Article 19 (Subsidization, etc.)

(1) The State or any local government may give preferential treatment, such as subsidization, to the project implementers and the occupants of a Technopark, to support the business activities prescribed in the items of subparagraph 1 of Article 2.

(2) The Minister of Knowledge Economy shall publicly notify necessary matters concerning persons eligible for, eligibility criteria and procedure for, and the method of support provided in paragraph (1), and other relevant matters.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

Article 20 (Taxation Support)

The State or a local government may grant an exemption or reduction of income tax, corporate tax, acquisition tax, property tax, registration license tax, etc., as prescribed by the Restriction of Special Taxation Act, the Restriction of Special Local Taxation Act, and any other relevant Acts, in order to support the development and operation of Technoparks.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

CHAPTER Ⅴ MEASURES FOR SMOOTH SUPPLY OF HUMAN RESOURCES

Article 21 (Permission for Leave of Absence or Concurrent Holding of Office by Public Educational Officials, etc.)

(1) Notwithstanding the Public Educational Officials Act, the State Public Officials Act, and the Local Public Officials Act, any of the following persons may take a leave of absence in order to work as an executive or employee of a project implementer or

concurrently hold a position of executive or employee of a project implementer:

1. A teaching staff member of a school defined in Article 2 of the Higher Education Act (excluding various kinds of schools defined in subparagraph 7 of the same Article);
2. A researcher in a national or public research institute (including a teaching staff member and a researcher under Article 15 of the Korea Advanced Institute of Science and Technology Act, Article 14 of the Gwangju Institute of Science and Technology Act and Article 12-3 of the Daegu-Kyeongbuk Institute of Science and Technology Act).

(2) The period of a leave of absence under paragraph (1) shall not exceed three years. In such cases, the period of leave of absence of any teaching staff member of a university or college may exceed the remaining term of his/her employment, notwithstanding Article 45 (2) of the Public Educational Officials Act.

(3) Where teaching staff members of a university or college, or researchers of a national or public research institute take a leave of absence for more than six months pursuant to paragraph (1), such national or public research institute is deemed to have an additionally prescribed number of teaching staff member or researcher corresponding to the number of persons taking such leave of absence.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

Article 22 (Technical Guidance, etc.)

(1) The State or a local government may second its affiliated public officials to the occupants of a Technopark to render guidance for technology and business management .

(2) The State or a local government may request the Small Business Corporation established under Article 68 of the Small and Medium Enterprises Promotion Act, or a public institution, Government-contributed institution, or Government-funded institution prescribed by Presidential Decree (hereinafter referred to as "guiding institution") to render guidance for technology and business management to persons who relocate into a Technopark.

(3) The State or a local government may fully or partially subsidize expenses incurred in rendering guidance for technology and business management under paragraph (2) to guiding institutions.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

CHAPTER Ⅵ SUPPLEMENTARY PROVISIONS

Article 23 (Reporting)

If the Minister of Knowledge Economy deems necessary for the implementation of this Act, he/she may require any project implementer to report data about the development

and operation of Technoparks. <Amended by Act No. 8852, Feb. 29, 2008>

Article 24 (Delegation and Entrustment of Authority)

The Minister of Knowledge Economy may, as prescribed by Presidential Decree, delegate part of his/her authority under this Act to the heads of its affiliated agencies or the Special Metropolitan City Mayor, Metropolitan City Mayors, Do Governors, or the Governor of a Special Self-Governing Province, or entrust to the heads of other administrative agencies or institutions or organizations prescribed by Presidential Decree.

[This Article Wholly Amended by Act No. 10589, Apr. 14, 2011]

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