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Socio-economic foundation by biocultural resources management: Suggestion for UNESCO Shinan Dadohae Biosphere Reserve, Korea



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Abstract SDBR is largely representative of the aforementioned archipelago, and its topography alone allows for species diversity. The demarcated divisions of SDBR have the following environmental traits. Eleven inhabited islands, including Heuksando and Hongdo, and eighty-nine uninhabited islands make up a total of one hundred islands and beaches. The coastline stretches 274.39 km long, and the area of land, including beaches, is 46.42 km². The highest altitude above sea level is 377.6 m, set by the flag pole of Heuksando. Erosive waves have resulted in a multitude of oddly shaped rocks along the coastline. The buffer region of SDBR is made up of the land and sea areas that form Dadohaehaesang National Park, in which Bigeumdo and Dochodo are located. One hundred and thirty-three islands, seven inhabited and one hundred and twenty-six uninhabited islands, make up this buffer region, which has a 292.14 km-long coastline and a 102.27 km²-wide land area. The transitional region of SDBR is made up of residential areas and waters. Two hundred and fifteen islands make up this transitional region, which has a 441.79 km-long coastline and a 486.68 km²-wide land area. The highest altitude above sea level is 255 m, set by Seosan of Bigeumdo.

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Natural environment and resources

Geology and topography

Located at 34° 41' N, 125° 25' E, Shinan Dadohae Biosphere Reserve (SDBR) is part of the archipelago of some 1000 islands located in the southwestern sea of the Korean peninsula. The area has the characteristics of a ria coast. Its winding coastline and vast, resource-abundant tidelands can only be traversed by small ships due to shallow waters and narrow channels. A geological and topographical analysis shows that the majority of SDBR is formed by floors of Cretaceous tuff and volcanoclastic sedimentary rock. This is consistent with the geographical traits of the south of the Korean peninsula, where acidic volcanic activity took place extensively in the mid to late Cretaceous Period, resulting in explosive volcanic eruptions and volcanic ash deposits. Recurring volcanic activity caused the accumulation of volcanic ash in small basins where rocks formed. Heuksando, one of the core components of SDBR, houses the gneiss commonly found in the gneiss complex found on Sobaeksan, and biotite gneiss. The igneous rocks from the Jurassic Period found on Heuksando indicate weathering and erosion of the greatest degree. Throughout SDBR, including its core regions, are the same Cretaceous acidic volcanic rocks and sedimentary rocks found in the south of the Korean peninsula, with volcanoclastic sandstone and mudstone being the most common types (Korea Ocean Research and Development Institute, 2001, 2002). What makes SDBR representative of the traits of Dadohae and differentiates it from the rest of the Korean peninsula is the abundant volcanic activity in the late Cretaceous Period that created a great many small lakes, which formed into high and low mounds from a prolonged differential erosion of volcanoclastic sedimentary rocks, to be eventually shaped into islands by the Holocene sea-level rise. The rock floor is speculated to be made up predominantly of the soil of weathered neutral-to-acidic volcanic and volcanoclastic rocks. In some areas red-yellow soil, a product of weathered acidic plutonic rocks, is found (see Fig. 1).

Environmental characteristics of tidal flat wetland

The most notable feature of SDBR is the mesotidal beaches of various forms spread out far and wide along the coastline. What sets the beaches of SDBR apart from the beaches of

the west coast of Korea is that the former possesses the island beaches endemic to archipelagos, as well as open beaches like the ones found on the west coast of Korea. Fine mud beaches formed between islands on both sides by tides, and sand beaches located in a swath along the west and northwest coasts of the islands exhibit dramatically different beach traits that coexist in just a small area (Hong, 2010, 2012). Moreover, sand beaches are interspersed with rocky, precipitous coasts inhabited by diverse coastal organisms. Study of this area is continually finding a rapid increase in species diversity. At these beaches primitive fishing activities, such as building stone walls (ancient fishing method) to trap fish and throwing stones to collect oysters, are still taking place. Organisms found at these beaches have been used to make tools and various household goods. As such, the beach has long served as sustenance to man, and part of civilization and culture (Je et al., 2014). Besides the feeding capacity of the beach, there are its somewhat less appreciated capacities to regulate air and humidity, purify, and provide visual aesthetics. The widely scattered beaches to the east of Bigeum-myeon and Docho-myeon have an extremely high water-holding capacity due to a fine and stable sediment quality. The organisms of this region are able to propagate in the most stable environment as there are no detriments found in inland ecosystems, such as wild fire and drought. Proximity to an estuary provides ample seawater nutrients that noticeably increase organismic productivity (Koh, 1997, 2001). The environmental gradient that changes seabed height with closer proximity to inner bay allows for a diverse and flourishing community of salt plants. Where beaches and shallow waters connect is a high biological diversity. In parts of beaches with a large sand content, there are more benthic organisms that live deep underground than there are organisms that live on the surface. These organisms also perform the function of relaying surface oxygen to the sediment of beaches, to create aerobic spaces that can be inhabited by organisms (Koh and Shin, 1988; Korea Ocean Research and Development Institute, 2002). The surface of tidal flat wetland is a habitat of microphytes, including diatoms (Koh and Shin, 1988). At low tide, the beach surface develops brown lines from the diatoms. Microphytes serve as an importance food for beach creatures. The marshland around the estuary, topographically diverse, is home to a phragmites community, as well as brackish organisms and a host of other organisms representative of Dadohae. Due to a complex food chain and ecological circulation, the beaches of SDBR is inhabited by a great multitude of fish and shellfish, such as octopuses,

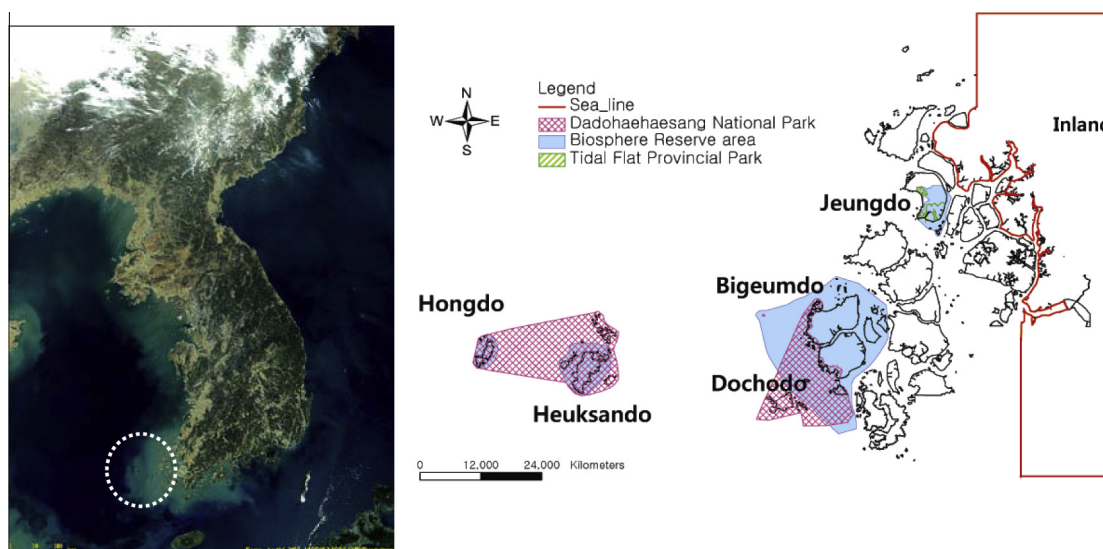


Fig. 1 Location of UNESCO Shinan Dadohae Biosphere Reserve in Korea (Hong et al., 2011).

blue-spotted mud hoppers, shuttles hopfish, and clams, as well as invertebrate organisms.

Vegetation

The dominant tree species of SDBR is evergreen trees, namely *Castanopsis sieboldii*, *Machilus thunbergii*, and *Camellia japonica*, which are the representative trees of Korea's warm temperate evergreen broad-leaved forest zone. These three trees are found in parts of the islands of Hongdo and Heuksando, as well as Uido-ri and its uninhabited islands, as the dominant tree species. *C. japonica* is the dominant species of small tree and shrub. In the *C. sieboldii* and *M. thunbergii* communities are found herbaceous plants, such as *Trachelospermum asiaticum*, *Ardisia japonica*, *Hedera rhombea*, *Lespedeza bicolor*, *Kalopanax septemlobus*, *Ophiopogon japonicas*, *Lemmaphyllum microphyllum*, and *Hepatica insularis* Nakai. The windbreak trees formed naturally along the coastline is a unique scenic-ecological trait of SDBR. Windbreak is mainly composed of *Pinus thunbergii*, and effectively blocks wind blowing from the sea (Hong et al., 2011). Dune vegetation in and around Docho-myeon is comprised of *Ischaemum antheophoroides* (Steud.) Miquel, *Zoysia sinica* Hance, *Vitex rotundifolia*, *Calystegia soldanella*, *Argusia sibirica*, and *Carex kobomugi* communities, and features a wide variety of salt plants. Also found in the dunes are *Phragmites australis*, *Carex kobomugi*, *V. rotundifolia*, *A. sibirica*, *Limonium tetragonum*, and *Glehnia littoralis*. Changes in dune topography caused by changing environmental conditions propagate a wide range of salt plants. SDBR is one of the typical salt plant habitats of Korea's southwest coast. Most of the uninhabited islands near Docho-myeon, such as Gyeongchido, Eorakdo, Seokhwangdo, Bido, and Hwado, fall within the boundaries of Dadohaehaesang National Park, and their shores and precipices are dominated by *P. thunbergii*. *P. thunbergii* is the most common vegetation of the coastal islands of Korea's southwest coast, but has substantially diminished in population due to human intervention. As well as the islands of Shinan-gun, a number of uninhabited islands in Uido-ri have remnant

patches of *P. thunbergii* communities as well as warm temperate evergreen broad-leaved tree communities (*C. sieboldii*, *M. thunbergii*, *C. japonica*), which serve as a critical specimen in island biogeographic research. The uninhabited islands of SDBR are home to South Asian insects that only inhabit warm temperate evergreen broad-leaved tree communities and coastal dunes, such as *Graphium sarpedon* and *Papilio protenor* Cramer.

Uninhabited Islands

There are some 1000 inhabited and uninhabited islands in Shinan-gun, Jeollanam-do. In SDBR, Jeungdo-myeon has 165 islands, Bigeum-myeon has 93 islands, Docho-myeon has 14 islands, with Uido-ri excluded, and Heuksan-myeon has 21 islands, with Hongdo and Heuksando included. The uninhabited islands of Shinan-gun can be divided into those of Bigeum-myeon and Docho-myeon, located in the inner sea, and those located in the outer sea; and their biological and geological characteristics differ. Uninhabited islands, compared to inhabited islands, are smaller and with limited ecological habitats. However, they are extremely important in the field of biology due to their isolation, which differentiates them from inner-sea islands or reclaimed lands. These uninhabited islands located within the Dadohaehaesang National Park are a key habitat to migratory birds and sea birds, and are also inhabited by warm temperate vegetation and Ministry of Environment-designated endangered species. For example, the islands of Chudo and Maeseom, located in Bigeum-myeon, Shinan-gun, have been verified as a habitat of *Falco peregrinus*, designated as a Class I Endangered Species by the Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora and the Korean Ministry of Environment, and as Natural Monument No. 323 by the Korean Cultural Properties Administration. In addition, *Milletia japonica*, discovered on Biado, is a rare plant designated as Class II Endangered Wild Plant by the Ministry of Environment. Jakeundaeseom of Bigeum-myeon, in recognition of its special topographical and geological feature of tuff and

volcanic soil, was designated as a Natural Monument in 2010. These uninhabited islands not only perform the role of a stepping stone for transitory creatures on the route between sea and inland, but also provide Dadohae residents with a source of income in the form of the seaweeds, abalones, and oysters growing in the waters of the islands. The global climate change and indiscriminate development of islands in recent times are changing the maritime ecosystem, e.g. seawater temperature and weather. Uninhabited islands differ from inlands and coasts in that the former's ecosystem demands a natural ecological recovery that is very complicated, a condition that makes them heavily disadvantaged in wildlife preservation. As such, ecosystem management of uninhabited islands must be differentiated from that of inlands, and be customized for uninhabited islands.

Migratory birds

Located off the southwest coast of Korea, Heuksando and Hongdo play an important role due to its location in the paths traveled by migratory birds (flyway). The flyway of East Asian migratory birds crosses these two islands, making it possible to observe large groups of birds migrating north or south via Southeast Asia and China in migration season. Rare birds are frequently observed also. Korea National Park Service found out in its 2009 research on migratory birds that Hongdo and Heuksando serve as a point of layover for 80% of Korea's migratory birds, and that it is traversed each year by 300,000 migratory birds moving between Siberia and Southeast Asia. In 2005 Korea National Park Service established the Migratory Bird Research Institute on Heuksando, and has since fitted an identification tag to 5000 migratory birds each year as part of an international research on the migration patterns and distribution of migratory birds (Lee et al., 2010). In 2009, Hongdo and Heuksando were traversed by some 300,000 birds of 271 species, and *Eremophila alpestris brandti* and *Motacilla alba personata*, two bird species previously unrecorded in Korea, were discovered for the first time.

Change in ecological landscape and social environment

Change in natural environment

SDBR falls into the categories of temperate broad-leaved forest and evergreen broad-leaved forest. The climate change of late, resulting in an elevated sea level and change in vegetation and fish species may have a multifarious impact on the islands of SDBR. As a UNESCO Biosphere Reserve, SDBR must be managed as follows, to inherit the culture of dependence on the unique and composite ecosystem of SDBR for man's survival and progression, and to move forward into the future. First, SDBR is directly exposed to natural disturbances, such as typhoons. Torrential rains accompanied by gales and sea winds containing salt are having a significant influence on vegetational development. The vegetation succession process resulting from today's climate change makes for a valuable academic resource that can be utilized in long-term ecological research aimed at the preservation of evergreen broad-leaved trees and coniferous trees that grow in warm temperate climates. Second, regions with dunes and beaches are ecotones where the ecosystems of land and sea connect. This means that

salt concentration in soil can be influenced by seawater and sea wind. Moreover, dunes develop a special vegetation community that results from exposure to both subterranean water and inundation. The wind erosion in progress in the dunes of Woojeon-ri, Jeungdo is expected to reduce dune vegetation or affect the range of vegetation species present. Last, the land-form of tideland is partially changed by tidal range. The elevated sea level and water temperature resulting from global warming are expected to have a momentous impact on the tideland ecosystem and the range of marine species.

Land use

SDBR's winding coastline and vast, resource-abundant tidelands can only be traversed by small ships due to shallow waters and narrow channels. The region has undergone reclamation to create farmland and salt pans (see Table 1 and Fig. 2), which brought about change in residences, estuaries, the ecosystem, and livelihoods. As the island community of Jeungdo-myeon, created by reclaiming 99 islands of various sizes, serves as an example, reclamation has been the catalyst that transformed the ecosystem and living space on Korea's southwest coast. Heuksando and Hongdo are entirely mountainous islands with precipitous sides and sinuous coastlines (41.8 km), and thus unsuitable as potential farmland. The residents of these two islands are reliant on fisheries and tourism for income. Specialty products of mountainous regions include medicinal plants and wild greens. The beaches surrounding Bigeumdo and Dochodo have spacious arable land, and the germanium found in the beach soil is beneficial to agricultural production. Most residents work in both farming and fisheries. Key produce include rice, barley, and sweet potatoes, and special products include spinach and tobacco. Bigeumdo and Dochodo were the first on Korea's southwest coast to produce sun-dried salt, and their salt-manufacturing industry still flourishes. Jeungdo was created by building an embankment to connect Daejodo, where Daecho-ri and Woojeon-ri were located, with 99 islands of various sizes, some inhabited and some not and now features large salt pans. The island features low uplands of approximately 100 m, and the flats among the uplands have been turned into rice fields. A sizeable farmland means that most residents work in farming, to produce rice, barley, rapeseed, and sesame. Notably, Taepyeong Saltpan Company is the largest single saltpan in Korea, and accounts for

Table 1 Land use of UNESCO Shinan Dadohae Biosphere Reserve (modified from Lee et al., 2010).

Land use type	Daeheuksan (ha)	Hongdo (ha)	Bigeum-Docho (ha)	Jeungdo (ha)
Residential area	71.91	13.09	319.12	61.48
Farmland	187.39	—	3631.53	539.45
Mountains	2132.05	652.04	9248.79	354.78
Grassland	214.19	—	4233.20	33.04
Marshland	2.34	—	3910.86	1790.92
Bare land	54.42	—	2260.23	51.00
Waters	3660.27	1125.04	37784.28	1319.86
Other	48.03	17.94	2007.42	24.85
Total	6370.60	1808.10	63395.43	4175.38

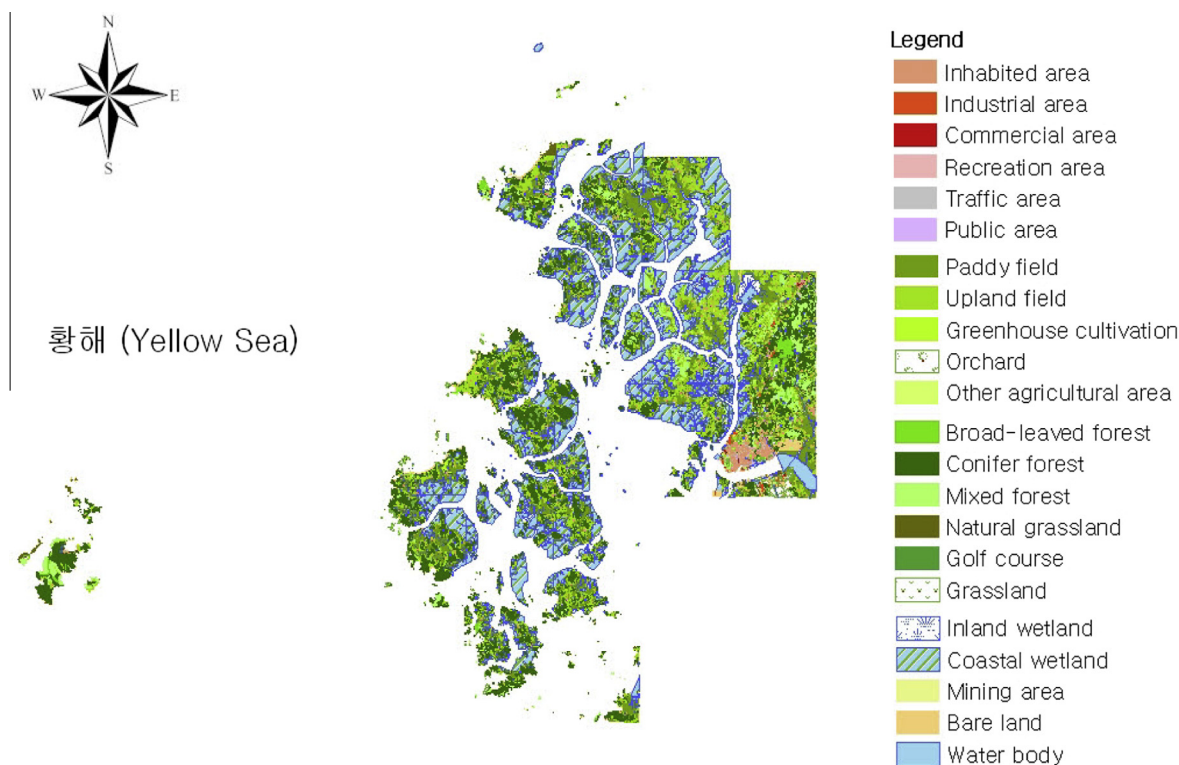


Fig. 2 Land use map of UNESCO Shinan Dadohae Biosphere Reserve. SDBR is mostly composed of tidal flat wetland and forested land.

Table 2 Annual population of Shian-gun.

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Population	56,614	54,953	53,150	51,342	49,704	50,726	47,591	46,451	46,714	46,968	45,718	45,294

6% of all sun-dried salt produced in Korea, which is equivalent to 16,000 tons of salt annually (Lee et al., 2010).

Features of social environment

Demography

As an island region, Shinan-gun's dwindling population from migration to nearby cities and metropolises is an important variable in its social environment. In a span of 10 years from 1999 to 2009, the population of Shinan-gun decreased from 54,953 to 45,294. Even with the young and the middle-aged capable of economic activity settling in Shinan-gun, a sharp rise in the aged population presents a difficulty in the maintenance of a sustainable society (Lee et al., 2010). An aging society, as defined by the United Nations, is one where more than 7% and less than 14% of total population is aged 65 or over (see Table 2). Korea became an aging society in November 2000 when its aged population (65 or over) reached approximately 3,390,000, equivalent to 7.2% of the total population of 45,980,000. Today the aged population of Korea continues to increase exponentially. The phenomenon of the aging society is especially pronounced in farming and fishing regions and on islands, and leads to a reduction in productive population.

The aging population of farming and fishing regions, together with a drop in productive population (aged 15–64), is further contributing to the decreasing productivity of island communities. The changing demography of islands communities, caused by a low birth rate, increasing aged population, and decreasing productive population, brings about many changes in their labor and consumer groups. The influence and ripple effect imposed on the society and economy of an island community by the aging of its population have multiple causes.

Economic structure

SDBR is made up entirely of islands, and its industries are agriculture and marine products (Hong et al., 2014). Under the autonomous regulation of a community (fishing cooperatives/fishery) formed voluntarily by residents, barehanded (traditional) fishing takes place in buffer regions, and fish farming, salt manufacture, organic farming, and tourism take place in transitional regions. The residents of SDBR apply the aboriginal experience and knowledge gained from adapting to SDBR's natural environment to their livelihoods. To sustain reproduction capacity and a balanced marine ecosystem, regulations are set and exercised by individual autonomous fishing communities. This allows the residents themselves to regulate

their resource acquisition and achieve preservation and sustainability.

Community

Communities are becoming a thing of the past in the Korean society, but fishing villages still maintain a strong sense of community. The sea can be unpredictable. Though an environment rich in resources, it can suddenly turn evil, robbing people of lives and properties. In recognition of the absolute power of the nature, something beyond man's control, communities are formed to overcome difficulties, and, when necessary, to adapt to the nature. Fishing communities promote the traditional virtue of interdependence, and the communal activities of co-production and co-distribution of marine resources. From seaweed to *Hizikia fusiforme* and oysters, resources put forth by the ocean, a shared domain, are still to this day collected and distributed as a concerted effort. If the socially handicapped, e.g. the aged, is unable to take part in such communal activities, earnings are divided and distributed among the entire community to have said handicapped receive their minimal share. This kind of community, though evolving in recent times, still performs an important function in regional societies. A prime example of such community is the fishing village cooperatives, a legal body that administers the right to use and occupy shared fisheries. Currently, there are 25 fishing village cooperatives in SDBR, and some 1000 households belong to them. Fishing village cooperatives have replaced 'jubi', the fishing village communities of the past and the functions of aging fishing populations of islands are being replaced by the activities of farmer groups, young adult groups, and women's groups (Cho, 1995; Lee et al., 2010). The village groups of yore are being succeeded to and developed in this manner. In the case of Jeungdo, the residents have formed a small community dedicated to the manufacture of organically dyed goods. The beach *V. rotundifolia*, a salt plant, is used in the manufacture of organically dyed scarves, pillowcases, and fabric, which are fast becoming a specialty product of Shinan-gun. Also in planning is a "community tourism company" to be owned and run by the residents of Jeungdo.

Economic environment

The primary industries of farming and fishery remain the backbone of SDBR's economy (Lee et al., 2010). The main economic activities are fishing and salt manufacture at the beaches, the key resource of SDBR. Farmland produces spinach, onions, garlic, and rice, and beach areas are where octopuses, crabs, and shellfish are manually caught, and where traditional methods are employed by residents in the collection of medicinal plants and seafood. Sun-dried salt manufacture is the most representative of SDBR's economic activities, which are primarily farming and fishing, accounting for 65% of all sun-dried salt produced in Korea.¹ Sun-dried salt of SDBR has one of the highest mineral contents in the world. Other economic activities include fish farming in onshore and offshore cages; laver culture, performed both underwater and out of water; inner sea fishing for croakers, sea bass, and shrimps; and spinach, garlic, Welsh onion, and sesame. In

recent times, vitalization of regional economy is being sought through the creation of "spinach clusters" that capitalize on SDBR's natural environment, and the development of specialty products (sun-dried salt products). The global economy continues its stagnancy, and countries around the world are looking to the new business model of the "6th industry," a convergence industry resulting from the convergence of primary, secondary, and tertiary industries (Hong et al., 2014). The 6th industry embodies a one-stop solution that encompasses production, processing, and service, and can contribute to the activation and promotion of regional aboriginal industries. Ecology tourism of SDBR is a highly marketable product, so by acquiring and commercializing ecological resources, cultural contents, and experts, regional economic vitalization can be achieved.

Proposal for the sustainable development of SDBR

Education of residents for increased awareness of sustainability

Unlike other animals of the natural realm, humans have utilized culture to obtain from the nature the things they need for survival. To adapt to the natural environment, man must understand it and apply acquired knowledge in life. This means that the anecdotal knowledge, the aboriginal knowledge, of the residents of SDBR must be researched, developed, and applied in economic activities. The experience and knowledge of the residents are an important economic resource. The Institution for Marine & Island Cultures of Mokpo National University and Shinan Culture Center provide elementary, middle, and high school students of SDBR with education in beach ecology, and the history and culture of the islands. The public awareness promotions program executed by the Institution for Marine & Island Cultures, which merges the humanities and natural sciences, allows intercourse with the residents and students of island communities. The program is recognized as a positive model as it employs a scientific approach to understanding the biodiversity of tidal flat ecosystem, and enables understanding and exchange of eco-cultural contents, ranging from fishery to indigenous knowledge transfer. The civil society is what collaborates most actively with regional communities to perform environmental preservation activities, ecological monitoring, and environmental education of regional residents. Indeed, it was the efforts of a regional environmental group attending the 1999 Ramsar Convention in Costa Rica as a Korean NGO representative that made the world aware of the merit of the beaches of Shinan-gun, and of the key routes of migratory birds that cross Shinan-gun. Other contributions made to increase public awareness of Shinan-gun include a campaign for the designation of coastal marshlands as protected areas, beach activities for urban and rural children, and in-class environmental education for elementary, middle, and high school students, all of which are ongoing, systematic environmental education. The environmental training program for the specialized institutes in SDBR is the expository program at the Salt Gallery and Mudflat Eco Exhibition Hall in Jeungdo-myeon. These exhibition facilities are operated by private organizations, and the on-site coordinator provides visitors with a variety of systematic experiences. On Heuksando and Hongdo, the National Park Migratory Birds Center operates focused environmental

¹ In 2007 Shinan-gun produced 192,853 tons of sun-dried salt.

education programs and ecological programs. This facility is regularly visited by Korean and international migratory bird experts, and is recognized as an important institute that researches the migration paths of migratory birds of East Asia and promotes education. Regional residents and offshore tourists frequent the National Park Migratory Birds Center. In 2010, the Institution for Marine & Island Cultures of Mokpo National University executed an eco-culture guide's development program for the environmental preservation of UNESCO Biosphere Reserves. The role of said program is a very important one, as it promotes understanding and preservation of the ecosystem and biodiversity, and advertises and steers regional eco-culture. As such, efforts must be made to execute this eco-culture guide's development program as a UNESCO Education for Sustainable Development (ESD) project (UNESCO MAB, 2008) in SDBR.

Service improvement and enhanced life quality of island residents

The ease of transportation is one of the causes of island communities' dropping population. Convenient means of travel between metropolises and smaller cities caused a shift of population to around metropolises, and islands are particularly susceptible to this trend (Tsai and Hong, 2014). More routes and bridges, and discounted ferry fares for island residents mean more island residents heading to metropolises, and this has a tangible influence on the concentration of population around cities. As Shinan-gun is made up of 827 islands, the majority of transportation occurs in the mode of passenger shipping, with the exception of some islands that have bridges linking them to inland. Delays in travel caused by irregular operating schedules and inter-port service have been of inconvenience in the past, but the resulting complaints by island residents led to the execution of a project designed to make travel between islands and inland easier, bringing about a change in the economy of Shinan-gun. In the whole of Korea, Shinan-gun is with the most islands, the longest ria coast (1734 km), and the largest area of beaches (331 km²). Also to be credited as a merit of Shinan-gun is Dadohaehaesang National Park (535 km²). The development potential of Shinan-gun is immense, thanks to its preponderant marine resources and tourism resources, but limits have been present due to infrastructure shortage, i.e. poor marine transportation. Excluded from industrialization, Shinan-gun is the least developed of all regions in Korea. The construction of bridges leading to inland began with the aim of effectively utilizing marine resources and initiating modernization of Shinan-gun. The construction of Aphae Bridge (complete), linking Mokpo and Aphae; Jeungdo Bridge (complete), linking Saokdo and Jeungdo; Sacheonnyeong Bridge (scheduled), linking Aphae and Amtae; and Woonnam Bridge (scheduled), created a network of all-weather marine transportation between the 10 administrative divisions and 640 islands of Shinan-gun. Bridges leading to inland should be treated as more than just routes for traveling island residents – as a marine infrastructure for global use, but doing so entails a significant disadvantage (Hong, 2015). Bridge construction may bring about the negative results of island resident migration, shorter periods of tourism by visitors of Shinan-gun, reduced consumer activity on islands, and increased waste discharge; however, efforts must be made to take such negative factors into account when

devising positive results. The positive aspect of easier travel between inland and islands is distribution innovation and increased tourism. With the completion of Jeungdo Bridge in 2010, the number of tourists increased exponentially, and agricultural and marine products distribution spending's decreased. The connection of inland and islands will likely bring about industrial and commercial development. Inordinate development may take place, and large vacation resorts may get built. As a UNESCO Biosphere Reserve, the unique cultures of the islands of SDBR must be preserved, and support must be provided to its communities to achieve self-sufficiency. Eco-culture, culture that has its roots in the ecosystem (Gössling, 1999; Hong, 2012), must be guarded from mainstream and uniform cultures.

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