

생태계보전부담금 반환사업의 복원기술 활용 경향과 방향 - 2014년부터 2020년까지 시행 사례를 중심으로 -

윤영관¹⁾ · 이호우¹⁾ · 구본학²⁾

¹⁾상명대학교 그린스마트학과 학생 · ²⁾상명대학교 그린스마트시티학과 교수

Trend and Development Direction of Restoration Technology Utilization in Ecosystem Conservation Charge Project - Focusing on Implementation Cases from 2014 to 2020 -

Yoon, Young-Kwan¹⁾ · Lee, Ho-Woo¹⁾ and Koo, Bon-Hak²⁾

¹⁾Dept. of Green Smart, Graduate School, Sang Myung University, Student,
²⁾Dept. of Green Smart, Graduate School, Sang Myung University, Professor.

ABSTRACT

The Ecosystem Conservation Levy (formerly known as the Ecosystem Conservation Cooperation Fund) system has been in place for 20 years, and it can be said that it has now entered the settlement stage. Based on an analysis of publicly available project implementation data from 2014 to 2020, we found that: 1) As the number of return projects increases, the targets of restoration technologies are also strengthening, and it is necessary to frame a series of processes from application, creation, and monitoring for some detailed projects to improve the effectiveness and efficiency of utilizing the levy. 2) Most of the implemented projects are applied as micro-ecosystem creation, but there are many cases where the contents of the project can be seen as other project categories. This shows that the purpose of the return project needs to be approached more clearly and suggests that institutional complementation is needed from the project application stage. 3) The detailed technologies applied tend to be gradually expanding, but most of them are technologies that are not differentiated from general development projects. It is urgent to secure a more technical identity, such as a range and list of utilized technologies suitable for the characteristics and purposes of return projects. 4) It is necessary to establish a relevant evaluation system or framework to utilize the monitoring results of restoration projects. 5) There have been few cases of application of single restoration technologies since the

First author : Yoon, Young Kwan, Dept. of Green Smart, Graduate School, Sang Myung University, Student
Tel : ***-****-**** E-mail : longput@naver.com

Corresponding author : Koo, Bon-Hak, Dept. of Green Smart, Graduate School, Sang Myung University, Professor,
Tel : +82-41-550-5300, E-mail : ecoculture@smu.kr

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beginning, but the content and scope of the complexity tend to expand in recent years. Even if the objectives are not comprehensive and diverse, it can be seen that many parts of the projects are oriented toward convergence, so it is necessary to conduct separate research on this. 6) As for the direction of improvement of the return project, it is possible to consider expanding the restoration and conservation focus to partially accommodate the complexity of the natural environment and human ecology. It seems that the expansion of restoration technologies that consider the role and function of humans in the natural environment should be explored.

Key Words: *Conservation of the natural environment, Levy Return Projects, Micro Ecosystems, Type of technology applied by charge project, Contents and categories of charge project.*

I. 연구 배경 및 목적

1. 연구의 배경 및 목적

자연환경보전법 상 생태계보전부담금(구 생태계보전협력금)의 적절한 활용에 대한 논의는 계속되고 있으며, 최근(자연환경보전법 제17846호, 2021. 1. 5., 일부개정)에는 법 제정의 취지와 자연생태적 가치 반영의 한계성 등을 고려하여 “생태계보전협력금”을 “생태계보전부담금”(이하 부담금)으로 변경한 바 있다. 부담금 제도

가 도입된 이후 이것을 활용한 생태계 보전 및 복원 사업의 규모와 종류가 확대되는 경향을 보이고 있지만, 200여 사업이 추진되는 과정에서 그 추진에 대한 보완도 꾸준히 지적되고 있다. 따라서 부담금의 적절한 활용을 위하여 2001년 10월부터 시행 중인 생태계보전부담금 반환사업(이하 반환사업)의 최근 사용 경향을 검토하고 향후 사업 추진의 방향을 모색하였다.

2. 연구의 내용

반환사업은 법령상(자연환경보전법 제46조제

Table 1. Applicable technologies for the ecosystem conservation charge project

Category of restoration project	Applied technology	Related laws
Creation of micro-ecosystem	Technology related to the creation of biological habitat spaces to increase biodiversity and improve the continuity of ecosystems, such as the ability of wildlife and plants to move between habitats, or to improve the habitat conditions of specific species.	Nature Conservation Act2, Article6
Alternative nature composition	A technology that installs ecological spaces such as artificial structures and vegetation to prevent the habitat of wild life and plants from being cut off, damaged, or destroyed by roads, dams, underwater beams, and embankments, and to maintain the continuity of the ecosystem, including the movement of wildlife and plants.	Natural Environment Conservation Act No.9, Article45
Installation of conservation and use facilities	Technologies utilized to perform similar or complementary functions to existing natural environments.	Natural Environment Conservation Act No.2, Article11
Restoration of damaged ecosystems	The technology of installing related facilities for the preservation and healthy use of the natural environment.	Nature Conservation Act No.38.
Restoration of other damaged ecosystems	A technique applied to an area that is recognized as being in particular need of restoration to maintain ecosystem continuity or enhance ecological function.	Nature Conservation Act No.43-2

Table 2. What to analyze for the ecosystem conservation charge project

year	number of projects (number of analysis)	main project name	study object
2003~2013	76 (0)	Ulsan Taehwa River Bamboo Forest Ecosystem Conservation Project, Seoul Urban Ecology Map Creation Project, Suwon-si Gwanggyosan Ecological Axis Restoration, etc.	×
2014	13 (13)	Environmental forest restoration project at the site of the abandoned railway line in Mapo, ecological oasis creation project in downtown Daejeon, habitat restoration project for endangered species in Ansim Wetland, etc.	○
2015	15 (14)	Small ecosystem creation project for urban development, ecological restoration of buffer green area in Jeongwang, Siheung, restoration project of replacement habitat for toads in Cheongju, etc.	○
2016	15 (12)	A small living habitat creation project through the restoration of a water reservoir in the city center, a Galsan small ecosystem restoration project to restore the disconnected urban ecological network, a ecological forest restoration project using the abandoned sports facility site, etc.	○
2017	20 (13)	Restoration of habitat for endangered prickly lotus flowers that are native to urban wetlands, restoration project for fireflies above Geumtosan Tunnel, restoration and operation of bird habitat with local residents and bird associations, etc.	○
2018	20 (17)	Gwangju old downtown ecological infrastructure construction project, Wolbong forest edge restoration project, Jeju Hamori abandoned space habitat restoration project, etc.	○
2019	20 (16)	Eunpyeong Hanok Village Urban Biodiversity Wetland Improvement Project, Endangered Species Habitat Restoration Project with Suwon Citizens' Environment Group, Migratory Bird Network Reinforcement Project through DMZ Crane Habitat Conservation, etc.	○
2020	33 (23)	Ecosystem restoration and ecological network establishment project at the foot of Moraksan, Uiseong red-spotted rhododendron habitat restoration project, Gwangyang Umbrella Ecological Forest restoration project connecting the fragments of the hole in the habitat, etc.	○

2항) “소생태계 조성, 생태통로 조성, 대체자연 조성, 자연환경보전·이용시설의 설치, 기타 훼손된 생태계 복원” 등으로 규정되어 있으나 금액이나 규모, 위치 등의 별도 정량적 기준은 미흡한 편이다. 따라서 시행된 반환사업의 종류와 사업 결과 등에 대한 고찰은 미진한 상황으로 효율적이고 효과적인 자금 사용을 위한 기본적인 사업 유형 검토가 필요하다. 따라서 본 연구

에서는 반환사업 결과 자료가 공개된 2014년부터 2020년까지의 사업을 대상으로 각 사업에 사용된 복원기술의 종류와 범위 등을 분석하여 최근의 경향성을 확인하고 이를 기반으로 관련 정책의 변화 방향을 모색하고자 하였다.

3. 선행연구의 검토

본 연구와 직접 연관되는 연구로 Cho &

Table 3. The study's findings and analytic framework

analysis content	key analysis	detail example	analysis frame	note
Contents and categories of charge project	categorization of the objectives of the project and the effects of the project	restoration of damaged areas, improvement of ecological functions, addition of ecosystem services, etc.	1) Project Category: Creation of small ecosystems, creation of ecological pathways, creation of alternative nature, installation of conservation and use facilities, restoration of damaged ecosystems, etc. 2) Project purpose: restoration, improvement, creation, etc. 3) Project details 4) List of applied technologies	Analysis by project
Type of technology applied by charge project	technology used, such as the content and scope of detailed restoration technology used in project implementation	habitat by species, ecological pathway, ecosystem recovery, etc.		Analysis by year

Kim(2010)은 반환사업 추진의 현황과 개선 과제를 당시 사업 사례를 분석하여 유형별 시범사업 추진으로 모범을 제시할 필요, 철저한 생태환경 조사, 복원 서식처와 공급원 사이의 연계성 고려, 반환사업의 지자체 홍보, 주민참여형 사업으로의 유도, 전문적 지식에 의한 사업 추진 등으로 도출하고 있다. Lee(2015)는 부과금 산정의 개선방안과 해당 근거법 및 관련 규정의 보완을 검토하기도 하였다. 이외에 부담금 제도의 개선에 관한 연구(Kim & Lee, 2011, Kim, 2012, Han, 2013), 반환사업의 실태와 관리에 관한 연구(Lee & Sung, 2013, Cho, 2021) 등이 이루어진 바 있다. 본 연구는 이러한 접근과는 달리 최근 시행 사례를 분석하여 복원기술의 활용경향과 방향을 모색한다는 점에서 차별성이 있으며 정책화 방안을 제안한다는 목적이 있다.

II. 연구 대상 및 방법

1. 연구 대상의 선정

1) 부담금 부과대상 및 반환사업 내용

부담금은 환경부 주관이나 지방자치단체가 부과 및 징수 업무를 추진한다. 이는 「자연환경보전법」 상에 의한 것으로 개발면적 3만제곱미터 이상인 개발사업을 주 대상으로 한다. 반환사업은

“생태계 · 생물종의 보전 · 복원사업, 자연환경복원사업”을 주 대상으로 하여 “생태계 보전을 위한 토지등의 확보, 생태 · 경관보전지역 등의 토지등의 매수, 자연환경보전 · 이용시설의 설치 · 운영, 도시생태 복원사업, 생태통로 설치사업, 생태계보전부담금을 돌려받은 사업의 조사 · 유지 · 관리, 유네스코가 선정한 생물권보전지역의 보전 및 관리” 등으로 그 용도를 지정하고 있다. 이는 부담금 및 반환사업 추진의 핵심 목적을 보여주며 이를 중심으로 사업 내용이 구성되어야 함을 보여준다.

따라서 분석대상 사업은 이러한 기본적인 신청의 조건을 만족한 것으로 가정하여 접근하였고 사용되는 복원기술의 범위로 이러한 범주 내에서 구성된 것으로 보았다. Table 3은 본 연구의 전체적인 연구의 방법과 틀을 요약한 것이고, Table 4는 분석 내용의 범주를 요약하고 있다.

2) 분석대상 반환사업 범위

2003년부터 2020년까지 사업이 완료된 반환사업은 모두 212건이었다. 이 중 완료 자료 확보가 가능한 108건을 최종 분석 대상으로 하여 Table 2와 같이 대상을 설정하여 연구를 진행할 수 있었다. 2013년 이전까지의 반환사업은 자료 미비와 관련 사업 확산기로 세부 적용기술을 확인하는데 한계가 있고, 연구 시점에 2021년 이후는 사업결

Table 4. Main contents by category of restoration project

Category of restoration project	Restoration Project Features
Creation of micro-ecosystem	In many cases, the purpose of the project is understood in a broad sense, and most of it is described and evaluated differently from the actual project content.
Alternative nature composition	Many needs and intents are listed, but few projects are proportionate to them.
Installation of conservation and use facilities	The method of park development is used as it is, and the use of residents is prioritized over ecological functions.
Restoration of damaged ecosystems	Mostly focused on topographic restoration and rarely on the ecosystem itself.
Restoration of other damaged ecosystems	In many cases, the focus is on the development of the neglected space rather than the purpose of the ecosystem conservation charge project .

과가 수합되지 못하여 분석대상에서 제외하였다. 추후 지속적인 모니터링이 필요한 부분이다.

2. 분석틀의 설정

1) 부담금 반환사업 적용기술 범주

반환사업은 크게 “소생태계 조성, 생태통로 조성, 대체자연 조성, 보전·이용시설 설치, 기타 훼손 생태계 복원”으로 기술의 범주를 사전에 설정하고 있다. 이러한 기술 범주는 현재 국내에서 이루어지고 있는 복원사업과 복원기술의 큰 범위를 보여준다고 할 수 있다.¹⁾

소생태계의 조성을 기반으로 그 활용까지를 내용적 범위로 설정하고 있으나 세부 활용기술이나 기술 내용에 대한 범위 설정은 모호한 편으로서 복원사업의 한계이자 가능성을 동시에 보여준다고 할 수 있다. 그러나 부담금의 효율적인 활용을 위해서는 기술의 범주뿐만 아니라 활용할 수 있는 기술의 내용까지 범위 설정이 되는 것이 사업의 기획부터 진행까지에 있어 효율성을 담보하게 할 것으로 보인다. 따라서 반

1) 세부 기술을 분류하고 그것을 분석틀로 삼는 것은 별도의 연구과제로 판단하며, 본 연구에서는 반환사업의 내용을 기술하는 표현과 도면 표기 사항 등을 자료로 연도별 사업 내용의 변화를 살펴보고자 하였습니다. 이 과정에서 사용되는 관련 기술적 사항들을 모두 기술로 통칭하였습니다.

환사업의 개별 추진 기술을 살펴본 본 연구가 이러한 범주와 기술 내용 전개 또는 설정에 충분히 활용될 수 있을 것으로 판단한다.

2) 반환사업 분석 내용과 분석틀 설정

분석 대상 반환사업은 분석의 내용을 크게 1) 사업의 내용과 범주, 2) 개별 사업별 적용기술의 종류로 나누어 접근하였다. 반환사업 추진시 목적으로 하는 사항이나 효과는 개별 사업 진행의 기준이 되고 설계시 주요 내용을 어떻게 구성하느냐의 뼈대가 되어 주므로 중요하다. 사업별 적용기술은 실제 사업 추진시 대상지에 적용된 복원기술을 살펴본 것으로 구체적인 활용 기술을 확인할 수 있다는 점에서 중요하다. 이러한 두 가지 측면을 기준으로 내용과 범주는 사업별 분석을, 적용기술 세부 사항은 연도별 분석을 진행하여 결과 고찰의 자료로 확보하였다.

III. 결과 및 고찰

1. 분석 결과 종합

분석 대상 반환사업을 개별 분석한 결과는 Table 5와 같이 요약된다. 주요 분석 내용으로는 “사업명, 사업범주, 사업목적, 사업내용, 적용기술, 사업별 특징”이 있고 개별 사업별 분석 후

연도별로 그 특징을 종합하였다. 특히 사업의 목적을 “복원, 창출, 향상”의 측면에서 대상지별로 재평가하는 과정을 거쳐 사업 결과에 대한 접근 시각을 보다 명확하게 하여 분석 결과를 종합하였다. 또한 개별 사업 주체의 사업 범주 설정이 명확하지 않아 Table 1에서 정리한 법령상의 범주로 재분류하여 접근하였다. 이를 통해 반환사업의 전반적인 경향을 파악할 수 있었으며 연도별 흐름을 추적할 수 있었다. 특히 개별 사업에 활용되고 있는 관련 기술들을 추출할 수 있어 세부적인 분석이 가능했다.

2. 반환사업의 범주별 특징

반환사업은 우선 사업의 범주별 특성에 따라 그 특징을 살펴볼 수 있다.(Table 4 참조) 먼저 1) 소생태계 조성 부문에서는 목적하는 바를 광의로 이해하는 경우가 많아 대부분 실제 사업 내용과는 달리 결과를 기술하거나 평가하고 있다. 2) 대체자연 조성 부문에서는 필요성과 취지에 비해 많은 사례가 나타나지 않고 있다. 3) 보전·이용시설 설치 부문에서는 개발의 방식을 주로 사용하고 있고 생태적 기능보다는 주민이용을 우선시하고 있는 것을 알 수 있다. 4) 훼손 생태계 복원 부문에서는 대체로 지형 복원에 초점이 맞추어져 있고 생태계 자체에 집중하는 경우는 거의 없었다. 5) 기타 훼손 생태계 복원 부문에서는 반환사업의 취지보다는 방치 공간의

개발에 치중한 경우가 많았다.





승인신청 단계에서 사업계획서 상 포함 내용은 사업의 목적과 내용, 기대효과뿐만 아니라 사업추진으로 인한 생태계 훼손 가능성 및 저감 방안, 사업의 유지관리 및 모니터링 계획까지임을 고려할 때 각 사업 종류와 범주별로 이와 관련한 부분이 미약한 것을 확인할 수 있다.

3. 반환사업 세부 적용기술

개별 반환사업들에 적용된 세부기술은 중요하게 살펴야 할 부분이다. 연도별로 살펴본 결과는 Table 6과 같이 정리할 수 있다. 복원기술의 발달에 따른 적용현황의 변화로도 볼 수 있으나 전반적으로는 복합화의 경향을 보인다.

1) 2014년과 2015년 초기 세부 적용 기술로는 생태기능과 관련한 내용이 주를 이루며, 2) 2016년, 2017년에는 탄소저감, 바람길, 거점 생태계 등과 같은 거시적 시각의 기술 언급이 나타난다. 3) 2018년, 2019년에는 연계 학습, 처리수 활용 등 보다 주민활동과 연관된 기술이 보인다. 4) 2020년에는 사업의 목적이 보다 구체화 되고 있음을 확인할 수 있으며, 목표 환경이나 사업 특성 등이 명확하게 제시되고 있음을 알 수 있다. 사업량이 확대된 것도 특징으로 볼 수 있다.

Table 5. Analysis summary table of restoration projects

Year	No.	Project Name	Category	Purpose	Details	Applied Technology	Properties	Site Photos
2014	1	Mapo Abandoned Railway Line Site Environmental Forest Restoration Project	Installing Conservation Facilities	Create	Restore, utilize, and revitalize abandoned railroad tracks	Creating connective corridors, building ecological networks, creating eco-forests, preventing roadkill, water circulation systems, and creating pollution-reducing drylands.	Enabling access	
	2	Restoration of golden frog habitat along the abandoned railway line of the Suinsan Line in Ansan	Restore damaged ecosystems	Restore	Restoring golden frog habitat	Expand and create ecosystem services and utilize urban green space	Enabling access	
	3	Restoration of habitat for Suwon bullfrogs to improve the ecological function of Ilwol Reservoir	Installing Conservation Facilities	Enhancement	Improve reservoir ecological function	Ecosystem restoration, ecological learning and play spaces, forest restoration, and buffer greening	Set a target species	
	4	Jinju Wolasan Ecological Corridor Creation Project	Creating ecological corridors	Create	Stabilizing the habitat of endangered species	Preserve forest ecosystems, increase biodiversity, and prevent roadkill	Connecting disconnects	

Year	No.	Project Name	Category	Purpose	Details	Applied Technology	Properties	Site Photos
	5	Restoration of Amphibian Habitat and Establishment of Ecological Network in Oksong Factory Rise Area	Creating micro-ecosystems	Enhancement	Enhancing reservoir wetland function and building rural ecological networks	Amphibian habitat creation, buffer zone creation, peat bog creation, water purification wetland creation	Combined wetland creation techniques	
	6	Creating an ecological oasis in the heart of Daejeon	Creating micro-ecosystems	Create	Create a monarch butterfly and bird ecosystem	Improving the water circulation system, creating ecological learning and play areas, creating green spaces and ecological wetlands, and providing biological habitat cups.	Enabling access	
	7	Odong Neighborhood Park Ecological Restoration Project	Creating Alternate Nature	Create	Create a Mantis Alternative Habitat	Ecological reclamation of landfills, creation of permanent wetlands, restoration of vegetation communities, and creation of ecological trails.	Restore and create reclaimed land	
	8	Odong Neighborhood Park Ecological Restoration Project	Creating micro-ecosystems	Restore	Creation of ecological forests, participatory ecological spaces, and ecological education	Aiming for a participatory ecological space, reflecting ecological education, and improving the habitat for birds	Restore storm damage	
	9	Future Ecosystem Restoration Project for Busan Public Building	Creating micro-ecosystems	Create	Restore insect habitat, improve the environment	Connecting biodiversity and green spending	Utilizing public building rooftops	
	10	Restoration of endangered species habitat in Daegu Safe Wetland	Creating micro-ecosystems	Enhancement	Conserving wetland ecosystems	Habitat for endangered species and natural monuments, restore nurturing wetlands, and expand biological reserves	Complementing an undermined ecosystem	
	11	Ecological restoration project using demolished buildings in Yeonsan Provincial Park	Restore damaged ecosystems	Restore	Restore defacement	Restoration of demolition sites, natural landscape enhancement, stream biotope restoration, enhancement of riparian and forest ecosystems, and ecologically functional plantings.	Ecological restoration of demolition sites	
	12	Ecological Wetland Restoration Project at Ochang Osteotomy Site	Installing Conservation Facilities	Enhancement	Improving ecological function and utilization of reservoirs	Create wetlands to preserve biodiversity and improve water quality	Enhancing ecosystem capabilities for nearby development	
	13	Boryeong City Abandoned Railway Site Carbon Reduction Ecological Forest Restoration Project	Installing Conservation Facilities	Restore	Creating green axes and urban forests	Creating cultural spaces and restoring the ecological base of degraded areas	Spatializing Resident Utilization	
2015	1	Restoration of damaged land at the southern end of Gangseo-gu Banghwa Bridge	Restore damaged ecosystems	Restore	Ecological forestry, mooting maintenance, and dryland creation	Restore forests, improve habitat under piers	Utilize space under piers	
	2	Restoration of damaged ecosystems in Warong Mountain, Seoul	Restore damaged ecosystems	Enhancement	Improving degraded forest greenery	Relieve trail pressure, create eco-trails, improve stormwater infiltration, and remediate illegally cultivated land.	Enabling access	
	3	Creating amphibian habitat through ecological restoration of Pungamji waterfront area	Creating micro-ecosystems	Enhancement	Amphibian-centric habitat restoration	Restore biological habitats, build ecological networks, restore biodiversity, and create eco-experiences and community spaces.	Enabling access	
	4	Restoration of degraded land at a public facility site in an urban center	Restore damaged ecosystems	Enhancement	Improving neglected natural areas	Improve planting status with multi-tiered forests, creating planting communities, ecological wetlands, reinforcing drainage facilities, and supplementing trails.	Enabling access	
	5	Microecosystem Creation Project for Urban Development	Creating micro-ecosystems	Enhancement	Leveraging idle land	Habitat creation, ecological wetland creation, buffer forest creation, ecological recreation and education spatialization, stormwater retention wetland	Enabling access	
	6	Muknon Wetland Restoration Project in Pangyo, Seongnam-si	Creating micro-ecosystems	Enhancement	Improving the ecological function of neglected spaces in mountain areas	Foothill micro-ecosystem restoration, original landform restoration, ecological forest creation, utilization of terrain, outdoor ecology classroom	Enhance the terrain-enabled ecosystem	
	7	Creation of an urban biosphere (Bio-topo) for ecological restoration of damaged areas in a youth cultural park	Creating micro-ecosystems	Enhancement	Improving the ecological function of urban derelict spaces	Establish native bird habitat, create wetland biotopes, and create microclimate-regulating functional spaces.	Improving the Ecology of Idle Spaces	

Year	No.	Project Name	Category	Purpose	Details	Applied Technology	Properties	Site Photos
	8	Ecological Restoration of Siheung Jungwang Buffer Green Space	Creating micro-ecosystems	Enhancement	Improving ecological function within the buffer	Improve buffer green vegetation, create ecological forests, create rain gardens, strengthen green axis connectivity, ecological learning boots	Enhancing the ecology of managed spaces	
	9	Restoration of native species and creation of cultural spaces in damaged areas along the DMZ	Creating micro-ecosystems	Enhancement	Improving the ecological function of neglected spaces in special areas	Create microhabitats, restore existing vegetation, create multi-tiered forests, and create ecological learning spaces	Restoration projects in DMZ environments utilize perimeter plantings	
	10	Restoration of damaged areas in Uiam Park to restore biological habitat and strengthen ecological networks	Creating micro-ecosystems	Enhancement	Introducing ecological utilization of urban underutilized spaces	Creating habitat for species, ecological learning and nature exploration functions, and ecological landscape-type use spaces	Revitalizing the ecological function and use of abandoned spaces	
	11	Cheongju City Toad Alternative Habitat Restoration Project	Creating Alternate Nature	Create	Creating an ecological function in conjunction with the Toad Ecological Park	Amphibian habitat creation, life history vegetation restoration, ecological learning boots, and buffer forest creation	Create alternative habitats for target species	
	12	Endangered Species Wildlife Habitat Restoration Project for the Pondweed and Mokong	Creating micro-ecosystems	Enhancement	Improvement of the environment and ecological function of abandoned spaces in urban mountain areas	Revegetation, habitat enhancement, and interpretive trails	Enabling access	
	13	Project to create an ecological resting place in the city center that breathes with nature	Installing Conservation Facilities	Enhancement	Improving fragmented parks in multifamily communities	Enhance functional plantings such as shade trees, create multi-tiered forests, create ecological systems, and install rest and convenience spaces.	Enabling access	
	14	Ecological forest restoration project through the restoration of damaged national palace grounds	Installing Conservation Facilities	Restore	Restore degraded landscapes and introduce ecological features	Restore degraded landscapes, enhance native species habitat, install rain gardens, and improve pavement.	Enabling access	
2016	1	Restoration of Dalmaigae native forest through regeneration of bear pine communities	Installing Conservation Facilities	Restore	Restoring ecosystems in coastal mountains	Restore habitats for specific species, create microhabitats, create ecological rest areas for local residents, and restore forest-green axis connectivity.	Enabling access	
	2	Restoration of amphibian habitat and establishment of ecological network in Icheon Maajangjeipji District	Creating micro-ecosystems	Create	Create a wetland ecosystem in a neglected space	Creation of a waterfront buffer greenbelt, restoration of biological habitat, community eco-education space, and amphibian and insect habitat.	Create a wetland ecosystem in a neglected space	
	3	Restoring Sadong Wetlands, the last bio-refuge of a vanishing coastal wetland	Creating micro-ecosystems	Enhancement	Conservation of isolated biological habitats	Securing open water, creating independent living spaces, creating ecological learning spaces, and improving old facilities	Improving the functionality of incubating wetlands	
	4	Wise use of Gwangju's ecological resources and restoration of endangered species habitats	Creating micro-ecosystems	Create	Enhancing the ecological function of wetlands	Restoration of arable land, creation of biological habitats, creation of wetlands and hibernation sites, application of ecological playgrounds and experience programs	Restoring Non-wetlands	
	5	Restoration of the hinterland wetlands along the Han River	Installing Conservation Facilities	Enhancement	Revitalizing the ecological function of neglected riverside spaces	Connect disconnected habitats, restore degraded landscapes, introduce flood protection, and create eco-experiential spaces.	Enabling access Flood response capabilities	
	6	Gimpo Unyang-dong Han River Estuary Complex Habitat Creation Project	Creating micro-ecosystems	Enhancement	Creating ecological habitat in streambed neglect spaces	Create complex habitats, create waterfowl habitat, introduce interpretive boots	Enhanced Load Habitat functionality	
	7	Galsan micro-ecosystem restoration project to restore disconnected urban ecological networks	Creating micro-ecosystems	Restore	Restoring ecological function to neglected urban spaces	Habitat creation, ecological learning spaces, experiential gardens, and ecological wetlands	Create a wetland ecosystem in a neglected space	
	8	Creating a bio-habitat environment and strengthening the ecology of the Gyeongchun Line abandoned rail line site	Installing Conservation Facilities	Create	Ecospatialization of abandoned railroad tracks	Creating biological habitats and micro-ecosystems, creating water environments, creating multi-layered planted forests, cleaning up pollution, creating carbon-reduce vegetation communities, improving streamine rates, and creating ecological learning centers.	Ecological restoration of demolition sites	

Year	No.	Project Name	Category	Purpose	Details	Applied Technology	Properties	Site Photos
	9	Ecological forest restoration project utilizing a neglected sports facility site	Restore damaged ecosystems	Restore	Restoring ecological function to neglected urban spaces	Creating biological habitats, strengthening linkage ecology, creating ecological experience and learning spaces, and reducing food sources	Ecological restoration in highly degraded areas	
	10	Toad colonies Massive roadkill prevention and habitat enhancement project	Creating ecological corridors	Enhancement	Create an ecosystem centered around toad migration corridors	Roadkill response techniques, restoration of target species spawning areas and enhancement of surrounding connectivity, mooring maintenance, and installation of toad traps.	Enhance target species-centric habitat	
	11	An eco-experiential urban micro-ecosystem restoration project where forests and books meet	Installing Conservation Facilities	Enhancement	Restoring ecological function to neglected urban spaces	Steep slope stabilization, forest ecosystem restoration, ecological learning, and soil erosion prevention	Enabling access Disaster prevention features	
	12	Jinju Gajosan Abandoned Line Section Urban Ecological Network Construction Project	Creating micro-ecosystems	Restore	Restoring ecospacialization to abandoned railroad tracks	Rainwater recycling technology, environmentally controlled wetlands, introduction of artificial water sources, ecological networking of cropland, ecological learning centers	Restoring abandoned railroad tracks with a biodiversity focus	
2017	1	Ecosystem restoration project at the foot of Yongma Mountain	Creating micro-ecosystems	Restore	Restoring ecological function to neglected urban spaces	Ecological forests, eco-rest areas, rain gardens, and habitat creation	Enhancing habitat functions in hillside neglected spaces	
	2	Restoration of endangered toad habitat in Woomyeonsan Natural Ecological Park Wildlife Sanctuary	Restore damaged ecosystems	Restore	Restore functionality to a wildlife refuge	Restore urban wetland function, repair landslide damage, create migration corridors, create toad habitat, and apply disaster countermeasures.	Restoring ecological function to landslide-damaged areas	
	3	Restoring endangered prickly pear habitat in an urban wetland	Creating micro-ecosystems	Enhancement	Enhancing the ecological function of reservoir waterfronts	Enhanced reservoir ecological function, restored prickly pear habitat, restored biological habitat, and created ecological experience and learning space	Enhance habitat functions in neglected reservoirs	
	4	Endangered Species (Amphibian) Alternative Habitat Restoration Conservation Project	Creating micro-ecosystems	Enhancement	Enhancing the ecological function of reservoir waterfronts	Enhance reservoir ecological functions, provide alternative habitat for endangered species, and enhance wetland functions	Enhance habitat functions in neglected reservoirs	
	5	Open Mom Ecological Forest Restoration Project, an oak forest that nurtures urban life	Installing Conservation Facilities	Enhancement	Improving the ecology of neglected open spaces	Environmental purification, base ecosystem enhancements, and wind paths	Improving the ecology and functionality of low-maintenance parks	
	6	Project to build an ecological network by improving the ecological infrastructure of an odor-reducing buffer forest	Installing Conservation Facilities	Enhancement	Restoring landfill functionality and responding to urban salt sources	Preventing urban saltwater intrusion, creating recreational areas for residents, multi-layered plantings, and managing landfill soils	Enhancing the ecological function of landfills and spatializing responses to urban pollution sources	
	7	Seolmacheon Ecosystem Restoration Project in connection with Gamaksan Healing Culture	Restore damaged ecosystems	Restore	Restoring the ecology of a degraded streamside	Preserve stream function, create vegetated buffers, enhance forest vegetation, and create pathways	Improving the ecology of abandoned commercial demolition spaces	
	8	Restoration of biological habitat to build an ecological platform for Anseong Industrial Complex	Installing Conservation Facilities	Enhancement	Restoring ecological function to neglected urban spaces	Biodiverse wetland creation, multi-tiered food forests, rain gardens, and interpretive facilities.	Complementing the ecological function of outdoor spaces	
	9	Biological Habitat Restoration Project to Strengthen Ecology in Chungju City	Installing Conservation Facilities	Create	Restoring ecological function to neglected urban spaces	Vegetation enhancement, buffer zones, riparian and wetland areas, experiential learning spaces, bird attractant forests	Ecospacialization of unplanned parks	
	10	Cheonan Wonang Habitat Restoration Project to Preserve Urban Ecological Wetlands	Creating micro-ecosystems	Enhancement	Enhancing the ecological function of reservoir waterfronts	Biological habitat creation, forest restoration, ecological learning spaces, waterfront ecospacialization	Enhance habitat functions in neglected reservoirs	
	11	Microhabitat restoration project utilizing a neglected idle site in the city center (Gochang-eup)	Creating micro-ecosystems	Enhancement	Restoring ecological function to neglected urban spaces	Ecological playground, ecological wetland, forest biotope, deck path, rainwater utilization facility	Enhancing habitat functions in hillside neglected spaces	
	12	Restoration of ecological forest in idle Jungdookji, Sangju City	Installing Conservation Facilities	Create	Enhancing the ecological function of reservoir waterfronts	Restoration of forests, creation of buffer zones, wildflower communities, restoration of wetland vegetation, creation of natural playgrounds	Enhance habitat functions in neglected reservoirs	

Year	No.	Project Name	Category	Purpose	Details	Applied Technology	Properties	Site Photos
	13	Restoration of microhabitats on vacant land	Creating micro-ecosystems	Enhancement	Restoring ecological function to neglected urban spaces	Strengthening ecological foundation, application of stormwater utilization technology, buffer greenery, ecological learning	Ecospatialization of Linear Neglected Space	
2018	1	Urban microhabitat restoration project using the former spring water site of Gaehwasan Mountain in Gangseo	Installing Conservation Facilities	Enhancement	Ecological forest restoration	Forest ecosystem restoration, terraced wetlands, water system enhancement, deck paths	Enabling access	
	2	Micro-ecosystem restoration project utilizing neglected idle spaces	Creating micro-ecosystems	Restore	Restoring ecological function to neglected urban spaces	Restore biodiversity, create ecological rest areas, create insect habitats, create ecological education spaces, and create ecological networks.	Enable the use of unattended spaces	
	3	Eumpyeong New Town Najirigol Urban Ecological Wetland Restoration Project	Creating micro-ecosystems	Enhancement	Enhancing the ecological function of reservoir waterfronts	Insectarium, water purification wetlands, floating wetlands, trails, ecological channels	Enhance reservoir ecological functions and enable use	
	4	Lights of Life Not Extinguished: Creating Habitat for the Monarch Firefly	Creating micro-ecosystems	Create	Restoring ecological function to neglected urban spaces	Create wetlands, hillsides, and ecological learning spaces	Enhance the ecological function of neglected spaces	
	5	Gwangju Docheonje Ecological Wetland Regeneration Project	Creating micro-ecosystems	Enhancement	Enhancing the ecological function of reservoir waterfronts	Biosphere conversion, vegetation clearing, ecological wetland, ecological resting place	Enhancing the ecological function of degraded reservoirs	
	6	Small ecosystem restoration project utilizing an abandoned schoolyard in Yeosu City	Creating micro-ecosystems	Create	Creating ecospatialization using abandoned schools	Creating ecological forests, restoring habitats, applying connected learning systems, and creating ecological education spaces	Transforming waste into eco-space	
	7	Restoration of wetland ecosystem by creating habitat for continental dragonflies in Paldang Lake	Restore damaged ecosystems	Enhancement	Enhancing the ecological function of reservoir waterfronts	Habitat Enhancement, Ecological Corridor, Ecological Forest, Ecological Wetland, Dryland	Restoring ecological function to waterfront spaces	
	8	Restoring Nakyang's degraded landscapes to connect water, forests, cities, and lives	Creating micro-ecosystems	Restore	Restoring a disconnected urban ecological axis	Wetland degradation prevention, forest ecosystem complementation, wetland ecosystem complementation, filtration and buffering, ecological resting place	Creating ecological functions in green spaces	
	9	Sancheok Bonghwangsan Oradri Oxygen Trail Restoration Project	Installing Conservation Facilities	Restore	Restoring a disconnected urban ecological axis	Restore the oxygen path, restore damaged ground, create ecological landscapes, and connect ecological axes	Enabling access	
	10	Chuncheon City Ududong Urban Development Response Biological Habitat Creation Project	Creating micro-ecosystems	Create	Create ecosystem services to counter adjacent development pressures	Creates habitat for small organisms, enhances ecosystem services, improves soil quality, and supports sub-ecosystems	Create an ecosystem that responds to neighborhood development	
	11	Restoration of the dysfunctional Saejeul Pond Ecological Wetland	Creating micro-ecosystems	Enhancement	Restoring the ecology of a degraded streamside	Restore reservoir ecological functions, create ecological resting places, and create biological habitats	Create an ecosystem that responds to neighborhood development	
	12	Ecosystem restoration project at the foot of Myeongsim Mountain in Cheongju	Installing Conservation Facilities	Enhancement	Enable ecological function and use of forest adjacencies	Creation of trails, creation of ecological education spaces, and ecological rest areas	Enabling access	
	13	Forest salamander habitat, forest recreation area, peatland conservation project in the village	Restore damaged ecosystems	Enhancement	Conserving wetlands and enhancing ecology in the heart of the mountains	Erosion control, salamander habitat restoration, forested eco-learning decking, aquatic ecosystem restoration	Focused support for forest microecosystems	
	14	Wubong Forest Edge (Edge effect) Restoration Project	Installing Conservation Facilities	Enhancement	Ecological forest restoration	Ecological networking, habitat provision, ecological education and experience spaces	Enabling access Disaster prevention features	
	15	Restoration of the Backhudsagan Luxury Tree Damage Site in the Jangsu National Trust for Future Generations	Restore damaged ecosystems	Enhancement	Improved ecological environment at the bottom of the road and introduced ecological corridor function	Wildlife corridors, habitat enhancement, wetlands, and buffers	Restoring degraded land from road development	

Year	No.	Project Name	Category	Purpose	Details	Applied Technology	Properties	Site Photos
	16	Hadong Park Darangi Muk Field Small Living Habitat Restoration Project	Creating micro-ecosystems	Enhancement	Disaster prevention and ecological utilization of mountain slopes	Stormwater retention areas, moorings and wetlands, and terraced wetlands	Using Terrain to Create Ecosystems	
	17	Jeju Hamori Neglected Space Biological Habitat Restoration Project	Creating micro-ecosystems	Enhancement	Enhancing wetland functions near beaches	Habitat, ecological breaks, trails, botanical gardens, and wetland soil improvement	Enhance waterfront wetland function and landscape	
2019	1	Ganseo Bongje Mountain Old House Demolition Damage Site Ecological Infrastructure Restoration Project	Installing Conservation Facilities	Enhancement	Ecological forest restoration	Retention Ponds, Dry Wetlands, Decks, Ecological Playgrounds, Horizontal Habitats	Enabling access	
	2	Restoration project at the end of Hannam Vein Forest, the axis of life that wraps around the city	Installing Conservation Facilities	Enhancement	Ecological forest restoration	Wide Area Ecological Network, Stormwater Channel, Ecological Rest Area, Moorings	Enabling access	
	3	Improvement of Biotop Function and Creation of Ecological Play and Learning Center in Silver Natural Stream	Creating micro-ecosystems	Enhancement	Restoring ecological function to neglected urban spaces	Ecological wetland restoration, willow community, ecological learning center, riparian vegetation buffer, multi-stage wetland	Enabling access	
	4	Seongnam Baekhyeon-dong Biodiversity Restoration Project in a Neglected Forest	Creating micro-ecosystems	Restore	Restoring ecological function to neglected urban spaces	Habitat restoration, ecological learning centers, insect habitats, ecological forests	Enhance the ecological function of neglected spaces	
	5	Endangered species habitat restoration project with Suwon civic environmental organization	Creating micro-ecosystems	Enhancement	Improving target species-oriented ecosystems on degraded landscapes	Restoring mangrove habitat, enhancing native forests and fragmented ecosystems	Create and manage civic engagement	
	6	Sanctuary Climate Change Response Forest Creation Project in Osan Segyo District, New City	Installing Conservation Facilities	Enhancement	Spatializing community use of existing forests	Ecological playground, ecological network, chestnut experience center, bird learning center	Enabling access	
	7	Ecological and cultural forest creation project by restoring vegetation at the foot of Inukjseongbong Mountain in Paju City	Restore damaged ecosystems	Restore	Restoring mountain roadside degradation	Strengthen ecological networks, plant revegetations, restore forest edges, and restore soil base	Restoring ecological integrity to demolition sites	
	8	Project to secure habitat for endangered golden frogs and hawksbill dragonflies in Hwasong Bihone Wetland Park and restore ecological functions	Creating micro-ecosystems	Enhancement	Improving target species-oriented ecosystems on degraded landscapes	Targeted species habitat creation, buffers, ecotourism programs, wetlands	Enhance the ecological function of neglected spaces	
	9	Strengthening the Migratory Bird Network by Preserving DMZ Crane Habitat	Installing Conservation Facilities	Restore	Protect and buffer migratory bird habitat	Sandhill crane trails, viewing platforms	Enhance ecological connectivity	
	10	Ecosystem Restoration Project for Hannam Geum Buk Vein in Eunseong County	Installing Conservation Facilities	Enhancement	Ecological forest restoration	Bird attraction forests, urban ecological forests, microhabitats, experiential learning, ecological rest areas	Enhancing the ecological environment of parks in industrial parks	
	11	Restoration of microhabitat through restoration of waterfront ecosystem function in Jeongakjeomot, Buyeo-gun	Creating micro-ecosystems	Enhancement	Restore mountain roadside ponds and degraded areas	Non-point source pollution reduction plantings, reed bed rehabilitation, and riparian ecosystem restoration	Enhance ecological connectivity	
	12	Cheonan Notae Mountain restoration project where forests grow and life continues	Installing Conservation Facilities	Enhancement	Improve ecological function and use of degraded areas in parks	Rainwater channels, pedestrian paths, water circulation systems, ecological corridor functions, wildflower gardens, ecological playgrounds	Enabling access	
	13	Seokjeong Thorn Lotus Habitat Creation Project	Creating micro-ecosystems	Enhancement	Restoring ecological function to neglected urban spaces	Improvement of wetland environment, introduction of aquatic plants, application of natural ground greening method, observation pontoon, wooden deck, ecological learning center, observation space	Ecotourism-focused improvements	

Year	No.	Project Name	Category	Purpose	Details	Applied Technology	Properties	Site Photos
	14	Micro-ecosystem creation project to restore the ecological function of neglected idle land along the Seomjin River	Creating micro-ecosystems	Create	Enhancing the ecological function of reservoir waterfronts	Improving habitat for rare species, creating microhabitat, creating ecological wetlands utilizing treated water, and creating water purification wetlands	Creating a functional ecological environment using waste resources	
	15	Restoration of Yilimsan's heated mountain wetlands and creation of microhabitats	Restore damaged ecosystems	Restore	Ecological forest restoration	Mountain wetlands, sewage bogs, bird habitat, butterfly habitat, observation decks, trails	Complementing ecological functions in core mountain areas	
	16	Village micro-ecosystem creation project utilizing damaged idle land in Indeok-dong, Pohang	Creating micro-ecosystems	Create	Restoring ecological function to neglected urban spaces	Micro-ecosystem creation, insect and bird induced planting, ecological infrastructure improvement, slope stabilization, ecological landscapes, ecological learning spaces	Create and manage civic engagement	
2020	1	Tianjin Lake Endangered Wildlife Nettle and Gaikshi Water Lily Conservation Project	Restore damaged ecosystems	Restore	Enhancing the ecological function of reservoir waterfronts	Clearing existing vegetation, preventing soil erosion, installing observation decks, planting water lilies, etc.	Improve targeted species-intensive habitat	
	2	Forest for Life: Goyang City's Tan County Ecological Forest Restoration Project	Restore damaged ecosystems	Restore	Ecological forest restoration	Dryland creation, insect hotel, edge forest restoration, bird colonization, filtered ecosystem installation, wildflower garden, ecological play space, trails	Create and manage civic engagement	
	3	Micro-ecosystem Creation Project Using Neglected Space in Icheon City - Icheon City	Installing Conservation Facilities	Create	Restoring habitats and building bird ecological networks	Create ecological yards, ecological systems, wetlands, resting decks, grassy paths, etc.	Enhance the ecological function of neglected spaces	
	4	Restoration of damaged ecosystems at the foot of Mt. Mook and establishment of an ecological network	Restore damaged ecosystems	Restore	Ecological forest restoration	Ecological yard, ecological wetland, observation deck, ecological learning center, ecological observatory, wildflower flower garden, ecological system, restoration forest	Enhance ecological connectivity	
	5	Jowon Park Biological Habitat Creation Project for Technology Development to Improve Urban Ecosystem Health	Restore damaged ecosystems	Enhancement	Securing urban ecological networks by improving forest structure	Ecological wetland, ecological waterway, buffer zone, bird of prey observation, ecological forest, ecological trail, ecological learning center	Enhancing the ecological diversity of neglected green spaces with simple vegetation	
	6	Urban micro-ecosystem restoration project utilizing wetlands near Onam Stream	Installing Conservation Facilities	Enhancement	Enhancing the ecological function of reservoir waterfronts	Ecosystem-based, non-point source pollution reduction, enhanced wetland environment, stormwater retention and infiltration, stable habitat, buffer forest zone	Enhance ecological connectivity	
	7	Creation of alternative habitat for cranes upstream of Imjin River	Restore damaged ecosystems	Create	Restore and enhance alternative habitat function	Maximize non-interference zones, provide stable food sources (animal and plant), minimize visual and spatial disruption, and create monitoring and management corridors.	Improve targeted species-intensive habitat	
	8	Restoring the habitat of the Pseudo-Red-spotted Monarch Butterfly	Creating micro-ecosystems	Enhancement	Restore and enhance alternative habitat function	Introduced ecological education services, restored food sources, created buffer forests, established exploratory learning centers, and established trails.	Restore and utilize existing alternative habitats	
	9	Restoration of degraded ecosystems for the reintroduction of black-crowned cranes in the Suyeong Wetlands	Restore damaged ecosystems	Create	Provide food sources and shelter for target species	Ecological Observation Deck, Maintenance Trail, Dumbwaiter, Bird Feeding Area, Sandbar, Gravel Seawall	Improve targeted species-intensive habitat	
	10	Forest healing project on the edge of Gubongsan Mountain in western Daejeon	Installing Conservation Facilities	Enhancement	Restoring an urban ecological axis damaged by cultivation	Create multi-tiered forests, plant forest edges, wildflower gardens, eco-trails, and utilize native species.	Enhance the ecological function of neglected spaces	
	11	Creation of an urban ecological platform in Gao Neighborhood Park - Gao Neighborhood Park	Installing Conservation Facilities	Enhancement	Create buffer wetlands to reduce nonpoint source pollution	Ecological waterways, ecological observation trails, forest trails, wooden bridges	Consider fine dust reduction and urban heat island mitigation	
	12	Urban forest microhabitat restoration project using water streams in Onsgol, Warong Mountain	Installing Conservation Facilities	Enhancement	Restore ecological function through cropland restoration	Plazas, huts, insect habitats, covered ponds, bird feeders, hibernacula, observation decks, rain gardens, woodpiles	Consider fine dust reduction and urban heat island mitigation	
	13	Guro Cheonwangsan Urban Microorganism Habitat Restoration and Ecological Network Construction Project	Restore damaged ecosystems	Enhancement	Restoring a disconnected urban ecological axis	Ecotourism trail, Deck observation trail, Bird attraction forest, Flower garden, Ecological wetland, Ecological playground	Improve multifunctional ecosystems on existing cropland	
	14	Ecological Platform Creation Project in Yonghyeon-dong, Sunrise Town, Incheon (Sun Line Idle Site)	Creating micro-ecosystems	Create	Restoring ecological function to neglected urban spaces	Rainwater Wetland, Bamboo Garden, Ecological Dumbbune, Inceae Tree Path, Grassy Waterway	Recreate the degraded ecosystem of an old railroad track	
	15	Wobongje Muknon Wetland Ecological Restoration Project, a haven for endangered species	Creating micro-ecosystems	Create	Stabilize and protect biological habitats	Dragonfly Habitat, Ecological Experience Center, Carbon Reduction Forest, Water Doe Habitat, Ecological Beach, Ecological Forest	Enhance the ecological function of existing wetlands	









Year	No.	Project Name	Category	Purpose	Details	Applied Technology	Properties	Site Photos
	16	Gwangyang Usan Ecological Forest Restoration Project to Connect Habitat Patches	Installing Conservation Facilities	Enhancement	Restore a broken forest patch	Environmental Forest, Ecological Forest, Rain Garden, Ecological Trail, Ecological Learning Space, Ecological Experience Space, Insect Habitat, Ecological Play Space, Grassland	Enabling access	
	17	Protecting habitat for the endangered poison dart butterfly and restoring the disappearing spiny kite in the Wanju urban wetlands	Restore damaged ecosystems	Enhancement	Restoring endangered species habitat	Sedimentation wetlands, riparian greenery, ecological channels, riparian plantings, open water, poison ivy habitat	Improve targeted species-intensive habitat	
	18	Borigol Forest Jungle Ecological Restoration Project	Installing Conservation Facilities	Enhancement	경작으로 훼손된 산림생태계 복원 및 탄소저장량 조성	gazebo, shelter, gabion retaining wall, ecological system, slope greening, boulder pile, birdhouse, woodpile	Revitalizing the ecological function and use of existing cropland	
	19	Survival at stake; conserving populations of psychotropic tarantulas	Creating micro-ecosystems	Enhancement	Reclaiming biodiversity in neglected reservoirs	Plant hemlock, create open water, and improve vernal pools	Improve targeted species-intensive habitat	
	20	Restoration of wetland ecosystems to increase biodiversity in backwater areas	Restore damaged ecosystems	Enhancement	Restoring a disconnected urban ecological axis	Habitat wetlands, wildflower meadows, buffer vegetation zones, shrublands	Enhance the ecological function of existing wetlands	
	21	Microhabitat restoration project using abandoned railroad tracks in Bahang-eup	Creating micro-ecosystems	Create	Restoring ecological function to neglected urban spaces	Insectarium, Observation Deck, Ecological Education Classroom, Wildflower Garden, Rainwater Garden, Carbon Reduction Forest, Earthen Pavement, Pinus sylvestris, Hawthorn Forest, Cedar Forest, Transition Observation Forest	Enhance the ecological function of neglected spaces	
	22	Demolition of a trout farm in the Songgye Valley in Chungju to restore habitat for endangered species	Restore damaged ecosystems	Restore	Restoring degraded landscapes to improve ecosystem health in national parks	Ecological Wetland, Recreation Area, Moss Garden, Forest Restoration, Ecological Learning Area, Microhabitat	Enhance ecological connectivity	
	23	Restoring the lost Jangja Swamp to its native habitat in South Korea	Installing Conservation Facilities	Enhancement	Build a network of nearby resource connections	Ecological forest, Conservation forest, Purification wetland, Observation deck, Observation deck, Ecological system, Reservoir wetland, Deck trail	Enabling access	

Table 6. Detailed application technology of restoration project

project year	application details
2014	Creating connectivity corridors, establishing ecological networks, creating environmental forests, roadkill prevention, water cycle systems, pollution-reducing dry and wetlands, utilizing urban green spaces, restoring ecosystems, ecological learning and play spaces, restoring forests, creating buffer zones, preserving forest ecosystems, enhancing biodiversity, preventing roadkill, creating amphibian habitats, creating buffer zones, creating peatlands, creating water purification wetlands, improving water cycle systems, and creating ecological learning and play spaces, creation of green areas and ecological wetlands, provision of biological habitat, ecological restoration of landfills, creation of permanent wetlands, restoration of vegetation communities, creation of ecological trails, participatory ecological spaces, habitat for endangered species and natural monuments, restoration of nurturing wetlands, restoration of demolition sites, enhancement of natural landscapes, restoration of stream biotopes, enhancement of forest and river ecosystems, ecological functional planting, conservation of biological habitats, creation of wetland environments for water quality improvement, restoration of the ecological base of damaged areas.
2015	Restoring forests, improving the growing environment under bridge piers, relieving downward pressure on hiking trails, creating ecological trails, improving rainwater infiltration, remediating illegal cultivated land, restoring biological habitats, establishing ecological networks, restoring biodiversity, and creating ecological experience and community spaces, planting multi-tiered forests, creating plant communities, ecological wetlands, reinforcing drainage facilities, creating habitat spaces, creating ecological wetlands, creating buffer forests, creating ecological recreation and education spaces, creating rainwater retention wetlands, restoring foothill micro-ecosystems, restoring original terrain, creating ecological forests, and utilizing terrain, outdoor ecology classroom, creation of native bird habitat, creation of wetland biotope, creation of microclimate control function space, improvement of buffer green vegetation, creation of ecological forest

Table 6. continue

project year	application details
2015	creation of rain gardens, creation of small creature habitat, ecological learning and nature exploration function, creation of ecological landscape type use space, creation of amphibian habitat, restoration of vegetation reflecting life history, maintenance of vegetation, creation of tourist paths, strengthening of functional plantings such as shielding plantings, creation of ecological system, installation of rest and convenience space, restoration of damaged terrain, improvement of native species habitat, installation of rain gardens, pavement improvement
2016	Restoring habitats for specific species, creating micro-ecosystems, creating ecological rest areas for local residents, restoring forest-green axis connectivity, creating waterside buffer zones, restoring biological habitats, creating ecological education spaces for local residents, creating amphibian and insect habitats, securing open water surfaces, creating independent habitats, improving old facilities, restoring arable land, creating biological habitats, creating wetlands and hibernation areas, applying ecological playgrounds and experience programs, connecting disconnected habitats, restoring damaged areas, introducing flood response functions, creating complex habitats, creating waterfowl habitats, and creating experience gardens, creating ecological wetlands, creating biological habitats and micro-ecosystems, creating water environments, creating multi-tiered planted forests, cleaning up pollution, creating carbon-reducing vegetation communities, improving greening rates, creating biological habitats, strengthening connectivity, creating ecological experience and learning spaces, and food source diversification, roadkill response techniques, restoration of target species spawning areas and strengthening of surrounding connections, maintenance of moorings, installation of toad traps, stabilization of steep slopes, restoration of forest ecosystems, ecological learning, prevention of soil loss, rainwater recycling techniques, environmentally controlled wetlands, introduction of artificial water sources, and ecological networking of cropland
2017	Creation of ecological forests, creation of ecological rest areas, rain gardens, habitat creation, restoration of urban wetland functions, restoration of landslide damaged areas, creation of movement paths, creation of toad habitats, application of disaster countermeasures, enhancement of reservoir ecological functions, restoration of prickly lotus habitat, restoration of biological habitat spaces, creation of ecological experience and learning spaces, enhancement of reservoir ecological functions, alternative habitats for endangered species, enhancement of wetland functions, environmental purification functions, enhancement of base ecosystem functions, wind paths, prevention of urban salt source inflow, creation of residents' rest areas, multi-tiered planting, reclaimed soil management, stream function preservation, vegetation buffer zone creation, forest vegetation enhancement, right-of-way creation, biodiversity wetland creation, multi-tiered bird food forest, vegetation base maintenance, buffer forest, riparian and wetland, bird attraction forest, Biological habitat creation, ecological spatialization of waterfront, ecological playground, ecological wetland, Forest biotope, deck path, Rainwater utilization facility, forest restoration, buffer forest creation, wildflower community, wetland restoration, natural playground, strengthening ecological infrastructure, application of stormwater utilization technology, buffer greenery
2018	Forest ecosystem restoration, terraced wetland, water system supplementation, deck path, biodiversity restoration, ecological resting space, insect habitat creation, ecological education space creation, ecological network creation, insect learning center, water purification wetland, floating wetland, tourist trail, ecological channel, paddy field, hillside creation, ecological learning space creation, biological habitat conversion, vegetation clearing, ecological wetland, ecological resting space, application of linked learning system, ecological education space creation, habitat improvement, ecological movement path, ecological forest, ecological wetland, dry wetland, preventing wetland degradation, complementing forest ecosystems, complementing wetland

Table 6. continue

project year	application details
2018	ecosystems, restoring oxygen pathways, restoring damaged ground, creating ecological landscapes, connecting ecological axes, creating microhabitats, enhancing ecosystem services, improving soil conditions, supporting sub-ecosystems, restoring reservoir ecological functions, preventing erosion, restoring salamander habitats, forest-type ecological learning, decks, restoring water ecosystems, wildlife corridors, improving habitats, wetlands, buffer forests, rainwater retention areas, Streams and wetlands, terraced wetlands, botanical gardens, wetland soil improvement
2019	Retention ponds, dry wetlands, decks, ecological playgrounds, horizontal habitats, regional ecological networks, stormwater channels, ecological recreation areas, moorings, wetland restoration, willow communities, ecological learning centers, riparian vegetation, buffers, multi-stage wetlands, native restoration, ecological learning centers, insect habitats, ecological forests, wildlife habitat restoration, native bird habitat, enhancement of fragmented ecological functions, ecological playground, ecological network, chestnut pine experience center, bird learning center, revetment planting, forest edge restoration, soil-based restoration, buffer greenery, ecotourism program, crane trail, observation deck, bird attraction forest, urban ecological forest, microhabitat, hands-on learning, ecological rest areas, non-point source pollution reduction plantings, reed beds, restoration of waterside ecosystems, stormwater channels, walking paths, water circulation systems, ecological corridor functions, wildflower gardens, ecological playgrounds, wetland enhancement, introduction of aquatic plants, application of natural ground greening methods, observation pontoons, wooden decks, ecological learning center, rare species habitat improvement, creation of microhabitat, creation of ecological wetland utilizing treated water, creation of water purification wetland, mountain wetland, leaky ecosystem, bird habitat, butterfly habitat, Insect and bird attraction planting, ecological infrastructure improvement, slope stabilization, ecological landscape, ecological learning space
2020	Clearing existing vegetation, preventing soil erosion, installing observation decks, planting water lilies, improving the water system, creating a dry environment, insect hotels, restoring edge forests, forming bird colonies, installing filter vegetation beds, nocturnal flower meadows, ecological play areas, trails, ecological yards, ecological systems, wetland creation, rest decks, grassy paths, ecological wetlands, observation decks, ecological learning centers, ecological observatories, wildflower meadow, ecological system, restoration forest, buffer forest, bird of prey observation, ecological forest, ecological trail, ecological infrastructure, non-point source pollution reduction, enhancement of nurturing wetland environment, stormwater retention and infiltration, stable habitat, buffer forest, maximization of non-interference zone, stable food source, minimization of visual and spatial disparity, and creation of monitoring and management corridors, restoration of prey species, berms, bird feeders, sandbars, gravel berms, multi-tiered forests, forest edge plantings, wildflower gardens, utilization of native species, plazas, huts, insect habitats, rice paddies, bird feeders, hibernacula, rain gardens, woodpiles, bird attraction forests, bird sanctuaries, bamboo paths, dragonfly habitats, carbon sequestration forests, water vole habitats, environmental forests, Ecological forest, sedimentation wetland, waterfront greenery, ecological waterway, buffer planting area, open water surface, poison ivy habitat, gabion retaining wall, slope greening, stone mound, Poison ivy planting, Secure open water surface, improvement of vernal pool, carbon reduction forest, dirt pavement, pin oak forest, cottonwood forest, hornbeam forest, cedar forest, transition observation forest, moss ecological garden, forest restoration, purification wetland

분석된 반환사업 세부 적용기술은 별도의 범주화가 필요한 상황으로 단위 기술과 복합기술이 혼재되어 표현되거나 일정 기준으로 유형을

분류할 수 없는 경우가 상당하다. 따라서 향후 보다 효율적인 반환사업 추진을 위해서는 사업 사례 확대에 따른 활용 기술 숫자가 충분한 것

으로 판단되어 사업 유형 범주와는 다른 설계 및 시공, 유지관리, 모니터링 측면에서의 기술적 범주를 구성하여 재분류하고 향후 반환사업의 추진에 활용할 필요가 있다고 판단된다.

4. 반환사업의 연도별 특징 및 경향

반환사업의 적용 기술과 사업 내용을 연도별로 특징지어보면 Table 7과 같이 요약된다.

1) 2014년은 여러 시범사업 성격의 사업

대상지와 적용 기술로 반환사업의 확산 특성을 보여주고 있다. 2) 2015년은 자연생태에 이용자 활성화를 고려한 일반적 조성 방식의 사업 시행이 대부분임을 알 수 있다. 3) 2016년은 하천 생태계를 향상하거나 목표종 중심으로 생태기능을 강화하는 등 주제에 집중하는 사업이 많음을 볼 수 있다. 4) 2017년은 저수지 및 하천변, 해안 인접지 등 수자원과 연계된 사업 대상지가 많고 기존 생태 기능 강화가 대부분을 이룬다. 5) 2018년은 산림 및 산지와 연계되는 소생태계 조성 사업이 많고 이용성과 연계한 사업 추진이 많았다. 6) 2019년은 도심 녹지를 활용한 경우가 대부분이고 주민 이용을 위한 개발 방식으로 추진된 경우가 많았다. 7) 2020년은 명확한 복원의 목표와 방향을 사업명으로 제시한 사례가 많고 보다 서식처 조정에 집중한 경우가 많았다.

연도별 변화와 흐름을 살펴보면 복원사업의 세부 기술이 주를 이루었던 초기와 달리 정착 후 전반적으로 반환사업 활용 기술 향상의 과정을 그대로 보여주며 기후 문제 등 사회적 요청에 대응하기 위한 복원기술을 중심으로 여러 관련 기술이 복합화 및 세분화하고 있음을 알 수 있다.

IV. 결 론

부담금 제도는 시행 20여 년이 지나며 이제 정착 단계에 접어들었다고 볼 수 있다. 앞의 결과를 볼 때 명칭이 바뀌는 등 수차례 업무가 보완되고 체계가 갖추어져 가면서 신청 사업과 시

행 사업 등에도 경향성이 나타나고 있으며, 적용되는 복원기술 또한 일정한 흐름을 보이는 것을 알 수 있다. 최근에는 단위 생태 공간 복원을 넘어 지역 전문가나 일반 시민이 참여하는 방식으로 생태계 기능의 향상을 도모하는 사업들이 늘고 있는 추세이다. 이러한 경향성은 반환사업의 향후 추진에도 시사하는 바가 크며, 자연환경 보전을 위한 노력에 새로운 방향성을 제시할 수 있다. 이러한 결과는 다음과 같은 결론을 시사한다.

1) 반환사업 시행 건수가 증가함에 따라 복원 기술의 적용 대상에도 경향성이 강화되는 추세가 나타남. 이는 부담금 제도의 효과와 효율 개선을 위해 몇 가지 세부 사업에 대해서는 신청과 조성, 모니터링까지 일련의 과정을 프레임화하고 보고할 필요성을 보여줌. 이런 사업으로는 생태통로 조성, 훼손 생태계 복원 등임

2) 대부분의 시행 사업이 소생태계 조성으로 신청되고 있으나 사업 내용을 보면 다른 사업 범주로 볼 수 있는 경우가 많음. 이는 반환사업 추진의 목적을 발주처가 보다 명확하게 제시해야 함을 보여주고 사업 신청 단계에서부터 제도적 보완이 필요함을 시사함. 반환사업의 효율적이고 효과적인 추진을 위해 사전에 사업에 대한 이해도를 높일 필요가 있음도 보여줌. 복원 사업이 대부분 복합화 사업이어서 다목적성이 있다고 하더라도 해당 사업의 성격과 특성은 분명하게 설정하여야 할 것임

3) 적용되는 세부 기술은 점차 확대되는 경향을 보이나 기술의 세부 특성을 설명하기 보다는 일반 명칭을 사용하여 차별성을 드러내지 못하는 경우가 많음. 반환사업의 특성과 목적에 적합한 활용 기술의 범위와 목록 등 보다 기술적인 정체성 홍보와 확보가 시급함

4) 반환사업의 모니터링 결과 활용을 위하여 관련된 평가의 체계나 틀을 구축할 필요가 있음. 사업의 목적이 달성되었는가는 명확하게 평가되기 어려울 수 있으나 사례가 누적된 만큼

Table 7. Special contents by year of restoration project

project year	Practice characteristics
2014	Demonstrate the diffuse nature of the return business with multiple pilot project locations and applied technologies
2015	Most of the projects are implemented in a general park greening method that considers user activation in natural ecology.
2016	Many projects focus on themes such as improving river ecosystems or enhancing ecological functions centered on target species
2017	There are many project sites linked to water resources, such as reservoirs and riversides, and adjacent to the coast, and most of them involve strengthening existing ecological functions.
2018	There are many micro-ecosystem creation projects linked to forests and mountain areas, and many projects linked to accessibility.
2019	Often utilizes urban green space and is often promoted as a park development for resident use.
2020	Many have clear restoration goals and directions in their business names, and many are more focused on habitat adjustments

추진 과정에서의 문제와 보완 사항을 추후 사업 추진에 반영할 필요가 있음. 현재는 모니터링의 범위가 제한적이고 사업 선정부터 조성 및 유지 관리 시의 피드백이 임의적인 경향이 있음

5) 단일 복원기술의 적용 사례는 초기부터 많지 않았고 최근으로 올수록 그 복잡화의 내용과 범위가 확대되는 경향을 보임. 목적하는 사항이 포괄적이고 다종다양하지 않더라도 사업 내용상 많은 부분이 융복합을 지향하는 것을 볼 수 있음. 이는 복원기술 관련 연구 성과가 누적되어온 영향이 있을 것으로 보이며, 개발사업 대상지에 한계가 있는 등의 외적 영향도 있을 것으로 보임. 이에 대해서는 별도 연구가 필요함

6) 반환사업의 개선 방향은 자연환경과 인간 생태의 복잡화를 일부 수용하는 방향으로 복원과 보전 기조를 확대하는 것을 고려할 수 있음. 이는 주민참여, 도시재생, 폐철로 활용 등 기존 인간 활동 중심이라 여겨졌던 사항들이 자연환경의 자생성과 회복력에 도움이 되고 있음을 반영한 것으로 볼 수 있음. 따라서 자연환경에서 인간의 역할과 기능을 고려한 복원기술의 확대를 모색해야 할 것으로 보임

본 연구는 연구 대상에 대해 전수조사에 기반하지 못하였고, 관련 사업의 신청과 시행에 있어 다양한 요인 등이 발생하는 등 한계가 있으나, 반환사업의 목적과 내용, 경향 등을 전반적으로 살펴보았다는 점에서 정책과 제도 개선에 충분히 시사하는 바가 있다. 특히 분석의 틀을 도출하고 이에 따라 결론을 도출한 점은 향후 한계점을 보완한 후속 연구에 기여할 것으로 판단된다. 무엇보다 반환사업의 합목적적 추진에 제도적, 정책적 방향성을 볼 수 있어 의미 있다.

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