



Local activation using traditional knowledge and ecological resources of Korean islands

Sun-Kee Hong*

Institution for Marine and Island Cultures, Mokpo National University 530-841, Korea

Abstract

When we consider changes in agro-fishery systems instigated by environmental changes in islands, rise in sea levels, and natural disasters such as tsunamis, there is an urgent need to carry out initiatives to enhance life standard and conserve ecosystem in island and coastal regions. To protect the region's landscape from the effects of climate change, it is necessary to develop an integrated management system for ecosystem conservation, human settlements, and the local economy. This paper discusses the outline of a preliminary national plan for a sustainable island management system for remote (inhabited and uninhabited) islands in Korea. Two main ideas to enhance life standard are adapting to the natural environment by applying traditional knowledge and utilizing ecological resources of islands, i.e., improving the quality of life and creating added value. As a technique for improving the quality of life, the establishment of eco-villages based on energy-efficient passive houses and ecological welfare is suggested. Another technique for creating added value, the development of sea-farming islands that utilize islands' new recyclable energy is also proposed. Finally, the suggested ideas are discussed in relation to island ecotourism and carbon zero islands.

Key words: ecological knowledge, island ecosystem, island resources, local activation, sustainable island

INTRODUCTION

Improving the quality of life on islands and ways of creating added value

The whole world is paying attention to the potential value of islands and surrounding waters as a driving force behind new growth engines and as sources of resources. Moreover, the importance of islands (especially uninhabited and inhabited islands within each country's territorial seas) is increasing in aspects of national security and maritime territory (Kennedy et al. 2002). Considering their importance, it is time to seriously make plans for preservation and improvement of the habitats of the islands' ecosystems that are vulnerable to global climate

changes, including natural disasters such as tsunamis, changes in agriculture/fishery bases due to environmental changes on islands, and rises in sea levels due to ocean climate changes (Maribus 2013). An integrated management of coastal ecosystems by organizing a foundation for islanders and qualitative economic systems needs to be implemented in Korea (Hong et al. 2011). The life quality of islanders needs to be enhanced and the ecological values of islands need to be shared with people all over the world by utilizing and preserving unique ecological resources of islands of archipelagos. To do this, an ecological analysis and diagnosis of the overall archipelago environment incurrents and oceanic climate borders are

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*Corresponding Author

E-mail: landskhong@gmail.com,

skhong@mokpo.ac.kr

Tel: +82-61-260-1708

necessary.

China established a national island protection plan at the government level (Lee et al. 2012). Japan has recognized its islands as an important part of its national territory, and enhanced support for them in the 6th Ritou (a remote island in Japanese) Development Plan (Kim 2013). It is of concern that funding for technological research, development, infrastructure, etc. in Korea has been focused on inland areas. Currently in Korea, there are 3,358 islands (The 3rd comprehensive island developing plans sponsored by the Safety Administration Department 2007) among which 432 are inhabited and 2,876 are uninhabited (Oh et al. 2011). However, the number of uninhabited islands is increasing according to the survey of uninhabited islands conducted by Ministry of Land, Transport, and Maritime Affairs (later the Ministry of Maritime Affairs and Fisheries) conducted from 2007 to 2012 (Ministry of Land, Transport and Maritime Affairs 2012). The problem is that this tendency is growing faster and the population of inhabited islands is decreasing every year.

The number of inhabited islands was 530 in 1984 and 366 in 2011 (Oh et al. 2011). The numbers of islanders were 434,000, which decreased to 68,000 in 2011. This trend indicates a high possibility for most of the inhabited islands to become uninhabited in the near future. Inhabited islands may remain unmanaged due to the decrease

of their population. In order to prevent this from happening, a policy needs to be developed to enhance living conditions, create an income basis for inhabited islands within Territorial Sea Baselines, and utilize the islands in sustainable ways.

The purpose of this study is to plan a technological development project to enhance the quality of life and create added value, which can be implemented on inhabited and uninhabited islands within Territorial Sea Baselines (Table 1). The islands are very important national territories, but neglected politically, economically, socially, and environmentally. Increasing or maintaining the island population can be achieved by inspiring islanders to settle on the island, by improving housing facilities, providing housing welfare through home improvements, and enhancing living conveniences and the well-being of islanders. The energy supply and demand structure of islands, vulnerable to energy crises needs to be changed into a flawless structure by reducing pollution and fuel costs caused by fossil fuels through a complex system using new and renewable energies such as solar and bio-energy, and using alternative energies based on wind, solar, and food wastes. Political and social attention of the Korean government needs to focus on island societies since more than 65% of the total populations of islands are senior citizens above 65 years old.

Table 1. Two main core objectives (Type A: improving the quality of life and type, B: creating added value)

Objective	Contents	
Type A Improving the quality of life	<ul style="list-style-type: none"> · Ecological well-being through the restoration of biodiversity and cultural diversity · Landfill stability investigation against flooding due to sea level rise on islands · Ensuring natural and cultural resources through monitoring and restoration plans of island village forests, tree fences for island villages and trees for protection · Long-term forestation plans for sea level rise due to climate warming · Advancement of Education and Medical Services in island areas · Service training for local tourism · Fostering self-supplying energy societies using techniques such as passive houses · Expansion of various infrastructures · Restoring island ecosystem for utilization of island ecosystem resources 	Necessary protective measures should be provided for the distant future, equipped with a long-term monitoring system.
Type B Creating added value	<ul style="list-style-type: none"> · Waste monitoring for sustainable use of marine litter · Energy production utilizing green waste incinerating facilities · Eco-tourism using special landscape of island areas · Planning and management of the entire island landscape for amenities of island areas · Ensuring the production and distribution system for the specialty products of the region and branding them · Developing cultural tourism resources through restoring the living heritage and traditions · Providing a variety of information services and tourist guide books published by island publishers 	

Possibility of regional activation

Korea is a marine-peninsula country surrounded by the sea on three sides, with about 3,400 inhabited and uninhabited islands. Unfortunately, the support of the central government considerably focuses on inland regions. Not only the support for new and recycled energy business, but also technologies for islands' settlement conditions, which define the standard of living, is inland oriented (Lee et al. 2012). As the environmental conditions, ecosystems, and climate conditions on islands are totally different from the mainland, whether the same technologies used inland can be used on the islands should be examined seriously. Efforts to improve quality of life and living bases as well as to develop new recyclable energies need to be made under creative economic policies for islands with inferior conditions.

The vision of new growth engines and development strategies, vitalization of the regional economy, and development of industrialized systems that can foster balanced regional development should be realized by the state. Revitalizing the region is necessary to foster a new type of living environment and industry based on an ecology-healing system with a new concept based on the proliferation of health and environment oriented lifestyles outside of cities. Korea is classified as a severely polluted country according to the international Environmental Sustainability Index. It ranked 122 out of 146 countries in 2005, which means that a system for integrated management of a new public environment is absolutely necessary to enhance the quality of life as well as improve Korea's national image as a green country. This field has not been recognized as an industry in Korea, which makes it impossible for us to research about this sector, but nowadays it is gradually becoming recognized as a service industry that caters to improving the quality of human lives as a living environment industry.

According to the World Tourism Organization (WTO), the market size of ecotourism, an industry related to improving the quality of life, amounts to 0.2 billion dollars, and a new occupation referred to as "nature guide" has emerged. Taking advantage of the energy balance of ecovillages by utilizing new and renewable energy has been proposed by Korea Institute of Energy Research as a large-scale integration approach to explore systematic renewable energy building and local adaptation measures. The islands of Jeollanam-do currently have the highest new and renewable energy supply rate in Korea, as this is the area with the most sunshine. Most of the new and renewable energy supply, however, is concentrated in inland ar-

eas in Jeollanam-do.

In order to improve the quality of life in fishing villages in Jeollanam-do, specialized models to accommodate regional characteristics have been developed, community-based activation programs and funding plans have been prepared, and all the attention has been focused on improving community network and life quality of islanders. As part of revitalizing the agricultural and fishing areas, Jeollanam-do operates a variety of ecotourism program to experience agriculture and fishing villages. However, tourism based on experiencing agriculture and fishing as a method for revitalization is highly likely to fail due to limited demands, various imitation programs, and the absence of preliminary-programs. The Ministry of Environment also supports businesses that protect and preserve natural resources in each village and restore damaged ecology through projects for excellent ecological villages and excellent restored villages. Since 2006, four villages have been designated as the "Best Eco-Village," and one village has been designated as the "Best Restoration Practice Area" in Jeollanam-do. Currently, high energy costs, aging citizens, increased need for better quality of life, nostalgia for traditional culture, the pursuit of a healthy life, quality changes in tourism due to increased earnings, increased foreign tourists' demands due to globalization, and diversion of national recognition on islands and the sea needs to be taken care by island authorities within Jeollanam-do. Business plans are desperately needed for green energy policy to cope technically, culturally, and ecologically with measures needed for the island development strategy throughout Korea. Such measures include those for the revitalization of the local economy and those for improving the quality of life of the islands.

Residences, living environment, and energy

Technology to construct Korean traditional ecovillages and natural welfare systems (ecology tourism, healing centers, therapy, etc.) in accordance with the aging society needs to be secured through the development of specialized technology for energy systems, development of renewable energy materials, and utilization of the finest building material. In the long term, the above-mentioned points need to be linked with island-related international eco-tourism (hotels and leisure pensions including traditional houses with Ondol, Korean traditional floor heating) and the development of resorts of different grades (IUCN, <https://www.iucn.org/>). Recently, the concept of ecovillages, which seeks well-being life styles that minimize environmental contaminants and ecosystem degra-

dation is being well-received due to the rise of environmental and energy issues worldwide. For example, much information is shared through the Global Ecovillage Network (GEN), an association with a total of 160 organizations.

With income levels lower than urban areas, island areas depend more than 90% on expensive oil in the winter, which indicates the need to reduce heating costs by using energy-efficient buildings or houses. Therefore, based on energy-saving technologies for buildings and economic analysis, it is necessary to provide structures with standard energy performance appropriate for island areas. Nordic countries are focusing on disseminating the construction of passive house in order to minimize heat loss of the buildings. The analysis of the feasibility of introducing buildings with the performance of passive house buildings into island areas in Korea should also be made. In the long run, the energy supply systems dependent on inland island areas should be converted into independent energy supply systems by building independent infrastructure committed to supplying clean energy and solving energy problems, after constructing complex facilities that produce and supply new recyclable energy such as solar and bio-energy (Korea Institute of Marine Science and Technology Promotion 2014).

The costs for heating should be reduced by spreading passive house buildings suitable for island areas, as island areas depend on expensive oils for heating in the winter. Meanwhile, the islands independent from the inland are supplied electricity by power generators using comparatively expensive diesel oil. A measure should be built in which building renovations and analyses on new and recyclable energy facilities are carried out on islands. Although the costs of heating continues to rise due to the consistent increase of oil prices, it is not easy for island areas to use alternative energies such as tidal or solar energies, not to mention LNG, which is dominantly used in urban areas. Forest fuel cannot be used due to the risk of environmental damage. The government's political attention and support needs to be taken into consideration regarding island areas, as more than 60% of the population on islands are senior citizens who are more than 65 years old.

Vitalizing regional economy using characteristics of islands

Shinan-gun (county) of Jeollanam-do Province has the characteristics of the Mediterranean archipelago; it consists of more than 1,000 inhabited and uninhabited

islands, is the 5th widest tidal flat area in the world, and has been designated as a UNESCO Biosphere Reserve in 2009 (Hong et al. 2014). Unique southern ecosystems have developed on the islands of the archipelago due to warm and humid maritime climates and they have ecological resources such as quality mud flats, which are also referred to as repositories of marine life. Particularly, various fisheries exist and sun-dried salt is harvested in Bi-Geum and Do-Cho Myeon, which are the major United Nations Educational, Scientific and Cultural Organization (UNESCO) Biosphere Reserve areas with ecological characteristics of tidal flats (Lee et al. 2010). Shellfish collected by traditional methods and various agricultural products produced in the germanium soil are the main primary commodities. In addition to traditional production resources, mudflats, ocher, and vegetation can be developed into environment-based future industries using state-of-the-art production methods. The creation of high-quality brand, Eco-Healing Island representing the global trend of environmental/cultural convergence industry, and the development of UNESCO Brand Products have region related merits based on which Future Living Environment Industry (Green Industry), which fits the "Green Growth Policy" pursued by the government, can be created and further developed (Hong et al. 2014).

Until 2010 most regions out of Jeollanam-do from throughout Korea have been selected for "Local Industry Promotion Projects," which is a kind of living environment industry sponsored by the Department of Agriculture, Forestry, and Fisheries. In the west sea regions, mud flats and small islands are widespread and have been designated as an "Archipelago Marine National Park." In the southern sea, although mud flat areas are less developed than in the west sea areas, there are still many islands spread out that are archipelago regions (Hanryeo Marine National Park). Particularly, since islands have significance as territorial sea baselines, the regional revitalization projects need to be quickly reviewed to counter the population, which is rapidly decreasing, and prevent the high possibility of them becoming uninhabited.

CONCLUSION

The purpose of the study is to apply various techniques being developed and utilized in and out of Korea in inhabited and uninhabited islands by planning a project committed to developing 2 types of techniques: (1) improving the quality of life (type A) and creating added value (type B). In addition, the challenge is to plan for new technolo-



Fig. 1. Grand design scheme for sustainable island. To understand diverse resources on land and ecosystem should be fundamental baseline to establish development policy in island (Korea Institute of Marine Science and Technology Promotion 2014).

gies that can create added value by improving the quality of islanders' lives and promoting local brands. In this study, plans for developing techniques for ecological well-being, construction of eco-villages using energy saving passive houses, and developing technology to use marine resources against climate changes have been proposed as appropriate measures (Korea Institute of Marine Science and Technology Promotion 2014). In addition, as methods for "creating added values," comparison and application of traditional and state-of-the-art techniques, such as preserving traditional knowledge and industries native to island areas, developing fish-farming islands, developing energy producing islands, developing tourism linked to uninhabited and inhabited islands, and developing strongpoint islands are proposed in this study. The project for improving the quality of life includes high-quality medical tourism such as eco-healing projects, which are products of the living environment industry, and carbon zero islands by introducing energy recycling passive houses built from green building materials (Fig. 1).

The final objective of this study is to plan a sustainable island management system that can be applied to inhabited and uninhabited islands in Korea by comprehensively assessing (policy, technical, and economic feasibility analysis) the two types (type A: improving the quality of life and type B: creating added value) of techniques, and furthermore deriving comprehensive plans necessary to

enhance the living patterns of islanders, which are adaptable to climate changes. Particularly, technique development linked to neighboring inhabited islands is proposed as a measure to manage and utilize uninhabited islands within the territorial sea baselines in this study.

It is essential to introduce technical measures and improve the environment in order to enhance living conditions and the quality of life on inhabited islands within territorial sea baselines, as many islands are rapidly becoming uninhabited. Besides, measures that can solve welfare issues on islands need to be discovered independently. For these issues to be dealt with, the environmental, socio-economic, and cultural characteristics of inhabited islands within territorial sea baselines should be closely examined. Based on these key targets, the technical feasibility that can be applied to island areas is proposed as follows:

1) Applying green energy systems and environment-friendly technology to island life

The economy of island areas close to the inland is based on half-farming and half-fishing, namely, the primary industry basis. Meanwhile inhabited islands within territorial sea baselines, far from the inland, are economically based only on fishing businesses. While recently, several islands are making money through marine culture, most of the islands are almost dependent on fishing and fish-

ing tourism, which indicates that they can hardly adjust to rapidly changing marine environments with the dependence on the primary industry increasing. In these situations, a basic study to introduce building styles for the industrialization of green growth engines has been initiated by the Korea Maritime Institute (KMI) since 2011, including a variety of farming techniques for seafood being attempted with the recirculation of sea-farming technology, which has been developed by domestic researchers. By applying these building-style sea farming techniques to island areas, island areas need to be given opportunities to be reborn as state-of-the-art farming islands, which can produce and export high-valued species of sea foods, and not be dependent on their primary industry anymore. But, since energy resources that can be used independently on islands are necessary to develop sea-farming islands using this building type aquaculture technology, the development of sea-farming islands should start from raising the level of energy independency by developing the islands' own new recyclable energies.

2) Effective use of inhabited-uninhabited islands

Through the surveys conducted by the Ministry of Land, Transport, and Maritime Affairs since 2007, research on natural and cultural resources of uninhabited islands, and their utilization methods have been finalized. Through these surveys, 4 categories for development and conservation of the uninhabited islands have been designated as areas for absolute conservation, semi-conservation, environment friendly utilization type, and development type. Except for several island areas designated for absolute conservation, utilization methods were established for most of the uninhabited islands from the perspective of size, accessibility, and utilization methods (Ministry of Land, Transport and Maritime Affairs 2012). Most of the uninhabited islands have been used for traditional fishery by residents of inhabited islands, and are very important places for biodiversity such as migratory birds, vegetation, etc. There is a need to develop eco-tourism as a new concept where major fishing points and beautiful scenery are taken advantage of and developed without being damaged (Oh et al. 2011). As for the uninhabited islands that can be developed, they can be developed as bases where renewable energy can be produced by taking into account environmental resources and harmony with the ecosystem.

3) Monitoring and research based development

Considering the living conditions on island areas, which are easily influenced by the rise in sea levels due to

ocean climate change, changes of agriculture and fishery bases due to changes in the environment, global climate change, and natural disasters such as earthquakes and tsunamis, there is a need for conservation of ecosystems on coastal areas near islands, establishment of island resident foundations, and development of qualitative economic systems (Kim 2013, Hong et al. 2014). While many studies of the existing archipelago islands have mainly focused on natural ecosystems, ecological space has been dramatically changing due to climate change, land use, and introduction of exotic species. In order to carefully review these matters, more studies on archipelagos will be needed depending on diverse ecosystems, landscape process, and interdisciplinary fields.

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