

# 국외출장 복명서

## 1. 출장 개요

- 출장자: 서태성 선임연구위원, 정희남 선임연구위원, 이원섭 선임연구위원, 김태환 선임연구위원
- 출장지: 르완다 키갈리
- 출장일정: 2012. 5. 27(일) ~ 2012. 6. 2(토)
- 출장목적
  - 아프리카 르완다에 대한 녹색성장 기반 국토 및 도시계획 컨설팅의 일환으로 추진되는 글로벌녹색성장연구소(GGGI) 주최 “GGGI Knowledge Sharing Session : Energy Efficient Housing and Urban Planning Guideline for Green Growth in Rwanda” 에서의 세미나 참석(발표), 관계기관 협의 및 향후 컨설팅 사업 추진을 위한 현지 조사

## 2. 출장일정

| 일정           | 출발지 | 도착지 | 업무수행내용  |
|--------------|-----|-----|---|
| 5월27일<br>(일) | 인천  | 키갈리 | 인천 출발<br>키갈리 도착   |
| 5월28일<br>(월) | 키갈리 | 키갈리 | (10:00-12:00) 르완다 인프라부처(Mininfra) 방문 및 관계자 접견, 협의<br>- 르완다 정부 인프라 정책 조사 및 논의<br><br>(14:00-17:00) 르완다 주택개발청(RHA) 방문 및 관계자 접견, 협의<br>- 르완다 주택정책 논의 |

| 일정                    | 출발지 | 도착지 | 업무수행내용   |
|-----------------------|-----|-----|--|
| 5월29일<br>(화)          | 키갈리 | 키갈리 | (10:00-12:00) 르완다 자연자원청(RNRA) 방문 및 관계자 접견, 협의<br>- 르완다 토지정책 논의<br>(14:00-18:00) 교통개발공사 방문 및 관계자 접견, 협의<br>- 르완다와 키갈리 교통정책, 관리정책 논의 |
| 5월<br>30~31일<br>(수~목) | 키갈리 | 키갈리 | (09:00-18:00) GGGI Knowledge Sharing Session : Energy Efficient Housing and Urban Planning Guideline for Green Growth in Rwanda    |
| 6월1일<br>(금)           | 키갈리 | 키갈리 | (09:00-18:00) 키갈리 시내 및 주변지역 현장 탐방, 조사  |
| 6월2일<br>(토)           | 키갈리 | 인천  | 키갈리 출발<br>인천 도착  |

### 3. 주요 활동 내용

#### 1) Rwanda 정부기관과의 Meeting

##### (1) Meeting with Christian Rwakunda, Director General of Policy and Planning, Ministry of Infrastructure(Mininfra)

○ 목적:

- Preparation for the Knowledge Sharing Session and signing of MoU between GGGI and Mininfra

○ 주요내용

- GGGI discussed the specifics of collaboration between GGGI and Mininfra, Which will commence by the end of August 2012 after Knowledge Sharing Session.

- Minifra mentioned that the MoU needs to contain more specific details on how GGGI and Minifra will cooperate

## **(2) Meeting with Esther Mutamba, Director General of Rwanda Housing Authority(RHA)**

### ○ 목적

- preparation for the Knowledge Sharing Session and collaboration between GGGI and RHA

### ○ 주요내용

- GGGI discussed the proposed GGGI's country program in Rwanda, which incorporates two components, including national territorial strategy of r green growth and technical support for energy efficient housing in Rwanda.
- RHA mentioned that RHA will provide full support to make the knowledge Sharing Session successful.

## **(3) Meeting with Thierry Hoza Ngoga, Land Technical Operations Division Manager, Rwanda Natural Resources Authority (RNRA)**

### ○ 목적

- Discussion on the Land Development Master Plan

### ○ 주요내용

- Mr. Thierry Hoza Ngoga introduced RNRA which is under the Ministry of Natural Resources that heads the management of promotion of natural resources which is composed of land, water, forests, mines and geology.
- Rwanda's land use and urban planning policies and Rwanda Land Use and Development Master Plan was discussed which was developed by RNRA in cooperation with Swede Survey.

#### **(4) Meeting with Elias Twagira, director General of Rwanda Transport Development Agency (RTDA)**

○ 목적

- preparation for the Knowledge Sharing Session

○ 주요내용

- DG Elias Twagira introduced RTDA. Under Minfra, RTDA is responsible for managing all day-to-day aspects of the transport sector in Rwanda.
- GGGI discussed the specifics of the preparation for the knowledge Sharing Session and DG Elias Twagira's presentation on Rwanda's Vision and policies for green road infrastructure, as well as opportunities for future collaboration between GGGI and RTDA.

## **2) Knowledge Sharing Session**

### **(1) 프로그램**

#### **□ Energy Efficient Housing and Urban Planning Guideline for Green Growth in Rwanda**

Kigali, Republic of Rwanda, 30 - 31 May 2012

#### **◆ Day 1 (Wednesday 30 May)**

##### **□ OPENING SESSION**

10:00-10:20 Opening Remarks

- **Myung Kyoon Lee**, Director of Country Program, GGGI

10:20-11:20 Keynote Speeches

- **Keynote Speaker from James Kamanzi** (*permanent Secretray of Minifra*)
- **Myung Kyoon Lee**, Director of Country Program, GGGI  
*Journey toward Green Growth - Promoting a New Paradigm of Economic Growth and Environmental Sustainability -*

11:20-11:40 Overview of GGGI Knowledge Sharing Session

- **Okju Jeong**, Senior Program Manager, GGGI

11:40-12:00 Group Photo

12:00-13:00 **Lunch**

##### **□ SESSION I. URBAN PLANNING GUIDELINE FOR GREEN CITY**

13:00-13:30 Elias Twagira, Director General, Rwanda Transport Development Authority  
- *Rwanda's Challenges for Infrastructure Development*

13:30-14:10 **Won-Sup Lee**, Korea Research Institute for Human Settlements

- *Planning Guideline for Efficient Territorial Resources Management*

14:10-14:30 **Break**

14:30-15:00 Liliane Uwanziga Mupende, Director of Urban Planning and Construction One Stop Center, Kigali City  
- *Rwanda's Urban Development, Kigali Master Plan*

15:00-15:30 **Tae Hwan Kim**, Korea Research Institute for Human Settlements  
- *Metropolitan Management Guideline for Green City*

15:30-15:50 **Break**

15:50-16:30 **Hee-Nam Jung**, Korea Research Institute for Human Settlements  
- *Institutional Guideline for Land Use and Urban Development*

16:30-17:30 **Discussion and Session Wrap-up**

## ◆ **Day 2 (Thursday 31 May)**

### □ **SESSION II. DESIGN FOR LOW ENERGY HOUSING IN RWANDA**

09:00-09:30 Eddie Kyazzee, Head of Division of Urban Planning and Physical development, Rwanda Housing Authority  
- *Housing Status and Policy, Challenges for Housing Supply in Rwanda*

09:30-10:00 **Myoungju Lee**, Myongji University  
- *Design for Low Energy Housing: Passive and Active Design Using Renewable Energies*

10:00-10:20 **Break**

10:20-10:50 **Junsuk Lee**, Myongji University  
- *The Global Competency & Role of the Architects in Sustainable Society*

10:50-11:50 **Discussion and Session Wrap-up**

11:50-13:00 **Lunch**

### □ **SESSION III. CONSTRUCTION MATERIALS FOR GREEN GROWTH**

13:00-13:30 Leopold Mbereyaho, Dean of Faculty of Engineering, Kigali Institute of Science and Technology  
- *Construction Materials and Technology in Rwanda: Status and Potential*

13:30-14:00 **Jun Hee Kim**, Korea Institute of Construction Technology  
- *Construction Material: Selection Criteria and Process*

14:00-14:20 **Break**

14:20-14:50 **Seok Ho Lim**, Korea Institute of Construction Technology  
- *Housing Standardization for Construction Industry*

14:50-15:20 **Kwang Heum Yu**, Architecture and Urban Research Institute  
- *Institutional Framework for Housing Construction*

15:20-15:40 **Break**

15:40-17:30 **Discussion and Session Wrap-up**

17:30-18:00 **Overall Assessment and Suggestion** on the Knowledge Sharing Session and GGGI Rwanda Country Program

19:00 **Dinner**

## (2) 주요 발표내용 요약

### Opening Session

Moderated by Junsuk Lee, the opening session of the Knowledge Sharing Session was led by the opening remarks of H.E. James Kamanzi, Permanent Secretary of Mininfra. Mr. Kamanzi thanked the government of Korea for supporting Rwanda's green growth initiative and stated that the Government of Rwanda is very keen on the subject as it was incorporated in policy guidelines such as Vision 2020 and EDPRS. On behalf of the Minister of Infrastructure, Mr. Kamanzi expressed his appreciation for the support and commitment to make sure the projects become successful.

Mr. Kamanzi also stressed the presence of key stakeholders from Rwanda's different districts, public and private sector, and their role to make green growth initiative successful.

H.E. Heon Lee, Ambassador to Rwanda, gave opening remarks on Korea's vision to guide the nation's long-term development through green growth. Green growth has emerged as a key value and goal around the world, with a main focus on clean energy and energy efficiency. Cooperation on green growth is being rapidly stepped up at a bilateral level as the number of countries willing to pursue green growth and participate in the cooperation to this end is growing. Ambassador Lee mentioned that Rwanda, in particular, has shown its commitment in pursuing low-carbon economic growth, as manifested at the launch of the National Strategy on Climate Change and Low Carbon Development, which aims to guide the process of mainstreaming climate resilience and low carbon development into key 14 sectors of the economy. He also stated the backdrop against which the Global Green Growth Institute (GGGI) was established in 2010 by forward-thinking governments to advance the theory and practice of "green growth", and supporting a number of developing countries to develop their green growth plans. Ambassador Lee expressed his sincere hope that the Knowledge Sharing Session will provide a meaningful step of broad collaboration between the Government of Rwanda and GGGI.

Dr. Myung Kyoon Lee gave a keynote speech on journey toward Green Growth where he explained the adverse effects of abrupt climate change, which leads to extreme weather events, economic loss and increasing conflicts for energy, water, and food. In this light, there is a need for a new development paradigm to address economic, environmental and social challenges. GGGI defines Green growth as the new revolutionary development paradigm that sustains economic growth while at the same time ensuring climatic and environmental sustainability. For developing countries, there are existing economic and environmental challenges where Climate vulnerability and environmental degradation lead developing countries to slower economic growth and worsening already widespread poverty. Green Growth can serve as a solution for economic, environmental and social challenges, in consideration of Africa's unique circumstances has potential opportunities and benefits in pursuing Green Growth. Africa should develop its own balanced and sustainable development strategies from the beginning, leapfrogging the traditional industrial development path through international/regional cooperation, strong government leadership and action oriented green growth strategies. Dr. Lee also introduced the case of green growth in Korea with a vision of becoming the world's 7<sup>th</sup> green power by 2020 and the 5<sup>th</sup> by 2050 by national strategy on green growth and the active role of the government.

Dr. Okju Jeong gave a presentation on the introduction of GGGI and overview of the Knowledge Sharing Session. Dr. Jeong introduced GGGI's vision and history, its country portfolio and countries and the scope of the Knowledge Sharing Session. Dr. Jeong introduced the status of Rwanda as the most densely populated country in Africa with rapid rate of urbanization and remarkable economic growth. As urban development is inevitable and required for economic development of developing countries such as Rwanda, Dr. Jeong explained that GGGI would like to assist Rwanda in evolving green growth opportunities into more detailed actions through technical assistance and knowledge sharing urban planning guidelines and energy efficient housing. Finally, Dr. Jeong introduced the GGGI Team for the Country Program in Rwanda, composed of GGGI, Korea Research Institute for Human Settlements (KRIHS), Korea Institute of Construction Technology (KICT), Architecture and Urban Research Institute (AURI) and Myongji University.

### **Session I. Territorial and Urban Planning Guideline for Green Growth**

Moderated by Mr. Alfred Nkusi, the first session was led by Dr. Won-Sup Lee of Korea Research Institute for Human Settlements with a presentation on Territorial Planning Guidelines for Resource Management and Green Growth. Dr. Lee emphasized that territorial development can play a central role in transforming Rwanda to a competitive middle-income country. Modern infrastructure built through territorial development contributes not only to the nation's economic growth but also higher standard of living. Dr. Lee explained that overconcentration into Kigali region weakens vitality of other regions, resulting in spatial disparities and significant social costs to resolve the problem, and that there is a need to avoid reckless development of territory by employing well organized planning and land use system. Dr. Lee concluded that Rwanda should pursue the path for green territorial development based on green growth to form the group of next generation small power countries.

Dr. Elias Twagira of Rwanda Transport Development Agency gave a presentation on Rwanda's Vision on Policies for Green Road Infrastructure. Dr. Twagira introduced Rwanda's government policy on transport sector which believes that in order to achieve its Vision 2020, EDPRS and MDGs, development of transport infrastructure is a crucial aspect in lowering the costs of doing business in Rwanda, and the region as a whole. Since Rwanda is a landlocked country, development of infrastructure is importance for National accessibility, mobility of goods and services, increase in imports and exports of commodities, and increase in city services and tourism. Currently Rwanda has 14,000 km of road network, of which 1,017 km are under Kigali City road network. The Rwanda Transport Development Agency (RTDA) was created to achieve Rwanda's vision on transport sector, such as development and timely maintenance of national road networks. Dr. Twagira explained that pedestrian walkways and bicycles have been given emphasis in relation to the transport master plan for the Kigali City, and that RTDA is planning to address the key issues on non-motorized transportation in the future roads development by developing an essential management and design system. Due to recreational purposes easy mobility, non-motorized means of transportation such as bicycles have received much attention in Rwanda. However, there are also challenges to adopt bicycles as main means of transportation in Rwanda due to lack of coherent policy and infrastructure and driver's behavior. Finally, Dr. Twagira mentioned that for the successful development of non-motorized transportation in Rwanda, policy for the full provision of non-motorized transport should be stressed by Mininfra through RTDA, as well as in the on-going study of Kigali city transport master plan.

Ms. Liliane Mupende from One-Stop Center of City of Kigali gave a presentation on the implementation of the Kigali Master Plan. Kigali is one of the fastest growing cities in Africa with a population of 1 million. In line with the Vision 2020, the Kigali Master Plan aims to promote Kigali as a hub within central and eastern Africa, as well as a livable and environmentally sustainable city. Ms. Mupende also introduced some of the detailed physical plans and zoning plans such as the Kimihurura conventional center, subarea plans in Rebero, Kimihurura and Kinyinya, and Road Network Plan. She also states that there are key issues to address such as housing and transportations for the community, tourism and infrastructural demands. In order to successfully implement the Kigali Master Plan, Ms. Mupende stressed the importance of specific implementation plans such as district physical plans and transportation master plan, public realm design standards, collaboration between the relevant authorities, affordable housing technologies, financing mechanisms and legal framework.

Dr. Hee-Nam Jung of Korea Research Institute for Human Settlements gave a presentation on the case of Korea's land use planning and urban development from the late 1940's to 2000's. The path of urbanization in Korea can be categorized into several phases. From 1940's to 1950's Korea was liberated from Japanese colonization, followed by a military coup in 1961 to escape absolute poverty. In the 60's, industrial policies focused on labor-intensive manufacturing as economic

development took-off. Following rapid industrialization, urban growth and rural to urban migration followed. In order to accommodate the need for rapid urbanization and industrialization infrastructures such as extensive network of roads, expressways, subways, the high-speed KTX (Korea Train Express), harbor, airport were installed throughout 1960 to 2008. Although increase in urbanization and industrialization also brought about increase in GDP, it also brought about discrepancies in the demand and supply of land where land and housing speculations chronically appeared. To address this problem, several measures were taken to regulate the speculative demand for urban land and housing such as land transaction permit/report systems and land value increment tax. Dr. Jung also explained the Land Readjustment (LR) Project where landowners made their land available for development and receive in return either serviced land or money in proportion to the value of the land they contributed to the project. Publically Managed Development (PMD) Projects were also introduced where project plans financed with the developer's own funds were resold as serviced land in the private market while development gains are used to lower the sales prices of land for low income groups, as exemplified in the case of Bundang and Pyeongchon. As most of the urban land for housing was developed through PMD projects after the 1980's, division of labor in urban development has been divided as land development for the public sector and housing construction for the private sector. As for the land policy in the early 1990's, the global trend in deregulation and privatization led to revision on national and use and management law in 1993. However, there were also negative results of globalization such as the Asian financial crisis in the 1997, as well as reckless development in the outskirts of city. To address these reckless developments, land policy in Korea emphasized sustainable development and "plan first- develop later" schemes in the 2000's. Finally, Dr. Jung stressed policy implications for Rwanda such as establishments of legal foundations, land information registration system and a functioning market with transparent set of laws and regulations.

Dr. Tae-Hwan Kim of Korea Research Institute for Human Settlements gave a presentation on the status and management policy for the Seoul Capital Region and its implications for Kigali. Out of 11 city regions in Korea, Seoul Capital Region (SCR) is the largest city region with almost half of South Korea's population. Compared to the stabilized population of Capital region in the developed nations, the SCR is still on the course of population growth where Forecast on the population size of the SCR shows the continued growth until 2030. The gap between the SCR and the rest of the country continues to widen while Decrease of manufacturing and increase of service industries. As Side effects of rapid urban development and concentration of functions, Seoul has a disproportionate share of central functions such as corporate headquarters, producer services, major commercial facilities, political and administrative institutions, higher education and cultural institutions that generates a heavy commuting to Seoul from other cities. The number of vehicles in the SCR and traffic congestion has enormously increased in a relatively short period of time. Reckless development and deterioration in natural environment also remains a problem where forest and semi-agricultural land have been sacrificed for urban development. In terms of quality of life, the SCR is still behind the capital regions of the developed nations. Policy Measures to control the growth of SCR emerged in the early 1960's where the main objective was to steer the location of people and industries away from the SCR. Major policy Measures include Greenbelt policy, Restrictive measures for construction of large buildings, factories and expansion of higher education facilities, and relocation of government and public organization. In relation to green growth of SCR, policy measure has been established with the aim of counter balancing the adverse effects of climate change. These include Urban Planning Guidelines for Low-Carbon Green Growth, development of self-reliant cities and restructuring of settlement system, green transportation policy, and building low carbon green city. As for implications for Kigali, Dr. Kim explained that it is important for Kigali to facilitate the development of a multi-core centers, establish well-developed transportation system, introduce zoning system and designate a green enterprise district.

## **Session II. Housing Policy and Energy Efficient Design**

Moderated by Dr. Sung Han Park of National University of Rwanda, the second session was led by the presentation of Mr. Edward Kyazze of RHA on the housing policy status and challenges for housing supply in Rwanda. Mr. Kyazze explained that Rwanda's housing policies aim to develop programmes aimed at providing urban housing for a cross-section of the population. However, despite policy (and legal) initiatives on affordable housing pursued by government, there is still a widening gap between policy advocacy and implementation as both the public and private sector remain hesitant in investing in both housing finance and affordable housing provision for low-income households. The challenge is to have a model that can address the highlighted aspirations (or inadequacies) to facilitate 'affordability'. As the rate of urbanization and the demand for housing is rapidly increasing, there is a serious shortage of housing in Rwanda. As housing market remains risky for both public and private sector to invest, it is the low-income households that are the mostly affected since they are unable to access mortgage loans. In conclusion, Mr. Kyazze stated that housing issues cannot be solved on an individual-based approach as they call for collective community-combined effort. In order to deliver housing affordable to various income levels, more effective and flexible models and innovative approach (product designs) need to be adopted. Moreover, coordinated and tandem efforts among private sector, public sector, NGOs and other players will enable a synergy which is essential for making housing affordable.

Ms. Juliet Kabera from Rwanda Environment Management Authority gave a presentation on the climate change and Rwanda's intervention towards green growth. Ms. Kabera began her presentation with the definition of climate change and global warming. As for signs of climate change in Rwanda, the average temperature of Rwanda has increased by 0.9°C in the last 27 years while the number of days of rainfall has decreased from 148 to 124 days within the last 40 years. The effect of climate change includes natural calamities such as floods and landslides, loss of crops, shortage of water resources and food insecurity. As climate change is a cross-cutting issue among many sectors, measures to mitigate the adverse effect of climate change have been introduced. Ms. Kabera also introduced the National Strategy for Climate Change and Low Carbon Development which aims for Rwanda to a developed climate-resilient, low carbon economy by 2050.

Prof. Junsuk Lee from Myongji University gave a presentation on the global competency and the role of architects in sustainable society. Prof. Lee explained that architecture involves everything that influences the way in which the built environment is planned, designed, made, used, furnished landscaped and maintained. Architect is responsible for conception of all architectural environments and also responsible for the improvement of the education and training of future architects to enable them to meet the expectations of 21st Century societies worldwide for sustainable human settlements in every cultural heritage. Prof. Lee then introduced the Conditions for Accreditation of Korea Architecture Accreditation Board as well as the UNESCO/UIA Charter for Architectural Education. As rapid process of globalization is consolidating the world economy, core competency requirements of licensed architects are also becoming transferable. The Canberra Accord has been signed in 2008 among accreditation/ validation agencies from Australia, Canada, China, Korea, Mexico and US to facilitate the portability of educational credentials among these countries.

Prof. Myoungju Lee from Myongji University gave a presentation on designs for low energy housing and passive and active design using renewable energies. Prof. Lee stated that the current conditions of Rwanda, such as rising population, lack of natural resources, deforestation, weak infrastructure, are similar to Korea's past in the 60's. However, while Korea's development has been heavily dependent on fossil fuel, Prof. Lee stated that Rwanda doesn't necessarily have to follow Korea and other developed countries' example but leapfrog to different path of green growth. In particular, green growth can be achieved by the use of energy efficient technology and renewable energy. In terms of building life cycle approach, over 80% of greenhouse gases are emitted from buildings. Prof. Lee introduced the concept of low-energy housing as a type of house uses less energy than a traditional or contemporary house. Since primary needs for energy in Rwanda's buildings account for air conditioning, cooking, lighting, and hot water, a different strategy must be

taken in relation to energy efficient housing. For Design practices for Housing or building site development on Sloped region, important concept for "Sustainable site development" could be implemented. As an example from Korea, Prof. showed video clips and pictures of actual passive design houses from Korea.

### **Session III. Construction Materials and Technology**

Moderated by Mr. Innocent Kalimba of Rwanda Housing Authority, the third session was led by Dr. Leopold Mbereyaho, Dean of Kigali Institute of Science and Technology. Dr. Mbereyaho gave a presentation on the status and potential of Rwanda's construction materials and technology. In Rwandan villages, as well as in other developing countries, the application of wood, mud and grasses as main building materials are crucial as selection of construction materials are limited. From rural areas of Rwanda, houses made with clay, stones and grasses are still common. For villages and for poor people, the Government embarked on a campaign on 2008 to improve housing, which included the eradication of Nyakatsi (thatched house). It was the government's target to put an end to grass-thatched houses so that poor Rwandans would have decent shelters equipped with modern and healthy infrastructure. In addition, Rwanda's building and construction industry today is rapidly growing and has seen a boom in the past couple of years as it is being transformed from being state funded to private funding. The challenge remains that Rwanda's construction materials industry remains underdeveloped due to limited capacity for material testing, limited quantity of raw materials and environment protection issues. As for Rwanda's opportunities and potentials, there an enabling environment for partnership and collaboration is present to share the experiences and getting the financial support. In spite of different and difficult historical period, Rwanda now has the necessary tools to a reach a sustainable development such as respective policies and guidelines. In line with this, sustainable construction materials are needed for the development of all types of infrastructures. There is a need for all stakeholders, such as academia, political and business leaders, to work together with each bringing his contribution in order to ensure the affordable and sustainable materials.

Dr. Seokho Lim of Korea Institute of Construction Technology gave a presentation on the standardization of construction materials in Korea with a focus on dimensional standardization, design standardization and Modular Coordination (MC). To achieve standardization, the construction industry needs common discipline among each sector of design, material manufacture and construction. To make the effects of standardization visible, the principle has to be unified as national rules and standards. During the past four decades, Korea has made a great progress in each part of design, material manufacture and construction; although its effects were limited since no common rules were established among sectors. Every criterion for each sector, when synthesized, acts as obstacles for standardization. To stabilize standardization in the domestic construction industry, the Korean government has established a strategy for nationwide application which aims to improve each sector of the standardization and establish a cooperative organization to perform standardization with continuous programs. Standardization is expected to enhance the productivity through increasing competitiveness between design criteria and material sizes, and is also expected to preserve the environment through reducing wastes from construction sites. There is a need to synthesize and analyze references and data related to the existing standardization, and then investigate the current situation in design, construction and material production sectors in Korea.

Dr. Junhee Kim of Korea Institute of Construction Technology gave a presentation on construction materials to activate the housing construction in Rwanda, with a focus on focus on selection criteria and process of construction materials by customizing Rwanda's short- and long- term housing plans. To select the optimal construction materials and to propose a customized system for activating the housing construction in Rwanda within the paradigm of low-carbon green growth, a customized process and criteria for construction materials are essential. In general, there are four key steps in the customized process in the selection construction materials. The analysis of the needs on the target site and the analysis of the characteristics of potential construction materials are the

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Dr. Seokho Lim of Korea Institute of Construction Technology gave a presentation on the standardization of construction materials in Korea with a focus on dimensional standardization, design standardization and Modular Coordination (MC). To achieve standardization, the construction industry needs common discipline among each sector of design, material manufacture and construction. To make the effects of standardization visible, the principle has to be unified as national rules and standards. During the past four decades, Korea has made a great progress in each part of design, material manufacture and construction; although its effects were limited since no common rules were established among sectors. Every criterion for each sector, when synthesized, acts as obstacles for standardization. To stabilize standardization in the domestic construction industry, the Korean government has established a strategy for nationwide application which aims to improve each sector of the standardization and establish a cooperative organization to perform standardization with continuous programs. Standardization is expected to enhance the productivity through increasing competitiveness between design criteria and material sizes, and is also expected to preserve the environment through reducing wastes from construction sites. There is a need to synthesize and analyze references and data related to the existing standardization, and then investigate the current situation in design, construction and material production sectors in Korea.

Dr. Junhee Kim of Korea Institute of Construction Technology gave a presentation on construction materials to activate the housing construction in Rwanda, with a focus on focus on selection criteria and process of construction materials by customizing Rwanda's short- and long- term housing plans. To select the optimal construction materials and to propose a customized system for activating the housing construction in Rwanda within the paradigm of low-carbon green growth, a customized process and criteria for construction materials are essential. In general, there are four key steps in the customized process in the selection construction materials. The analysis of the needs on the target site and the analysis of the characteristics of potential construction materials are the

foundation in establishing selection criteria for construction materials. The comparison and analysis between the needs and capacities in the construction materials produces the customized selection procedure to the target site. Finally, the evaluation methods are reviewed in terms of life-cycle analysis. Dr. Kim emphasized that first, the needs in Rwanda's housing system should be collected and analyzed with the status information on the general status on Rwanda and the construction status on Rwanda. Second, the characteristics of major materials in housing should be investigated in the classification with structure materials, finishing materials, window and others. The material performance needed to housing members should be examined in terms of quantitative performance including stability, residential performance etc. and of qualitative performance including location, use, scale, structure form etc. Third, the selection process of the construction materials should be customized to in Rwanda's residential buildings. Finally, the optimal materials would be reviewed in terms of residential life cycle in Rwanda.

Dr. Kwang Heum Yu of Architecture and Urban Research Institute gave a presentation on Institutional Framework for Housing Construction. Housing construction means both a stable housing supply and the assurance of the residence right by its supply. Dr. Yu explained that housing construction could be explained following as two stages: converting lands to be constructible for buildings and constructing houses and relevant buildings. Land development has been accomplished by diverse development methods according to the development purpose, and the national government mostly has a main role to develop lands. Furthermore, legislative supports and development corporations have worked on housing supply projects in order to develop lands. For instance, land developments in Korea have legal grounds based on Housing Site Development Promotion Act, and Korea Land and Housing Corporation founded by the government have performed land developments. Private parties mainly fulfill on the process of constructing buildings, and the performance of constructing buildings have been regulated by laws such as Building Act, Certified Architects Acts, Framework Act on the Construction Industry, etc. Dr. Yu emphasized that it is necessary to reform a legal system in order to achieve policy goals. And for that, it is needed to take into consideration both the composition of organization and the role division between private parties and the government, also an appropriate institutional systems is simultaneously essential.

After all Session III, the participants to the Knowledge Sharing Session had a chance to have a discussion with the presenters who were divided into component 1 (Development of National Territorial Strategy for Green Growth) and component 2 (Technical support for energy efficient housing measures and their institutional set-up).

As a result of the discussion for the component 1, challenges in the implementation of the master plan in the district level were discussed. Financial support, public awareness, cooperation between the central government and the local government, lack of private investment to public infrastructure were raised as some of the challenges to successful implementation of the territorial master plan. Sending local urban planners and engineers to other countries in order for them to bring new skills and technology to the country and maintaining qualified staff in their position while avoiding turnovers were mentioned as some of the solutions for successful implementation of the Plan.

For the component 2, the issue was upgrading the production of construction materials while preserving the environment. Shortage in cement production in the background of a construction boom stresses the need for cement and the industry's expansion. However, there is a challenge to this expansion in the Rwandan context as REMA requires companies to develop an environment impact assessment which determine if the project interferes with the environment and solutions to these problems. Some effect on the environment is considered inevitable in creating cement, to which the government should understand. As a solution, RHA should initiate talks with the government to support the cement industry, and try to come up with ways on how to support this industry such decreasing taxes.

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