

## 1. Overview

### (1) Background and features of the practice

There is a wide variety of ecosystem services that are beneficial to humans. Ecosystems and their functions are not necessarily a one-to-one relationship; rather, one ecosystem usually has multiple functions.

From a different angle, this means that a deterioration in one ecosystem may affect the lives of human in multiple ways. In fact, there are many cases around the world in which the overexploitation of provisional services (such as food, fuel, and materials) has caused loss of multiple functions of the ecosystem simultaneously and brought difficulties to the lives of local people.

One of the causes of such problems is the lack of proper maintenance and management of all ecosystem services, which happens because the use and management of natural resources are left to the discretion of the market mechanism despite the fact that the multiple functions include public ecosystem functions that have no market value.

With the involvement of public entities such as government and international organizations, this practice aims to restore public ecosystem functions through the conservation, restoration, or creation of vegetation and to solve the problems associated with the use and management of natural resources (such as overexploitation and under-exploitation) which are causing the deterioration the public ecosystem functions.

### (2) Details of the practices and their applicability

There are two representative practices as shown below.

#### 1) Bioshield development

- i. Details of the practice
  - This practice conserves, restores, or creates natural ecosystems such as forests along coastlines, lake shores, and river banks near residential areas such as cities and communities in order to alleviate and prevent natural disasters such as floods, tidal waves, and tsunamis.
- ii. Range of application
  - Implementation of this practice is effective in areas where significant damage can be expected from natural disasters such as floods, tidal waves, and tsunamis.
- iii. Implementing bodies
  - Public entities such as government organizations take initiatives to implement this practice based on the intentions of local residents.

#### [Cases]

In Japan No.5: Restoration of coastal forest for the purpose of recovery of marine resources and improvement of living environment in Cape Erimo, Hokkaido Prefecture, Japan

Around the world No.23: Agriculture in harmony with nature in the state of Queensland, Australia

## **2) Forest conservation-style sand control**

- i. Details of the practice
  - This practice conserves, restores, or creates forests in mountains located in upstream regions in order to alleviate or prevent the damage of natural disasters such as landslides and floods in residential areas such as cities and communities.
- ii. Range of application
  - It is effective to implement this practice when damage from landslides and floods are anticipated, and they are thought to be originated by weakened ecosystem services in the upstream mountains.
- iii. Implementing bodies
  - Public entities such as government organizations take initiatives to implement this practice based on the intentions of local residents.

### **[Cases]**

In Japan No.4: Reforestation by public works for the purpose of restoring ecosystem service in the Rokko Mountain Range, Hyogo Prefecture, Japan

## **2. Effects obtained from these Cases regarding the sustainable use and management of natural resources**

Implementation of the practices in this category is associated with the following effects in the sustainable use and management of natural resources and the maintenance of a healthy secondary nature.

### **(1) Effects in the sustainable use and management of natural resources (socioeconomic effects)**

- Natural ecosystems nurtured by this practice are expected to simultaneously provide multiple functions better than artificial infrastructures (such as shore protections, banks, and dams) that aim to preserve public ecosystem functions.
- In areas that face shortages of food, fuel, or materials, it is expected that building ecosystems that have both provisional functions and public functions will improve the overall welfare of local residents.
- Waterfronts and mountain regions that are the application targets of this practice take up important roles in the mutual relationships with the surrounding ecosystems. Thus, it is expected that improving their fundamental services (such as nutrient circulation, soil formation, and the prevention and removal of infectious diseases) through the implementation of this practice will improve the productivity of agriculture, forestry, and fishery of the entire region.

### **(2) Effects on the health of the secondary nature (effects on ecosystem and biodiversity)**

- The implementation of this practice is expected to improve biodiversity as well as the health of secondary nature in waterfronts and mountains.

### 3. Toward the implementation of this practice : Points of planning and examples of action items based on the “Five Perspectives” of the SATOYAMA Initiative

Points of planning and action items for planning the employment of practices in this category are as follows.

Table: Points of planning and action items based on the “Five Perspectives” of the *Satoyama* Initiatives

“Five Perspectives” of the Satoyama Initiative	Points of planning	Action items
(1) Resource use within the carrying capacity and resilience of the environment	<ul style="list-style-type: none"> <li>• It is necessary to analyze causal relationships between weakened public ecosystem functions and problems associated with the use and management of natural resources.</li> <li>• It is necessary to create a plan for the conservation, restoration, or creation of ecosystems that not only improves public ecosystem functions but also contribute to optimize the use of natural resources based on the above analysis.</li> </ul>	<ul style="list-style-type: none"> <li>• Sort out current conditions and issues associated with the use and management of public ecosystem functions and natural resources.</li> <li>• Plan the conservation, restoration, or creation of an ecosystem</li> </ul>
(2) Cyclic use of natural resources	<ul style="list-style-type: none"> <li>• It is effective to explore the possibilities of the cyclic use of natural resources of the new ecosystem to be nurtured.</li> </ul>	<ul style="list-style-type: none"> <li>• Examine the cyclic use of natural resources.</li> </ul>
(3) Recognition of the value and importance of local traditions and cultures	<ul style="list-style-type: none"> <li>• It is necessary explore the applicability of traditional knowledge of the region.</li> </ul>	<ul style="list-style-type: none"> <li>• Verify the applicability of traditional knowledge.</li> </ul>
(4) Natural resource management by various participating and cooperating entities	<ul style="list-style-type: none"> <li>• In the planning and establishing a foundation, it is necessary for public entities such as government organizations to take initiatives and build a system that local residents can voluntarily get involved with.</li> <li>• When transferring the use and management to local residents, it is necessary to establish systems, rules, and mechanisms to ensure proper use and management.</li> </ul>	<ul style="list-style-type: none"> <li>• Establish implementation systems.</li> <li>• Establish rules and mechanisms of use and management.</li> </ul>
(5) Contributions to local socio-economies	<ul style="list-style-type: none"> <li>• In order to gain the understanding and cooperation of local residents, it is effective to work with local businesses and operations that utilize the nurtured ecosystems.</li> <li>• It is important to provide education and develop the human resources and capacities toward the autonomous management by local residents.</li> </ul>	<ul style="list-style-type: none"> <li>• Plan to utilize the developed ecosystems.</li> <li>• Plan education, human resources development, and capacity building.</li> </ul>

## (1) Resource use within the carrying capacity and resilience of the environment

<b>Points of planning</b>	<ul style="list-style-type: none"> <li>• It is necessary to analyze causal relationships between weakened public ecosystem functions and problems associated with the use and management of natural resources.</li> <li>• It is necessary to create a plan for the conservation, restoration, or creation of ecosystems that not only improves public ecosystem functions but also contribute to optimize the use of natural resources based on the above analysis.</li> </ul>
<b>Action items</b>	<ul style="list-style-type: none"> <li>• Sort out current conditions and issues associated with the use and management of public ecosystem functions and natural resources.</li> <li>• Plan the conservation, restoration, or creation of an ecosystem</li> </ul>

Weakened public ecosystem functions and problems associated with the use and management of natural resources are often closely related with each other. There are many cases in which a vicious cycle has been established. For example, landslides and flooding have become more frequent due to excessive deforestation, which has made the lives of local residents difficult and driven them to cut down more trees to gain income, causing yet more disasters. In contrast with this, there are cases where the under-exploitation of natural resources has weakened the public functions.

When introducing this practice, it is necessary to first identify the ecosystem that is the origin of the weakened public ecosystem functions. Then, the causal relationship between the weakened public ecosystem functions and problems associated with the use and management of natural resources (e.g. overexploitation and under-exploitation) in the area has to be analyzed. It is effective to seek the support of public entities such as government organizations or researchers, because this procedure requires expert knowledge and skills.

Then, based on the above analysis create a plan not only to improve public ecosystem functions but also to nurture ecosystems that can also optimize the use of natural resources. It takes a long time to nurture ecosystems. Thus, it is important to establish a clear long-term goal putting a priority on the conservation of public ecosystem functions and then create a gradual nurturing plan.

Table: Examples of actions and focus points to ensure use within the carrying capacity and resilience of the environment

Action items		Examples of actions and focus points
<b>Sort the current status and problems associated with the public ecosystem functions and use and management of natural resources.</b>		<ul style="list-style-type: none"> <li>• Locations and details of the ecosystem that is the origin of the weakened public ecosystem functions</li> <li>• Status of the use and management of natural resources in the above location (Example: Is the ecosystem used and managed in a way that is in harmony with the carrying capacity and resilience of the environment?)</li> <li>• Analyze causal relationships between weakened public ecosystem functions and problems associated with the use and management of natural resources (Example: Compare the trends of disasters with the decrease of forest resources)</li> </ul>
<b>Ecosystem nurturing plan</b>	<b>Target ecosystem</b>	<ul style="list-style-type: none"> <li>• Establish a long-term goal for the ecosystem while prioritizing the conservation of public ecosystem functions. (Example: Coastal forests composed of dense vegetation with high wave-absorption properties, and mountainous forests composed of vegetation with high soil-holding properties)</li> </ul>
	<b>Vegetation composition</b>	<ul style="list-style-type: none"> <li>• Basically include vegetation that satisfies the above goal and mix with additional vegetation that can improve other functions (e.g. improvement of the availability of provisional services).</li> <li>• Refer to healthy natural ecosystems that exist near the area and use native species as much as possible.</li> </ul>
	<b>Gradual nurturing plan</b>	<ul style="list-style-type: none"> <li>• Utilize natural succession mechanism (e.g. herbaceous plants → pioneering tree species → target tree species).</li> <li>• When the topography and soil conditions are not favorable, use species that grow well in oligotrophic soils with high soil conditioning properties (e.g. nitrogen fixing properties) in order to promote initial vegetation settlement.</li> </ul>

## (2) Cyclic use of natural resources

<b>Points of planning</b>	<ul style="list-style-type: none"><li>• It is effective to explore the possibilities of the cyclic use of natural resources of the new ecosystem to be developed.</li></ul>
<b>Action items</b>	<ul style="list-style-type: none"><li>• Examine the cyclic use of natural resources.</li></ul>

It is possible to use the natural resources that form a new ecosystem to be nurtured as sources of food, fuel, and materials in a cyclic way by connecting them with surrounding land uses and human activities.

Thus, it is effective to examine the applicability of the compound operations (Category No. 1) of agriculture, forestry, and fishery based on multi-layered land use and biomass utilization (Category No. 5) while placing the first priority on ensuring public ecosystem functions.

## (3) Recognition of the value and importance of local traditions and cultures

<b>Points of planning</b>	<ul style="list-style-type: none"><li>• It is necessary explore the applicability of traditional knowledge of the region.</li></ul>
<b>Action items</b>	<ul style="list-style-type: none"><li>• Verify the applicability of traditional knowledge.</li></ul>

Local wisdom regarding traditional resource circulation and knowledge of useful plants may include information that can be utilized in setting ecosystem goals and selecting tree species for this practice.

Thus, as a part of the preliminary research to plan the implementation of this practice, it is necessary to sort the details and locations of traditional knowledge, identify their natural and social rationalities, and examine their applicability.

#### (4) Natural resource management by various participating and cooperating entities

<b>Points of planning</b>	<ul style="list-style-type: none"> <li>• In the planning and establishing a foundation, it is necessary for public entities such as government organizations to take initiatives and build a system that local residents can voluntarily get involved with.</li> <li>• When transferring the use and management to local residents, it is necessary to establish systems, rules, and mechanisms to ensure proper use and management.</li> </ul>
<b>Action items</b>	<ul style="list-style-type: none"> <li>• Establish implementation systems.</li> <li>• Establish rules and mechanisms of use and management.</li> </ul>

In the implementation of this practice, the involvement of public entities such as government organizations and international organizations is essential, since one of the purposes of this practice is to improve public ecosystem functions. These public entities are especially expected to take initiative in the planning phase where expert knowledge and skills are required, and in the foundation establishment phase (e.g. site preparation, procuring seeds or young plants, and nurturing until the environment stabilizes) where a large sum of funding is required. The active participation of local residents is also essential in the above process, because local residents are the beneficiaries of this practice.

After vegetation growth stabilizes, it is preferable to switch over to autonomous use and management system under the initiative of local residents (however, there is also an option for public entities to continue to manage in special circumstances such as when the terrain is steep and unsuitable for the use of natural resources). It is also necessary to establish rules and systems to guarantee proper usage and management in order to avoid the recurrence of problems such as overexploitation and under-exploitation.

In order to make the systems, rules, and mechanisms created by local residents viable, it is effective for government organizations to provide support such as the legal guarantee of rights. Also, when the beneficiaries of public ecosystem functions that originate in the nurtured ecosystems include an unspecified number of people over a wide area, it is effective to combine efforts to secure the proper responsibilities of the beneficiaries (Category No. 9).

Table: Examples of rules and systems to guarantee proper use and management by local residents

Category	Expected contents	Purpose of the rules and systems described on the left
<b>Rules for use and management</b>	<ul style="list-style-type: none"> <li>• Set an upper limit to the amount of use (total and individual amount of use)</li> </ul>	<ul style="list-style-type: none"> <li>• To ensure use within the carrying capacity and resilience of the environment</li> </ul>
	<ul style="list-style-type: none"> <li>• Usage zoning (locations where use is allowed, locations where use is limited, locations where use is not allowed, etc.)</li> <li>• Limits of actions associated with use and management</li> <li>• Limits to the period of use</li> </ul>	<ul style="list-style-type: none"> <li>• To control use to reduce negative impacts on public ecosystem functions</li> <li>• To prevent use during vegetation growth phases</li> </ul>
<b>Systems of use and management</b>	<ul style="list-style-type: none"> <li>• Allocation of available amount of resources depending on management responsibilities</li> </ul>	<ul style="list-style-type: none"> <li>• To set responsibilities depending on benefits received</li> <li>• To provide motivation for management</li> </ul>
	<ul style="list-style-type: none"> <li>• Limits on the transfer of land or usage rights, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• To prevent improper use by entities or parties outside the area</li> </ul>

## (5) Contributions to local socio-economies

<b>Points of planning</b>	<ul style="list-style-type: none"> <li>• In order to gain the understanding and cooperation of local residents, it is effective to work with local businesses and operations that utilize the developed ecosystems.</li> <li>• It is important to provide education and develop the human resources and capacities toward the autonomous management by local residents.</li> </ul>
<b>Action items</b>	<ul style="list-style-type: none"> <li>• Plan to utilize the developed ecosystems.</li> <li>• Plan education, human resources development, and capacity building.</li> </ul>

The understanding and cooperation of local residents, the beneficiaries, is required to ensure the continuous effects of public ecosystem functions in the ecosystems nurtured through this practice. In the meantime, as public ecosystem functions are not visibly effective on a daily basis, it is effective to work with local businesses that utilize the nurtured ecosystems and natural resources obtained from the ecosystem to promote understanding and cooperation. Specific examples include the compound operations of agriculture, forestry, and fishery based on multi-layered land uses (Category No. 1), the production of industries using traditional cultures and skills (Category No. 4), biomass utilization (Category No. 5), and ecotourism (Category No. 7).

Also, in order to maintain favorable conditions through the autonomous activities of local residents, it is important for individual participants involved in the use and management of ecosystems to understand the basic concepts of this practice as well as acquire the knowledge and skills to realize them. Thus, all public entities that play a central role of this practice need to provide education, human resources, and capacity building programs that target local residents.

Table: Examples of new local businesses in forests

Field of local business	Specific examples
<b>Compound agriculture and forestry through multi-layered land use (Category No. 1)</b>	<ul style="list-style-type: none"> <li>• Introduction of agroforestry in tropical forests</li> <li>• Introduction of fish and shellfish culture in mangrove forests</li> <li>• Introduction of forest grazing that also serves as undergrowth vegetation management</li> </ul>
<b>Production of industries with traditional cultures and skills (Category No. 4)</b>	<ul style="list-style-type: none"> <li>• Manufacturing of traditional arts and crafts that primarily use wood</li> <li>• Cultivation of traditionally useful plants</li> </ul>
<b>Biomass utilization (Category No. 5)</b>	<ul style="list-style-type: none"> <li>• Fuel use or power generation (energy use)</li> <li>• Manufacturing of new products that use wood as a primary material (material use)</li> </ul>
<b>Ecotourism (Category No. 7)</b>	<ul style="list-style-type: none"> <li>• Implementation of ecotourism that utilizes local ecosystems, relevant culture, and other local features</li> </ul>