SUGGESTIONS FOR IMPROVING LID-RELATED LAWS AND POLICIES IN KOREA

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Abstract - Floods and water shortages resulting from urbanization and climate change are looming large around the globe. LID (Low Impact Development) is suggested as a viable option to address the challenge in water-stressed cities. Still, LID is in its infancy in Korea because of legal and institutional obstacles. Hence, this paper sheds light on some requisites for the enactment and enforcement of LID by analyzing LID-related laws and policies in advanced countries, and also makes suggestions for reinforcing relevant systems for further implementation of LID in Korea

Keywords - Low Impact Development, Water Cycle,Law Institution Improvement.

I. INTRODUCTION

Emerging in urban planning as a means of managing the water cycle in cities, LID is defined as a method of restoring a pre-development water cycle system via diverse strategies and components (Prince's Georges County, 1999; US EPA, 2007). Nevertheless, LID is still in its infancy in Korea due to legal and institutional limitations. The country has not enacted any law governing the LID implementation in space, nor viable guidelines and schemes (Ban, 2015). The absence of a governing law precludes any compulsory implementation of LID in building or urbanization projects (Lee et al., 2014). Also, LID-related laws, policies and guidelines do not consider urban development systems. Although LID should be reflected in the early stage of urban planning (e.g. initial land use plans), specific methods of implementing LID in space as planned are not available. Consequently, LID is deemed only as structural facilities in Korea while the conservation LID emphasizes in land development and growth management is underestimated (Suh, 2015). For that reason, this paper analyzes LID-related laws and policies in overseas countries to highlight the requisites for enactment and enforcement of LID, examines relevant laws and policies in Korea, and makes suggestions for further implementation of LID. Chapter 2 reviews the laws and policies concerning LID and water management in advanced countries to derive implications. Chapter 3 assesses the laws and policies relative to LID in Korea for their reinforcement. Chapter 4 makes suggestions for the enactment and enforcement of LID in Korea, and draws conclusions.

II. OVERSEA LID-RELATED LAWS AND POLICIES AND IMPLICATION

2.1. LID-Related laws and policies in advanced countries

Initiated in Prince George's County Maryland in late 1990, LID has spread nationwide. The U.S. Environmental Protection Agency (US EPA) does not control the quantity and quality of water but establishes guidelines or directions for each state government to implement the integrated water resources management.

Analogous to LID, Australia's 'Water Sensitive Urban Design' is underpinned by the Water Act 2007 and governmental reorganization for water resource management. Australian state governments set up policy directions for integrated water resource management and share information, managing water resources as per hydrological conditions and federal policies. The federal government does not intervene in states' policy implementation and administrative reorganization because of decentralization (Park, 2010).

The UK's 'Sustainable Urban Drainage System (SUDS)' is grounded in the Water Act 1983 and Water Resource Act 1991. The Water Act 1983 stipulates central and local governments' roles and authorities in efficient water resource management and operation, and assigns a supervisory authority per basin. The Act 1991 extends the Environmental Agency's authority over water resource management to supervising and licensing the use and storage of water resources in water-related businesses and agencies.

Japan's 'Water Cycle Act' aims to protect water resources and catchment forests, requires the government to develop a 'water cycle plan' every 5 years, provides August 1st as 'Water Day' to cherish a sound water cycle, and prescribes governments manage water as 'an invaluable public asset'.

2.2. Implications

The foregoing overseas cases imply the following. First, it is necessary to connect water resource management with space planning and take specific approaches. Those cases stress development and conservation, and conservation and connectivity of basins and ecosystem. Notably, it is crucial to secure the connectivity with urban space plans including district unit plans and urban park and green space

plans relevant to city master plans. LID in each urban space need be linked to relevant plans (city master plans, management plans and district unit plans) and urban infra plans (urban park and green space plans and traffic plans). Also, it is essential to meet LID-related goals set forth in higher-level and relevant plans and consider the goals and strategies presented in plans in each sector.

Second, given the central aim of LID, a multidisciplinary approach is critical for LID implementation beyond 'environment conservation and management'. Sophisticated techniques and technologies facilitate the maximal manifestation of multi-functionality of LID involving storm-water runoff management for water quantity, non-point pollutant source management for water quality, green ecological space, aesthetics including landscapes, micro-climate control and public health. Yet, given current assessment systems and methods, it is reasonable to focus LID on 'water quantity and quality and green space'.

III. ASSESSING LID-RELATED LAWS AND POLICIES IN KOREA AND SUGGESTIONS FOR IMPROVEMENT

3.1. Assessment areas and criteria

To assess the extent to which local LID-related laws and policies can assure the LID implementation based on the implications, we sub-classify the assessment areas and criteria into the space and environment planning as in Fig 1.

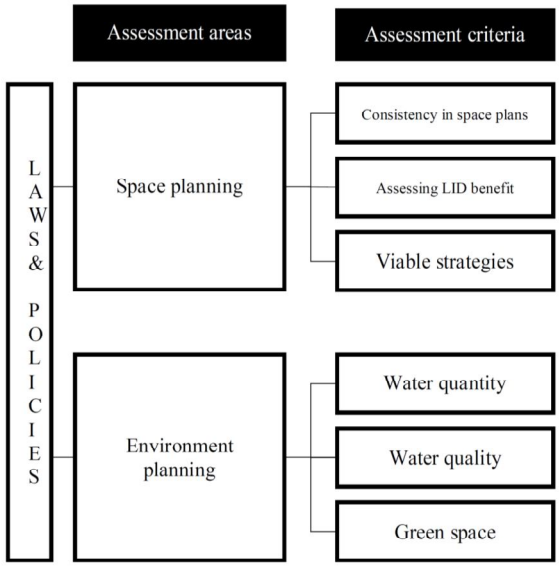


Fig.1. assessment areas and criteria

The assessment criteria are outlined in the Table 1.

Table 1: Assessment criteria and details

Planning		Description
Space planning	Planning LID	To determine if LID-related 'fundamental inspection and analysis', 'conception', 'land use planning', 'facility planning' and implementation details are specified.
	Connectivity between LID plans	To determine the viability of links between high-level space planning and LID-related details in practice.
	Viability of LID plans	To determine the presence of regulations and strategies as part of efforts to reflect the advice of responsible agencies and to listen to community voices in planning.
Environment planning	Water quantity	To determine if regulations and responsive strategies regarding water quantity are included, e.g. infiltration (mm/year) and surface runoff (mm/year).
	Water quality	To determine if regulations and responsive strategies regarding water quality are included, e.g. total nitrogen (T-N, kg /year), total phosphorous (T-P, kg/year) and BOD(kg/year) goals achieved.
	Green space	To determine if regulations and responsive strategies concerning green space are included, e.g. compatibility in conservation areas and developable lands.

3.2. LID-Related Laws and Policies in Korea

We investigate the spatial plans and guidelines for LID in Korea particularly in the highest-level laws concerning space planning, i.e. the National Land Planning & Utilization Act, City Master Plans and Urban Management Plans, and the District Unit Plans involving the air and water cycles.

Meanwhile, laws and policies relevant to environment planning concern water quantity and quality and green space. We examine the Total Water Pollution Load Management System, Water Environment Conservation Act, Environmental

Impact Assessment Act, Promotion of & Support for Water Reuse Act and Countermeasures against Natural Disasters Act.

3.3. Assessment of Korean Laws and Policies and Suggestion for Improvement

LID-related laws and policies in Korea are assessed in terms of space planning. As shown in Table 2, LID planning and connectivity and viability of LID plans are all insufficient. Specifically, the concept and principles of LID are not fully reflected. The principles need to mention the water cycle or define LID. The 'environment conservation and management' plans should focus on LID-related details or formulate specific independent LID plans. Yet, these issues are not limited to LID but result from overall environment plans failing to be embedded in space planning.

Table 2: Space planning assessment result

Section	Description
Planning LID	· The need to consider conservation areas in land use is advised without informing the LID-related inspection items. · Comprehensive analysis and conception is infeasible due to the absence of LID-related fundamental inspection. Detailed lower-level plans fail to involve LID.
Connectivity between LID plans	· The assessment system cannot efficiently control the planned destruction of natural environment. The connection between the assessment system and plans is loose. · Quantitative goals of post-development LID benefits are not set.
Viability of LID plans	· No governance criteria exist for reflecting the advice of related agencies. · No criteria exist to determine if community voices are properly heard in planning.

The assessed LID-related laws and policies deal with various environmental issues from different perspectives including flooding, water pollution, and destruction of green space and eco-system (Table 3). As the defined targets of LID vary with the rationales of enforced laws and policies and environmental characteristics, and as policy measures for LID improvement diversify with different perceptions, limitations exist. The overarching connectivity with spatial plans is hardly embodied in space despite the presence of LID-related descriptions and assessment methods in terms of water quality and quantity and green space.

Table 3: Environment planning assessment result

Section	Description
Water quantity	(Countermeasures against Natural Disaster Act) · Defines storm-water runoff reduction facilities, establishes countermeasures and facility standards, and prescribes operation thereof. · Types of storm-water runoff reduction facilities, relevant countermeasures and applicable installation targets are specified in its ordinance. · Defines rainwater harvesting facilities.
Water quality	(Water Environment Conservation Act) · To reduce business-induced non-point pollutant sources, it defines non-point pollutant sources, non-point pollutant reduction system, storm-water runoff and impermeable layers. ·Businesses/facilities required to report on non-point pollutant sources, non-point pollutant reduction facility installation, designated regions of non-point pollutant sources and management measures are specified in its ordinance. (Environmental Impact Assessment Act) ·Prescribes the conformance to environment conservation plans and alternatives should be analyzed to examine the feasibility of lands and the environmental viability of plans. (Total water pollution load management system) · Sets forth approaches to managing non-point pollutant sources and LID in development projects, types (biotope areas, rainwater harvesting/infiltration/filtering/storage systems), installation criteria, management plans, reduced load calculation and management examples of non-point pollutant sources.
GGreen space	(Environmental Impact Assessment Act) · Establishes specific management guidelines on regions advised to be conserved in environmental assessment. · Includes proactive measures and strategies to cope with regional conflicts and environmental pollution owing to development, water and green space.

CONCLUSIONS

As aforementioned, LID-related laws and policies should be implemented from two perspectives, or a governing law on LID linked to viable spatial plans. We suggest the following for improving the laws and policies for integrating LID with spatial plans.

1. First, provisions on LID support need be enacted. To forestall any conflicts with established laws and policies, we propose the enactment of a special act governing LID (tentatively named) stipulating the LID master plans and action plans by central and municipal governments, respectively, involve the following:
   1. Goals and directions of LID;
   2. Analysis of preferred and critical regions for LID;
   3. Quantitative goals and allotment of LID;
   4. LID management facilities and related issues; and
   5. LID-related programs and promotion.
2. Second, the guidelines and policies concerning spatial plans should be linked to LID plans. Mandatory provisions and recommendations should be given so that LID can be applied in the early stage of planning. Plus, incentives need be provided based on LID certification and assessment. The entire urban planning process, not just the land use plans, should allow for LID, which is integral to complementary plans conforming to LID-related plans and policies. The holistic approach to incorporating LID factors in the whole process ensures the consistency in planning. Higher-level plans should specify the directions of LID, whilst lower-level plans, e.g. District Unit Plans, should involve quantitative analysis of LID-related benefits, since the latter cover nonstructural and structural LID techniques, embrace higher-level directions and LID plans and are legally binding, given the urban-planning hierarchy.
3. Third, environmental benefits of structural and nonstructural LID techniques should be quantitatively analyzed so that the benefits can be reflected in planning a proper deployment and capacity of LID.

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