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3rd Meeting of the World Network of Island and Coastal Biosphere Reserves,
Hiiumaa and Saaremaa Islands, Estonia, 4 - 6 June 2013



Sustainable Management in Island and Coastal Biosphere Reserves





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Sustainable Management in Island and Coastal Biosphere Reserves

About the images

The natural and cultural values of islands in western Estonia are intimately connected with traditional agriculture. Many species are well adapted to semi-natural coastal grasslands, non-fertilized meadows and pastures used by man and his companions - horses, cattle and sheep - for centuries, which have formed one of the most species-rich habitats in northern Europe.

Coastal grasslands are indeed the landscape where long-term sustainable use of local resources is evident. Today the economic activity of local inhabitants on the coastal grasslands demonstrates the whole cycle of sustainable use “from grassland till cuisine”. Here the ecological production of meat is supporting maintenance of historical open landscapes and restoration of bird habitats. To add the social values of such model - jobs, viable countryside, healthy society - and we get a small example of achievement in line with the MAB programme.

Toomas Kokovkin



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Foreword



Dr. Miguel Clüsener-Godt

Division of Ecological and
Earth Sciences of UNESCO
Coordinator of the World
Network of Island and Coastal
Biosphere Reserves,

For the 3rd publication of the
World Network of Coastal
and Island Biosphere Reserves:
3rd Meeting of the World
Network of Island and Coastal
Biosphere Reserves, Best
Practices from Saaremaa and
Hiiumaa Islands in Estonia

It is with a great pleasure that I would like to introduce the third publication of the Network on the *World Network of Island and Coastal Biosphere Reserves: Sustainable Development and Climate Change*, which emanates from the 3rd meeting of this Network, held in Hiiumaa and Saaremaa Islands, Estonia, in June 2013.

The book reflects all the presentations of Island and Coastal Biosphere Reserves that were presented at this meeting and in its final report provides an update on the progress made by this network.

Today (2014), there are 621 biosphere reserves in 117 countries of the world; many of them are located on islands and in coastal areas. The Network is now having more than 30 Biosphere Reserves actively participating, which is a clear indication that these areas are becoming more and more important. Island biosphere reserves are places for people and nature to co-exist and find concrete ways of interacting with one another that can guide sustainability in action for the future. They are very important places for transboundary co-operation and joint management of natural resources. But island biosphere reserves have also special problems, as all participants could experience during the event in Estonia. Changes in the population dynamics affect island more than continental sites as their communities are smaller and less subject to migrations. Emigration patterns are more important than immigrations, particularly with regard to the young population. Thus, biosphere reserves are called to provide new models for development in island communities and to provide new solutions to these problems.

My special thanks go to the Government of Estonia and its MAB National Committee for enabling this Network to meet; also I would like to mention the National Commission of Estonia to UNESCO, which provided substantial support to the holding for this event. Finally, I would like to thank again the Jeju Autonomous Province, the Island Council of Menorca, the Spanish Ministry for Agriculture, Food and Environment and its Autonomous Organism for National Parks, as well as the Government of the Republic of Korea and its National Park Service, that have been providing very strong support to the MAB Programme for many years. Without this unconditional support from our Member States, the World Network of Island and Coastal Biosphere Reserves would not have achieved the important progress that it has made until now.

I am also pleased to announce that the next 4th meeting of the Network will be held mid 2014 in the Palawan Biosphere Reserve, Philippines. As the Network is continuously growing, I am convinced that it will to a better understanding of island communities and provide substantial contributions to aspects of sustainable development in the context of climate change.

Paris, December 2013



Riho Rahuoja

Governor island of
Hiiumaa Estonia

Foreword

Dear participants of the 3rd meeting of the World's Network of Island and Coastal Biosphere Reserves.

In my capacity of the governor of the island of Hiiumaa, I am very much privileged to say these opening words also on behalf of other islands which you visited during the meeting: the islands of Saaremaa, Muhumaa and Kassari. They all belong to the West Estonian Archipelago biosphere reserve since 1990.

During more than two decades, the understandings of our islanders about the relations of people and nature have gradually changed, and I wish to say, that these changes were in the direction of the UNESCO programme Man and Biosphere. In earlier days we emphasized high nature values of our islands, and have developed a strong nature conservation framework. We also have considerable achievements in environmental awareness and education. At the same time we hoped very much that the economy of the islands would flourish based on newest technologies and open markets. Unfortunately the achievements in islands economies have not met all our expectations, and we are still facing such unchangeable geographical constraints as isolation, seasonality and elevated dependance on natural hazards.

This is why during last years we have more and more paid our attention at balancing the nature and economy of the islands, keeping in mind the sustainability and self-sufficiency of the island environments. One of our targets today is so called green economy, which we understand in a broad sense as an economic model which aims to increase prosperity by using resources efficiently as well as maintaining the carrying capacity of islands' nature, which in turn sustains island culture and society. As we know, this approach has been used by UNESCO MAB and the World network of Biosphere reserves at least since the Seville conference almost two decades ago.

I take this opportunity to thank the participants of the meeting for visiting our islands, for your interest in our life, culture and nature, and I wish that our co-operation would continue in favour of the island people in all different seas and oceans of our Globe.

With best wishes

The West Estonian Archipelago Biosphere Reserve: some natural, historical and legislative features

Kokovkin, Toomas and Kukk, Leelo

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The West Estonian Archipelago Biosphere Reserve: some natural, historical and legislative features



Kokovkin, Toomas and Kukk, Leelo

Toomas KOKOVKIN, member of the advisory board of
the Estonian National Commission for UNESCO
Leelo KUKK, deputy director general of the
Environmental Board of Estonia

Location, size and population

The West Estonian Biosphere Reserve is located in the central Eastern part of the Baltic sea, adjacent to the mainland Estonia, south to Finnish coast and East to major Swedish islands.

Area: 1,560,078 ha

Incl. Water 1,156,300 ha

Incl. Land 403,778 ha

Arable land around 50,000 ha

Major islands:

Saaremaa (2,673 km²)

Hiiumaa (1,008 km² including Kassari island)

Muhu (200 km²)

Vormsi (93 km²)



Fig. 1. Cultural heritage and local island ethnography is preserved via folk festivals and handicrafts.



Fig. 2. The West-Estonian archipelago biosphere reserve represents the coastal and marine environments of temperate boreal zone.

About 45,000 inhabitants in 3 different counties, composed of 22 municipalities including 2 towns. Language: Estonian, with a slight island dialect. Local ethnography, traditions and cultural peculiarities of the Estonian islands have definite characters, which are nowadays not very evident, but are in places still well preserved.

Natural characteristics

Today the Biosphere reserve covers 10% of Estonian mainland. The area is overlapping with different conservation areas - European nature conservation network Natura 2000, national parks, Ramsar areas etc. 6% of the biosphere reserve is core zone and it corresponds to the strict nature reserves and conservation zone of protected areas; 12% is buffer zone which corresponds to the limited management zone of protected areas and 81 % of the biosphere reserve is transition zone.

Biogeographical region: Temperate mixed woodlands / coastal marine zone. Southern part of the Boreal forest zone of the Northern hemisphere, where the south-taiga forest changes into spruce-hardwood forest.

Climate: Atlantic-continental region of the temperate climatic zone, which is characterised by warm summers and moderately cool winters. February's mean temperature is $-3 : -4,5^{\circ}\text{C}$. July's mean temperature is $+16 : +17^{\circ}\text{C}$. Annual mean temperature is $+5,2 : +6^{\circ}\text{C}$. The mean annual precipitation is 550–750 mm. Snow cover is formed in November–December and lasts for 80–105 days. The ice cover in the sea forms usually in January, and stays until late March.

Geology: The archipelago is located in the area of Ordovician and Silurian carbonate rocks (limestones, marls and dolomites), however bedrock is mostly covered with loose Quaternary deposits (sands, gravels, clays, peat).

Historical and legislative overview

The idea of establishment of biosphere reserve in Estonia arose as early as the beginning of the 80's but we managed to finalize the idea just in the end of the collapse of Soviet Union. The Estonian MAB committee already in late 1970's considered establishing a biosphere reserve. Academicians published the idea in 1980, and it was based on the need to protect and study some globally representative natural areas. Later, the idea was made more concrete, as the concept included the necessity of local people's participation, and was applied for the West-Estonian archipelago. The application to UNESCO was approved by the organization in 1989, and the official birth date of the biosphere reserve in Estonia is the 1st of January 1990. It appears that we got the certificate for our biosphere reserve before Estonia as a state became the member of UNESCO in October 1991. After the decision to establish the biosphere reserve, it took some time to integrate it into the legislation.

In 1994 Estonia got its first law of nature conservation. Among the other types of protected areas (named, for say, national park, landscape protected area), 'program area' was also mentioned which actually meant a biosphere reserve. Biosphere reserve based on this legal act operated for about 10 years. During this period 3 offices were opened and approximately 20 people worked there.

In 1990–2002, three local offices (called also 'centers') of the biosphere reserve in three islands of the archipelago existed. The centres carried out a remarkable amount of work upon sustainable development projects, environmental education, publishing and research. For instance, two journals were published during these years: a more popular 'Pirrujaak' and a more scientific 'Estonia Maritima'. A newsletter of the biosphere reserve was monthly published as a supplement to a local newspaper. Vast research was carried out on both terrestrial and marine environments in co-operation with Estonian, Russian and Finnish universities. The biosphere reserve centres created a GIS system of the area, conducted sociological researches, initiated some projects for local economies. One of the most prominent projects was about restoration of traditional semi-natural coastal grasslands. For centuries our flat, sloping coasts have been grazed by sheep and cattle, but nowadays extensive agriculture on non-fertilized natural grasslands is not



Fig. 3. The Estonian islands enjoy warm summers and moderate winters. Snow cover is formed in November–December and lasts for about 4 months.



Fig. 4. Restoration of semi-natural coastal grasslands by extensive grazing of cattle.



Fig. 5. Environmental education includes a programme of ecological production and cooking.

economical enough for farmers. This results in losing many valuable habitats suitable for e.g. migratory birds, as well as overgrowing of open landscapes. To influence the trend in a positive way, the biosphere reserve, in co-operation with local NGOs, introduced new breeds of beef cattle and helped with training farmers and marketing ecological farm products. As a result, an important shift in local economies was achieved over last 20 years, and high quality products are now available from viable ecological farms.

However, the co-ordination among the centres turned out to be insufficient as well as the clear strategy for the holistic biosphere reserve was missing. One may say that the concept did not fit into the environmental protection system of the country. Thus, in 2002, the Ministry of the Environment decided to dissolve the centres and to transfer the biosphere reserve management to a non-governmental sector.

The Biosphere Reserve Foundation was an NGO that was supposed to carry on the biosphere reserve ideas and doings. However, efficient functioning of the biosphere reserve was inconceivable without the governmental supervision and scientific support. In 2004, the definition of “program area“ was removed from the Nature conservation law. During the same time the offices were closed and the work of biosphere reserves was based only on projects lead by different initiative groups.

It took 7 years until the biosphere reserve definition was regenerated in legislation where the aims and tasks of the biosphere reserves were articulated in the Law of Sustainable Development in 2009.

This law inacts (1) that the Biosphere Program Area, linked to the UNESCO program MAB (Man and Biosphere), aims to promote education, monitoring and scientific work to get more balanced linkage between the usage and protection of natural resources. And (2) in the biosphere programme area the principles of balanced relations between people and environment are elaborated and local development is canalized by planning and development processes according to the UNESCO programs aims

From 2009 the councillor of Biosphere reserve started his work under the Environmental Board of Estonia. In 2013 the strategic document named 'The Programme of Biosphere Reserve' was composed, which sets up the main aims of the

area and devises the establishment of the advisory board of biosphere reserve. The advisory board is composed of local authorities, governmental administrations, local NGO representatives, educators, as well as scientists. The role of the advisory board is to consult the governmental policies in the biosphere reserve area.

Three pillars: nature conservation, knowledge and green economies

These three pillars of the biosphere reserve have different weights and backgrounds. The nature conservation has a long history in the area (started as early as 1910 as a bird sanctuary). Today the nature conservation is well organized and integrated into the framework of the European Union.

The knowledge and awareness in the biosphere reserve is linked to school education, for instance, several schools participate in the international environmental networks. The professional schools, adult education centres and university representatives link their education programmes to the concept of the biosphere reserve. Cultural heritages, especially the topics related to coastal and marine tradition, are well preserved and promoted via various programmes (such as traditional folk songs and dances, ethnography, seafaring museums and societies, traditional sailing initiatives, boatbuilding).

The newest pillar is of the green economy, which seems to be supported by the political interests of self-sufficiency and economic growth of the islands. The economic activities related to local traditions and resources are increasing, such as tourism, forestry, extensive semi-natural agriculture, health resorts, shipping, ecological gastronomy.



Fig. 6. Revival of traditions of seafaring and boatbuilding is an important component of cultural heritage.

Strategies of Jeju Island Biosphere Reserve on Climate Change Issues

Kilrim Ko

3rd Meeting of the World Network of Island and Coastal Biosphere Reserves,
Hiiumaa and Saaremaa Islands, Estonia, 4 - 6 June 2013

Strategies of Jeju Island Biosphere Reserve on Climate Change Issues



Kilrim Ko

Leader of the Jeju Island BR team

I. About Jeju Island Biosphere Reserve

Main part of the core area of Jeju Island Biosphere Reserve is located at the center of the island where Mt. Hallasan stands. This core area well coincides with a Korean national park and a UNESCO World natural heritage site. In addition to Mt. Hallasan area, three small islets and two streams in the southern part of Jeju Island make separate core areas, surrounded by their own buffer zones and transition areas. The biosphere reserve as a whole takes up about 45% of the land surface of Jeju Island.

It is estimated that more than 10 million tourists would visit Jeju Island in 2013 alone. People of Jeju Island well know that they enjoy the enormous benefit from tourism industry because they have a well preserved land. This recognition made them highly conscious of nature conservation. They feel proud to invite and host international conferences in the cause of nature conservation. During the past few years, many international conferences were held in Jeju, as listed below.

- 9th conference of EABRN (2005)
- International conference of BRs in island and coastal regions (2008)
- 21th session of UNESCO MAB ICC (2009)



UNESCO 자연과학 분야 3관왕, 제주

생물권보전지역 세계자연유산 세계지질공원



- World Conservation Congress (WCC) (2012)
- 2nd International Conference of WNICBR (2012)

Among these, the World Conservation Congress was like a world festival for those who love nature and care about its conservation. It was held in the year 2012 at the same time as the international meeting of the Network WNICBR.

II. Strategies of Korea on climate change

Just a few representative items may well describe the outline of Korea's strategy on climate change issues.

1. Comprehensive Master Plans to address climate change issues

Though Koreans' awareness of environmental issues has long been on the rise, Korea began to have comprehensive plans on climate change adaptation in 1999. In total, three successive plans of 3 year terms were implemented during the period from 1999 to 2007.

During this period, many researches and related activities were carried out to set the baseline for the reduction in greenhouse gas emission and climate change adaptation.

2. National Master Plan for Climate Change Adaptation

On expiration of the previous 3 plans, Korea set out the National Master Plan for Climate Change Adaptation in 2008. This plan has the vision to establish a secure society and to pursue green growth.

To be specific, this plan sets the goals to be achieved

by 2030. The goals are 10 % reduction in the damages caused by natural calamities and to foster climate-change-related industry to the level that it would take up 1% of GDP.

Five strategies were adopted for an efficient pursuit of the vision and goal. They are 1) to establish risk evaluation system for climate change, 2) to develop effective climate change adaptation program, 3) to establish partnership among all the involved domestic entities to build up adaptation capability and raise awareness, 4) to secure global leadership through global cooperation and contribution and 5) to set up the institutional foundation to efficiently implement the adaptation program

3. Low-Carbon Green Growth Act

This law was enacted in 2010, incorporating all the previous laws and regulations related to environmental issues. It has the vision to realize a low-carbon society and to use the green industry as an engine for economic growth. Main contents of this law are as listed below.

- To set general principles to drive green growth,
- To identify the responsibilities of all the stakeholders,
- To establish relevant institutions, such as commissions, rules, and
- To prepare implementation programs particularly to realize green lifestyle and persistent development in 9 sectors.

III. Strategies of Jeju Province on climate change

Jeju's value as a model case of environmental conservation was well recognized by the nation. On this

ground, Jeju was chosen to be made into a pilot region for how to cope with climate change impacts. For this purpose, an agreement was signed between Jeju and Korean Governments in 2007. Based on this agreement, Jeju set out a plan and started to do researches in order to establish a climate change impact evaluation system and an adaptation model.

On the part of Korean Government, they founded Climate Change Adaptation Center in 2008. This center has the mission to set long- and short-term plans and to search for efficient alternatives to reduce greenhouse gas emission and handle its impacts.

Hard to understand, Jeju Island turned out to be one of the poorest victims of climate change. For example, a big rise in average temperature was witnessed. It rose by 0.6°C in the 1990's. As for the precipitation, no significant change was noticed in the 2000's compared to the 1980's. But Jeju has suffered from very intensive precipitation incidents due to typhoons. On average, 2.5 typhoons per year inflicted severe effects on Korean soil. The phenomena of heavy downpour and high-intensity typhoons called for the foundation of National Typhoon Center in 2008 at the national level. It is given the mission to forecast storms and to do researches on the genesis and dissipation of the storms.

Jeju's strategies to deal with climate change issues can be well presented by introducing a few relevant schemes or institutions set up for this purpose.

1. Carbon-point incentive scheme

This scheme is not unique to Jeju because it is a nationwide program of Korea, intended to induce a

reduction in the consumption of electricity, water and gas. By this scheme, the government gives households an incentive in cash for the saved utilities. Savings in the use of utility is calculated as the standard usage minus actual usage. This calculation is done in each month because the use rate of utility is highly seasonal. The standard usage is set at the average of those in two previous years. And the incentive is handed out twice a year.

1 carbon point is equivalent to 10 grams of CO₂ saved from emission due to frugal use of utility. Saved carbon emissions and incentive amounts are listed in the table below.

utility	saved unit	saved carbon	incentive
Electricity	KWh	424g	₩8
Water	m ³	332g	₩6
Gas	m ³	2,240g	₩41

As of the end of 2011, more than 2.5 million households are participating in this scheme. And the participation is on the rise.

2. Wind-power generation project

Jeju has set an ambitious plan to realize the vision of carbon-free Jeju, which means all the demand for electric power is met with that from a renewable energy source. It is quite windy in Jeju. And the strength of wind is relatively constant because Jeju Island stands in the open sea. Abundance and high quality of wind power are in the background of this long-term Wind Power Generation Project, which has the time span up to the year 2030.

The target of this project is to build up generation capacity of 2GW from offshore wind farms. This target

is more than ambitious considering that the established wind power generation capacity is just about 100 MW. This project is based on a 2-phase programs. Through successful completion of this project, it is expected that Carbon-Free Jeju Island would be realized by 2030.

3. Smart Grid Project

Smart grid means a grid formed by integrating information technology (smart) and existing power grid. This grid has the function of two-way real-time information exchange between producers and consumers on the use of electricity. It also includes the wind farms on the supplier side and electric cars on the consumer side.

Through smart grid, Korea plans to raise energy efficiency and reduce greenhouse gas emission and to use green technology as a new growth engine because construction and operation of it accelerates technological advancement and provides jobs to a lot of experts.

In 2009, Jeju launched Smart Grid Test-bed Project under the support from Korean Government. The national government intends to run a plot project in Jeju to collect empirical data on a small scale, and then apply the result to all the areas in Korea.

Why a pilot project in Jeju? Compared with all other regions, Jeju has many advantages due to abundant resources of green energy in the form of wind power. Jeju also makes a good experience lab easily accessible for average Koreans because no other place in Korea has more visitors from all over the country. High feasibility attainable by building wind farms on an economic scale is another advantage.

To operate this test-bed project, a consortium was formed

by 168 companies from IT and energy industries. The project site is located in the northeast area of Jeju Island which has about 6,000 households. Investment budget amounts to \$ 218 million, supposed to be disbursed by 2013.

It is planned to establish various smart component systems following a 2-phase schedule. In the first phase, smart Power Grid, smart Place and smart Transportation systems are planned to be established. Likewise, in the second phase, smart Renewable Energy system and smart Electricity Service system would be laid out.

Of course, this project would be run beyond its established planning period. On this assumption, the continued project is estimated to produce enormous accumulated effect by 2030. The quantity of reduction in CO₂ emission is estimated at 232,786 tons and 86,008 new jobs would be created.

4. Asia Climate Change Education Center

Jeju has the ambition to play a leading role in the area of climate change education. With this aim, Jeju founded Asia Climate Change Education Center in 2009. Currently, this center is operated by a private organization which was commissioned by Jeju Government because it needs a special expertise.

This education center is expected to perform the functions such as;

- 1) To develop education programs related to climate change
- 2) To provide education and experience opportunities
- 3) To train young green leaders

5. Climate Change Exhibition Hall

The Climate Change Exhibition Hall opened in 2012



is a small institute, but expected to play a critical role in educating people on the impacts of climate change. This hall was built at the expense of the Ministry of Environment of Korean Government and is being run at the expense of Jeju Province Government.

It is located on the Yongmeory Coast. This place is a tourist attraction and makes a good photo scene due to its outlandish geological feature in harmony with the seascape. But this place turned out to be a good spot to demonstrate the sea level rise. A study showed that it rose by 22.5 centimeters over past 38 years, with annual average of 0.6mm.

This exhibition hall can be regarded as a hallmark facility to show the impact of climate change on Jeju. It is effectively used as a place for publicity and education.

IV. Research Institutes in Jeju Island Biosphere Reserve handling climate change issues

Research activities are a key to building capacity to deal with the climate change issues. Jeju has three major research institutes in this area.

1. Research Institute for Hallasan

In this institute, they do researches on the changes in the vegetation on the Mt. Hallasan and the areas bordering streams. 7 people out of its 27 personnel are research staff.

2. Jeju Ocean and Fisheries Research Institute

They conduct aquatic monitoring on marine ecosystems and study on the changes in marine fauna and flora. 12

people out of its total 26 personnel are research staff.

3. Jeju Biodiversity Research Institute

They continuously carry out projects pertaining to conservation of biological resources and to their industrialization. All the staff of 29 personnel are involved in research activities in some ways.

Analysis with indicators by the Socioenvironmental Observatory of Menorca (OBSAM) as a model for scientific monitoring of the World Network of Island and Coastal Biosphere Reserves – WNICBR

Sergi Marí



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Analysis with indicators by the Socioenvironmental Observatory of Menorca (OBSAM) as a model for scientific monitoring of the World Network of Island and Coastal Biosphere Reserves – WNICBR



Sergi Marí

Director of the OBSAM
Menorca Research Institute

This report is divided into four parts as follows:

1. What is OBSAM?
2. The work method
3. Monitoring networks
4. Challenges in and proposals for establishing a monitoring system for the World Network of Island and Coastal Biosphere Reserves

1. WHAT IS OBSAM?

The Environmental Observatory of Menorca (OBSAM) is a monitoring programme at the service of the biosphere reserve. It is currently managed by the very core of the IME.

Currently, the IME has assigned to OBSAM a permanent workforce made up of three researchers (a director-economist, a biologist and an environmentalist), endowed with the right to organize other scientists on a temporary basis depending on specific programmes.



Diagram 1

2. WORKING AREAS

The monitoring system of the Menorca Biosphere Reserve developed by the OBSAM can be broken down into six working areas:

- Territory and digital cartography (GIS)
- Natural environment monitoring
- Environmental vectors (energy, water, waste)
- Social and economic indicators
- Monitoring of the primary sectors (farming and fishing)
- Landscape lab

These working areas are linked together because each area has multidisciplinary characteristics, and the activities in each working area are aimed both at the production of new relevant scientific information as well as at its spreading for the purpose of enhancing public awareness.

Production of information

This task is the fundamental base on which the monitoring activities should rely.

Relevant set of information is grouped into two categories;

A. Public information or the information produced by a network of collaborating entities (public administrations, private companies, NGOs and certain individuals or teams such as amateur naturalists or university researchers).

B. The data compiled directly by the OBSAM staff. These data, significantly more expensive, are collected on the topics for which there is little relevant information though it is critically important for a guide to a long-term sustainability. Some examples of such data production activities are the conduction of surveys carried out on the general population and the monitoring of birds and the sea environment.

Spreading of information

In short, it could be said that a majority of the dissemination activities of the results gained from the working areas uses the following methods:

- Dissemination through mass media
- Direct dissemination via the Internet and social networks

- Educational activities (student groups visiting the IME)
- Participatory activities (workshops or public debates)
- OBSAM's consulting activities for the Island's administration carried out when required.

3. MONITORING NETWORKS

The OBSAM takes part in several monitoring activities and thus supplies information on the situations of Menorca in order to help make assessments of a wider geographical scope or global change. These activities include:

- Monitoring of nesting birds following the methodology of the European Union of Ringing (EURING)
- Monitoring of diurnal butterflies, following the methodology of the Butterfly Monitoring System (BMS)
- Collaboration in the monitoring of the *Posidonia oceanica* meadows through the programme POSIMED (funded by the EU Life programme).

We would like to highlight two points about the benefit we could enjoy by sharing all our practices with other biosphere reserves:

- The variables that OBSAM uses to calculate the indicators, including some time-series variables, must have an undeniable value for other biosphere reserves, especially in the long term.
- If applied to many biosphere reserves in different geographical regions, the result of comparative analysis would substantially strengthen the assessment function of OBSAM.

However, comparative analysis is not a task of trivial difficulty. It requires many preconditions such as:

- Extensive knowledge of the data compilation methods at all points of the network.
- Knowledge on the situations particular to individual biosphere reserve.
- Institution which ensures, for data analysis, the participation of all the people involved in data collection and/or management.



Picture 1 and Picture 2. Monitoring tasks of the *Posidonia oceanica* meadows.



Picture 3. OBSAM's Facebook

Redes de monitoreo

El canvi climàtic reduirà la població de papallones a la Mediterrània

Algunes espècies, amenaçades per la modificació del seu hàbitat

VICTOR BACILLIS

La població de papallones de la conca mediterrània nord podrà veure disminuïda la seva presència a causa dels efectes del canvi climàtic i l'acció humana sobre el territori. Així ho afirma un estudi publicat a la revista *Biogeography*, relacionat amb els efectes de les Canviats Naturals de

estable les condicions per fer les prediccions de futur que ho presenten el nou estudi. Els factors són l'augment de la temperatura i el consegüent increment de l'òxid de carboni, juntament amb factors humans com la intensificació de l'ús del territori, així com la disminució de la cobertura de la conca de la Mediterrània nord, a causa de la reducció de la població de la papallona reina zebra.



"*Papilio polixenes*", coneguda com la reina zebra, és tracta d'una espècie comuna al nord de la Mediterrània, que destaca per la mida (pot arribar a fer 8 centímetres)

Picture 4. Newspaper cutting about butterflies

4. CHALLENGES IN AND PROPOSALS FOR ESTABLISHING A MONITORING SYSTEM FOR THE WNICBR

We would like to stress that, in order to move towards establishing a system of indicators for the World Network of Island and Coastal Biosphere Reserves, we need some criteria to identify what must be considered in determining the component variables of an “indicator”. Literature on this topic is in no short supply. Therefore we could do some literature review. The result of our review can be summed up by four criteria. (Their initials, if put together, makes the word “ROCA” which means “rock” in Catalan):

R: Relevance. The variables must rightly measure the phenomena we aim to monitor in every sense of science.

O: Objectivity. The measurement method for the variables must be set in an objective way. The measurement replicated by different assessors should produce consistent result.

C: Communicability. For society-wide implementation, meaning of the variables should be plainly and clearly understood by the public general, the people in economic sectors, the social agents and the authorities at various levels. This criterion is crucially important in ensuring the participation from a majority of society members.

A: Assessment. The variables should be aimed

at offering policy assessment, public or private. That is, they should produce outcome decisively needed for various sorts of decision making on the long-term sustainability of a territory. They must not be simply informative; they should not be statistics of little meaning. On the contrary, they should allow value judgement and thus indicate whether some human actions, specific or general, have positive or negative consequences in respect of sustainability.

Moreover, it is desirable if the indicator system proposed hereby for the WNICBR could be carried out at two different levels

a) At local level. The indicator system better allow the assessment on both conservation and development which can benefit the local residents, present and future.

b) At global level. The indicator system better demonstrate that biosphere reserves are model cases in eliciting valuable lessons applicable to the rest of the world.

For a good performance at both levels we need, as we have said, the combination of two types of analysis: the temporal series analysis that allow us to identify the presence of long-term trends; and the comparative analysis across different areas adopting different models, which permit the assessment of the relationship between the goal of sustainable development and the actual situation of each territory.

Of course, significant differences are faced by the biosphere reserves around the world. Even if we compare biosphere reserves in insular and coastal regions which are thought to have common characteristics, their biogeographical and social and environmental differences are drastic. We grouped the variables into four categories by which we can summarize the differences among areas.

- 1) Climate, natural resources available, biodiversity (species and habitats)
- 2) Demography, population density and human settlements, type of urban living, means of transportation
- 3) Level and distribution of income, role of fishing and farming, economic importance of tourism, type of tourism
- 4) Education system, existence of scientific institutions, civic centres and organisation of interests, of mass media.

The substantial difference in the situation among biosphere reserves should not discourage the adoption of the monitoring system proposed here because it remains clear that we face similar challenges as we strive for sustainable development in harmony with the nature conservation. After a few decades of practices in biosphere reserve management, an important learnt lesson is the conviction that we all share common challenges above our territorial diversity.

An indicator system, if used for the comparison of various territories, may help detect the common challenges shared by them and thus help set the social goal that will guide actions for its achievement.

Practical proposal

Our proposal presented here is based on our own experiences with the monitoring system developed and implemented for Menorca Biosphere Reserve. Furthermore, our Biosphere Reserve, along with Jeju BR, houses a technical secretariat of the WNICBR, especially devoted to sustainable development. In this context, we would like to propose to all the Network members to participate in a common program of sustainability monitoring by adopting the common indicator system.

To make this endeavour successful, it would be recommendable to follow a few steps, starting from an easier one to a more difficult one, in extending the scope of application of the proposed monitoring system.

- 1) Each Network Reserve shall appoint a technically qualified expert (A good level of English competence is essential) willing to coordinate with Menorca. A technical team would be formed in the biosphere reserves interested in the project.
- 2) Jointly establish an initial-stage subsystem of indicators requiring less work load, that is, those



Picture 5. Fishing diversity

indicators based on official statistics that are published periodically.

3) Subsequently, establish a second indicator subsystem which requires field work but can be periodically repeated at a low cost. Qualified staff would hence be needed, which would constitute a second level of difficulty and expense.

4) Finally, achieve a third subsystem of indicators which needs periodical surveys on the general population and more complex field work. We believe that this would be a third level of difficulty because of the challenge of finding reliable experts in statistical data processing.

We believe that this proposal can be taken on if it is well prepared in the long term. Our hope is that we could report on some solid progress in stage 1) mentioned above, at the next Network meeting, and set a more specific schedule for the next stages.

Príncipe Island Biosphere Reserve (São Tomé & Príncipe) – first steps and perspectives

António D Abreu

3rd Meeting of the World Network of Island and Coastal Biosphere Reserves,
Hiiumaa and Saaremaa Islands, Estonia, 4 - 6 June 2013

Príncipe Island Biosphere Reserve (São Tomé & Príncipe) – first steps and perspectives



António D Abreu

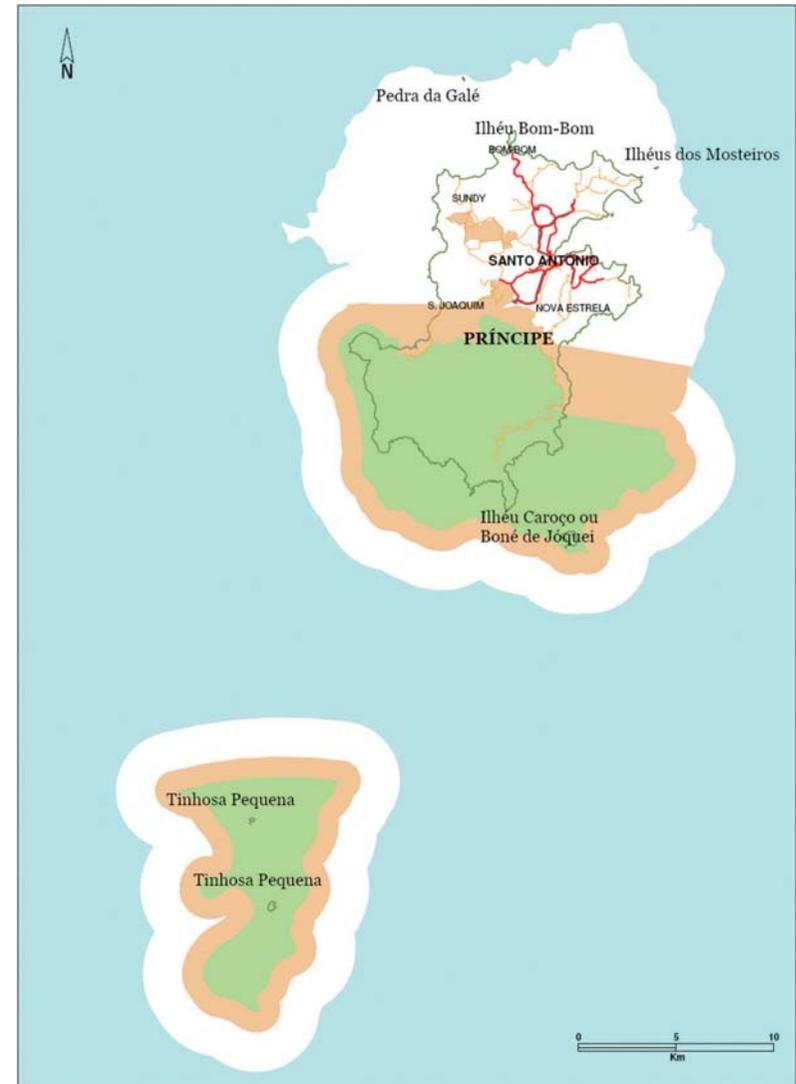
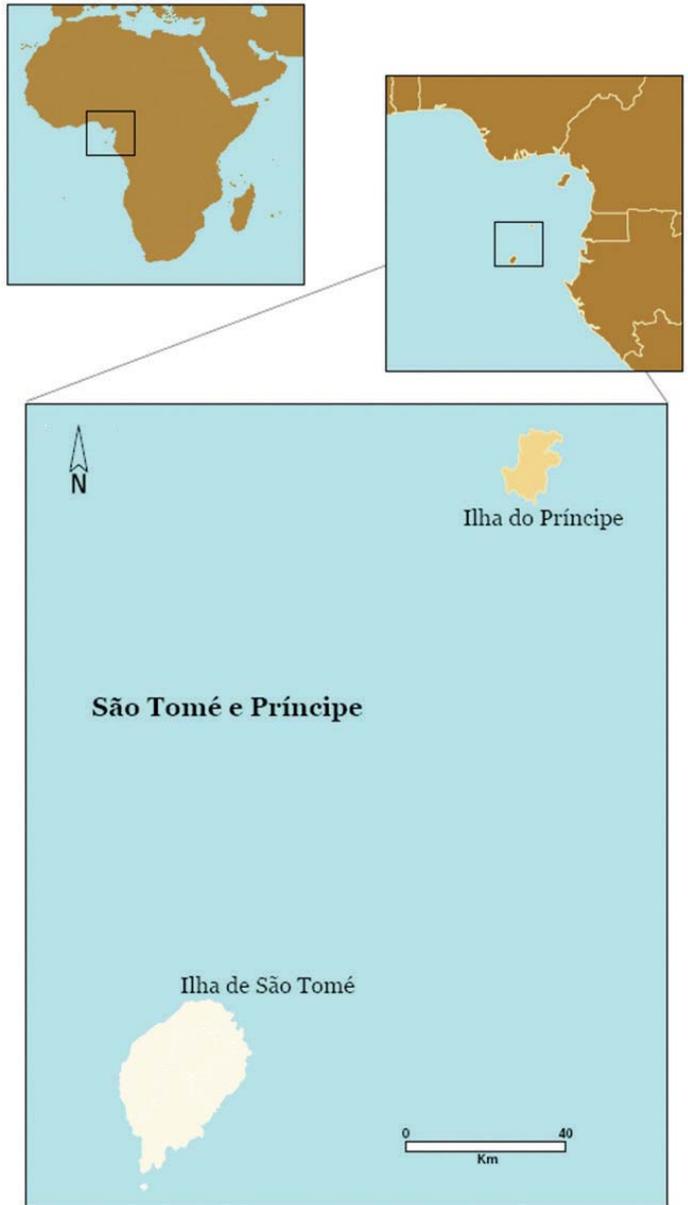
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In 2012 Príncipe Island was approved as Biosphere Reserve by the International Coordinating Council of UNESCO's Man and Biosphere Programme (MaB).

The island of Príncipe is located in the Gulf of Guinea and together with the Island of São Tomé forms the Democratic Republic of São Tomé and Príncipe. Príncipe has a land surface area of 142 km² reaching a maximum altitude of 948 meters. Príncipe Island is an autonomous region (political and administrative autonomy) with a local government and parliament.

The Island of Príncipe is part of the biodiversity hotspot of tropical forests of West Africa, including habitats of high international importance such as primary tropical forests, shadow forests, palm trees and lowland riparian habitats. Also at the marine level, Príncipe Island plays a major role as habitat of important marine species such as the cetaceans and the sea turtles that find the beaches of Príncipe Island as their nesting sites. The islets around Príncipe including the IlhasTinhosas sub-archipelago are considered important sea bird conservation areas.

Since the nomination as UNESCO Biosphere Reserve, in July 2012, Príncipe Island actively started to develop a set of initiatives oriented to three main objectives. First, the setting up and kick off of the Biosphere Reserve Management Unit and the MaB National Committee. In second place, launching several initiatives aimed to increase the awareness and ownership of local communities towards their Biosphere Reserve. In third place, Príncipe Biosphere Reserve is also dedicating priority to the participation in thematic and regional Biosphere



Reserve's networks and, as the result of this cooperation, there are already some ongoing initiatives like the training of Príncipe Biosphere Reserve staff in Santana, Madeira Biosphere Reserve (Portugal) and the establishment of a memorandum of understanding with Fuerteventura Island Biosphere Reserve, Canary Island, Spain, for the cooperation on sea turtle conservation actions. Other ongoing and planned projects includes the participation of Príncipe Island secondary school's students in a international art competition promoted by the Portuguese National UNESCO Committee and the Biosphere Reserves of the Azores and Santana, Madeira and a local project targeting to reduce the use of plastic and improve quality and availability of potable water.

The Regional Government basically provides all means to support the functioning of Príncipe Island Biosphere Reserve. Nevertheless the governance model includes the participation and cooperation of several local and international stakeholders through the participative council of the Biosphere Reserve. A management unit was created with the role to ensure the daily management of the Biosphere Reserve and it is expected that a headquarters would be installed soon.

During its first year of existence, Príncipe Island was able to establish a very intense and participatory dynamism, which can be seen by the knowledge and sense of ownership showed by all island communities. This was clearly visible during the field visits taken in May 2013 during the XI REDBIO Biosphere Reserves Network in Príncipe Island. This event in itself is also a good demonstration of Príncipe Biosphere Reserve's commitment to actively cooperate within the World Network of Biosphere Reserves. In this sense, Príncipe is also a member of the World Network of Biosphere Reserves in Island and Coastal Zones, being a participant of the second and third meetings of this network, respectively in Jeju Island, South Korea (2012) and Estonia (2013). It is expected that Príncipe Island can participate in the AfriMaB activities during 2013.

The main areas of action of high priority for Príncipe Island Biosphere Reserve, are as follows:

- Conservation and sustainable use of natural resources
- Biodiversity and Protected Areas
- Responsible Tourism
- Waste, water and energy
- Climate change adaptation





- Transition to green economy
- Capacity building, education and professional training

Príncipe Island Biosphere Reserve considers that these priorities and all related actions should be developed in a close cooperation among Biosphere Reserves and in particular of those that share similar conditions and realities such as the insular and coastal areas biosphere reserves. This cooperation should also seek for innovative ways and tools in order to increase proximity and facilitate the networking among Biosphere Reserves. The use of information and communication technologies should be encouraged as a way to compensate the existing human resources limitations.

Climate change and sustainability indicators are good examples of subjects of work that can promote the use of a collaborative platform. This would be very useful in order to provide means of access to and exchange of information among Biosphere Reserves, allowing comparative analysis and use of success case stories. On the other hand, Príncipe Island Biosphere Reserve aims that the sustainable development indicators to be created and used for Biosphere Reserves and that they also would be used for the larger regions where the Biosphere Reserves belong. The possibility should also be explored to use these indicators to identify and establish the Sustainable Development Goals as defined during Rio+20 Conference. This approach would put in evidence the potentials of Biosphere Reserve as demonstration sites benefiting from the already established sustainable development view and practice daily promoted by the Biosphere Reserves.

Translation of the sustainable development principle in the Palawan Biosphere Reserve

Romeo B. Dorado

3rd Meeting of the World Network of Island and Coastal Biosphere Reserves,
Hiiumaa and Saaremaa Islands, Estonia, 4 - 6 June 2013

Translation of the sustainable development principle in the Palawan Biosphere Reserve



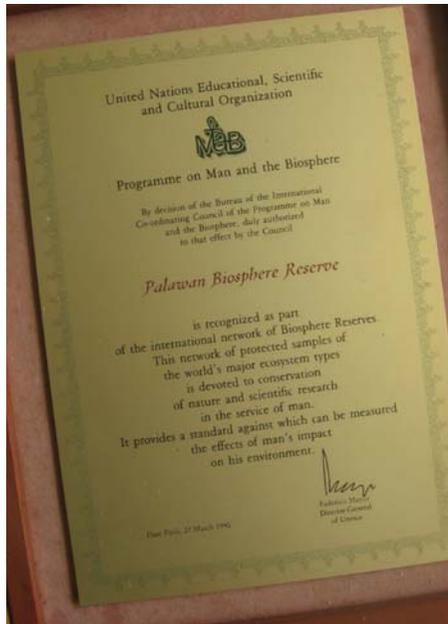
Romeo B. Dorado

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The Palawan Biosphere Reserve

Palawan was officially inscribed into the UNESCO MAB Programme on March 27, 1990. The administrative island province of Palawan, located at the western side of the Philippines between the Sulu Sea and the West Philippine Sea, subsumes the entire biosphere reserve (BR). It has a total land area of about 1.5 million hectares and is home to two natural World Heritage Sites the Tubbataha Reefs Natural Park and the Puerto Princesa Subterranean River National Park. It is further characterized by the presence of tropical forests, coral reefs, sea grass beds, beach ecosystems, and around 1,700 islands. The area is unique in terms of having a large proportion of endemic plants and animals and 30 Key Biodiversity Areas (KBAs).

The population of Palawan is around 1 million in 2010 with an annual growth rate (2000-2010) of 2.79%. The rich environment and diverse natural resources of the province serve as the backbone of its economy. The benefit from ecotourism products is probably at its all time high. The steady arrival of local and international tourists is partly due to increasing renown of Palawan as a tourist destination. Overall, fisheries, agriculture, tourism, and mining and mineral development are the key economic industries in Palawan BR.



In addition, the unique ultramafic geology of Palawan makes it highly prospective for metallic mineralization. Based on the Geological Prospectivity Map prepared by the Philippine Mines and Geosciences Bureau, the total area considered prospective for metallic mineral resources (in mainland Palawan only) amounts to some 287,000 hectares. Of this area, the projected area for mine development is around 80,000 hectares, or 5.6% of the land area of Palawan Mainland.

Palawan BR is covered by an assortment of national environmental laws and is also specially governed by Republic Act 7611 or the Strategic Environmental Plan (SEP) for Palawan Act. Under this law, the implementation of extractive and critical undertakings such as mining and mineral development must satisfy the sustainable development criteria of (i) ecological integrity, (ii) social acceptability, and (iii) integrated approach.

Sustainable development in Palawan BR through the Environmentally Critical Areas Network (ECAN)

The SEP law is an on-the-ground translation of the state policy of sustainable development of Palawan as an ecologically important region. The passage of the law in June 1992 is contemporaneous with the Earth Summit in Rio de Janeiro.

The Palawan Council for Sustainable Development (PCSD) is the administrative and policy making agency mandated to implement the SEP. The PCSD has the authority to approve or disapprove the entry of critical projects in the BR.

The SEP relies on the Environmentally Critical Areas Network (ECAN), a graded system of protection and development control dividing the whole province into management zones according to predefined biophysical and socioeconomic criteria. The designation of the ECAN zones is conformable to the biosphere reserve zoning scheme as prescribed by the MAB Programme of UNESCO. The ECAN zones are indicators of ecological hotspots, geologic hazards, high diversity areas, and sustainable development activities.

The ECAN strategy is given more emphasis in the case of Palawan BR for several reasons. They include the province's narrow geography, its vulnerability as a chain of island ecosystems, its high species diversity and endemism, the high threat of species decline, the very high conservation value of its ecosystems, the growing population, and the high economic development potential.

The ECAN guidelines states that environmentally critical projects such as mining and extractive operations are not to be allowed in areas designated as Core and Restricted Use Zones,



particularly in areas with natural-growth forests and critical watershed areas.

ECAN is used in the formulation and implementation of plans, programs, and projects within Palawan BR. Currently, the ECAN zones of the entire province are already mapped using geographic information systems (GIS). All developmental undertakings, especially environmentally critical projects, are required to secure an SEP Clearance. The SEP Clearance system prescribes a very strict and rigorous evaluation process. To this end, PCSD has instituted an environmental clearance system that takes into account people participation in decision making. Projects must meet the social acceptability criteria in addition to ecological and economic viability. Involvement of people in the decision making process ensures the maximization of people support and commitment and the promotion of good governance through accountability and transparency.

The SEP and the ECAN strategy are thus configured to safeguard the ecology, economy, society, culture, and governance of Palawan.

Major issues/challenges in Palawan BR vis-à-vis the innovations and measures undertaken to address them

• Impacts of climate change.

Global climate change is foreseen to have adverse

impacts on coastal island environments like Palawan BR. It is imperative that measures be put in place to cushion the impacts of climate change on both the natural and economic systems of the island province. Well-coordinated and integrated efforts are needed to identify highly vulnerable human and environmental components. The integration of climate change adaptation and disaster risk reduction and management into local sustainable development plans is an important step in maintaining the ecological integrity of Palawan. As a startup activity toward disaster preparedness, the GIS Unit of the PCSD Staff generated detailed geohazard maps showing areas prone to flooding and areas susceptible to landslides. These maps can serve as a guide to local authorities in managing disaster risk areas to prevent the loss of lives and properties during extreme weather events.

• **Rapid urbanization and growth**, including the influx of migrants into coastal areas, resulting in high demand for natural resources and energy. This concern is addressed by urban planning, the establishment of development controls in growth areas and the inclusion of reproductive health (RH) and family planning in information and education campaigns. While the shift to renewable energy is considered a viable, long term strategy to securing sustainable energy, the present energy requirements of Palawan may be augmented by energy from other sources such as a coal-fired power plant employing clean and environment-





friendly technology.

- **Strictly controlled mining as a development option in biosphere reserves.**

Mining and mineral development that are within the context of environmental protection, social concerns, and economic imperatives could be viable land use options for BRs. At this point, however, the national government has disallowed the entry of new mining players unless an economic valuation of mining proves that benefits from mining can compensate for the damages inherent to such extractive activity, and a legislation that increases the income share of the government from the earnings of mining is passed.

- **Forest and land use change/conversion.**

The municipal ECAN maps already serve as bases for the crafting of Comprehensive Land and Water Use Plans (CLWUPs), the master plans that direct the sustainable development agenda of the province's 23 municipalities and one city. Activities being undertaken to prevent the conversion of Palawan forests to other land uses include mapping, delineation, and validation of forest reserves, watershed areas, and protected areas, among others, and the integration of the same into the CLWUP of the respective local government unit. The PCSD Staff is currently reviewing the provincial program on oil palm industry in the southern part of the province. This is in response to the issues being raised against the operations of oil palm plantations in the area.



- **Trafficking/poaching of wildlife resources,** including limited trans boundary logistics to monitor undocumented shipments of live reef fish. Although the limitations in logistics and resources are the major setbacks in handling this concern, the handicap is being addressed by forging partnership and cooperation among the law enforcement agencies. The promotion of trans boundary conservation in the East ASEAN Growth Area (BIMP-EAGA) region is another initiative that could be explored.

Prospects toward restorative development

- **Implementation of the PalTREES reforestation program**

Forest protection and management remains a foremost concern of the PCSD. Palawan BR has the country's largest forest cover of 666,000 hectares, yet the PCSD is still planning to increase the Palawan's forest cover as a legacy for future generations.

In partnership with government institutions and other stakeholders, the PCSD launched the Palawan Trees for the Restoration of Ecology, Economy, and Society (PalTREES) program. PalTREES is a collective effort to build the province's forest infrastructure and to support the National Greening Program (NGP) of the Philippine Government, pursuant to Executive

Order 26 which intends to plant 1.5 billion trees throughout the Philippines within the next six years. As of December 2011, some 1,700 hectares of land in the province were planted through the NGP-PalTREES reforestation program.

- **Strengthening local sustainable development institutional framework**

The SEP already laid the foundation to achieving economic prosperity and environmental resilience in Palawan, but it is handicapped without the support from the local people. Current initiatives are thus geared towards main streaming and localizing the SEP, the ECAN strategy, and sustainable development principles.

In terms of regulating development activities, the SEP Clearance System can be streamlined by integrating economic valuation methods and cost-benefit analysis into the technical assessment process of critical projects. Also envisioned is an enhanced clearance system that is climate-smart through the addition of environmental criteria related to climate change in the evaluation of projects.

- **Transition to a green economy**

Schemes that will pave the way toward a full-fledged “green economy” in Palawan are currently being explored. This includes market-based instruments such as Payment for Ecosystem Services (PES) and the anticipated carbon trading under the Reducing Emissions from Deforestation and Forest Degradation (REDD-Plus) mechanism.

Green investments like zero to low carbon technologies and renewable sources of energy are also being pursued. Toward this end, the PCSD has signed a partnership agreement with GrAT (Center for Appropriate Technology) to implement in Palawan the Zero Carbon Resorts (ZCR) project funded by the European Union’s SWITCH Asia program to encourage the small and medium tourism establishments to reduce their use of fossil fuels and gradually shift to renewable energy sources.

- **Contribution of Palawan BR to the World Network of Island and Coastal Biosphere Reserves**

The Palawan BR, through the management of the PCSD, has actively supported the World Network of Island and Coastal Biosphere Reserves through the active involvement





and participation of environmental staff in the activities pursued by the Network. The PCSD has continuously shared BR experiences, good practices, and learned lessons with the other members of the Network during meetings and learning events.

The agency has been fortunate to have been backed by a technical staff with 20 years of experience in environmental governance and adaptive environmental management. It has also been supported by adequate investment in technology such as GIS and an environmental laboratory. It expects to keep on producing strategic innovations in environmental management while implementing a most unique ecosystem-based planning strategy that is the ECAN.



The Current State of Yakushima Biosphere Reserve

Takahiro Okano

3rd Meeting of the World Network of Island and Coastal Biosphere Reserves,
Hiiumaa and Saaremaa Islands, Estonia, 4 - 6 June 2013

The Current State of Yakushima Biosphere Reserve



Takahiro Okano

Associate Professor, Kagoshima University
Education Center

There are 5 Biosphere Reserves in Japan (Figure 1), Shiga Highland, Mt Hakusan, Mt Odaigahara & Mt Omine, Yakushima Island, which were designated in 1980. Aya was designated in 2012.

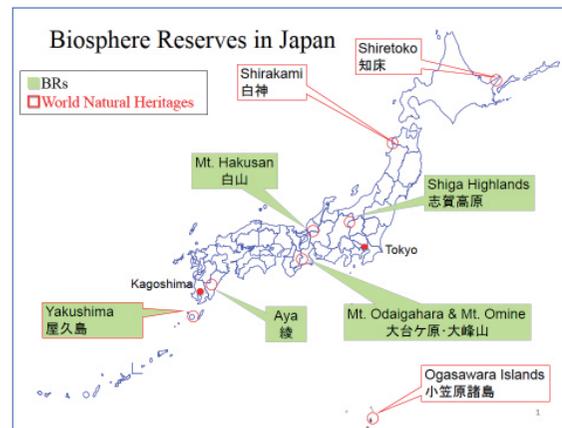


Figure 1.

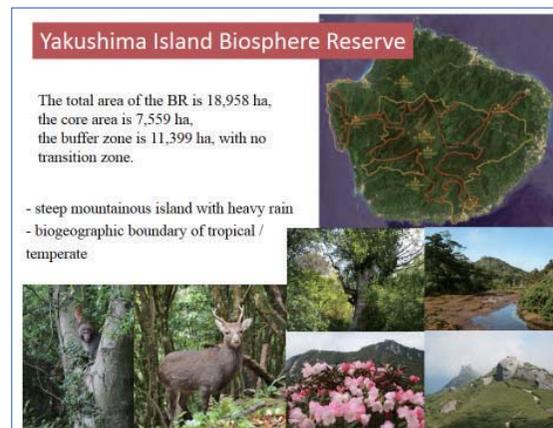


Figure 2.

Yakushima Biosphere Reserve is located in Yakushima Island. Total area of the BR is 18,958 ha, the core area 7,559ha, and the buffer zone 11,399 ha, with no transition zone (Figure 2).

Yakushima Island is a quite round island with a circumference of 130km, and is located 60km off the southern tip of mainland Kyushu. There are 11 mountains higher than 1500m, including Miyanouradake (1,936m), the highest mountain in Kyushu. This island is steep and mountainous with a heavy rainfall. This island is located in biogeographical boundary between tropical and temperate. This island has a unique vertical distribution of vegetation (Figure 3).

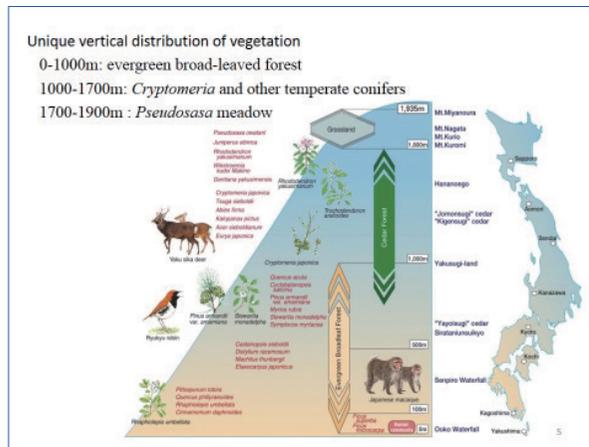


Figure 3.

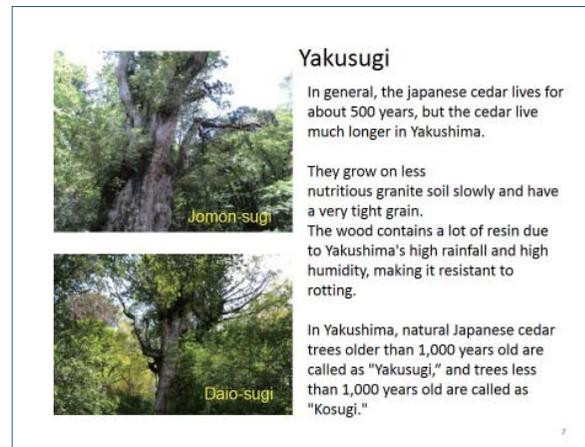


Figure 4.



Figure 5.



Figure 6.

Yakushima has big and aged cedar trees (Figure 4). In general, the Japanese cedar lives for about 500 years, but it lives much longer in Yakushima. These trees tend to have long lives, and many large trees have survived more than 2,000 years. In Yakushima, natural Japanese cedar trees older than 1,000 years old are called “Yakusugi,” and those less than 1,000 years old “Kosugi.” It means a child cedar in Japanese.

In this way, Yakushima has a unique nature. So, Yakushima is counted as one of the most famous protected areas in Japan (Figure 5). Before being designated as a BR, the area was designated as Kirishima Yaku National Park in 1964. This National Park extended its boundary, and the name changed to Yakushima National Park last year. After its designation as a BR, the area was inscribed on the World Heritage List in 1993. Natural environment in Yakushima can be regarded well protected.

In Japan, World Heritage site is very popular. The number of the tourists visiting Yakushima Island has increased after it was inscribed on the World Heritage List. Especially, Jomon-sugi is a very popular tourist destination though it takes 5 to 6 hours on foot from lodging facilities. In the last 10 years, the number of visitors to Jomon-sugi has increased three-fold (Figure 6). This boom caused to raise the number of nature guides in Yakushima (Figure 7).

The World Heritage created new jobs, and produced a big economic effect. The reduction in the population of Yakushima Town stopped after it was inscribed on the World Heritage List (Figure 8). Unfortunately, this has also caused negative impacts, such as the traffic congestion and the destruction of vegetation (Figure 9).

BR and World Heritage site cover mainly mountain areas. There are many natural and cultural resources surrounding the BR and World Heritage sites.

Nagatahama is a beautiful white beach on the northwestern side of the island. Loggerhead sea turtles (*Caretta caretta*) come to breed on this beach every year (Figure 10). This beach has the highest number of turtles' nesting in the north Pacific region. This beach was designated as protected wetlands under the Ramsar Convention in 2005.

Loggerhead sea turtles visit Nagatahama to lay eggs from May to July. It takes a female about 30 minutes to dig a hole and lay 60-100 eggs. It is estimated that 2,000-3,000 turtles arrive on the beach to lay eggs every year.

The Ministry of the Environment introduced a set of rules to keep visitors from disturbing the spawning sea turtles on this beach in 2009 (Figure 11). This rule mandates visitors to join tour groups guided by the local community, and to refrain from using cameras and video equipment.

Due to the world's largest warm current Kuroshio, rainfall is abundant in Yakushima. Average rainfall in the seaside areas is 4,000 mm per year, and 8,000-10,000mm in the mountainous areas. Therefore, Yakushima is mostly powered by hydroelectricity. It occupies 99% of the total electric power capacity of the island (Figure 12).

Focusing on this unique island, Kagoshima prefecture promotes the "Zero Carbon Emission Island" and the introduction of electric vehicles (Figure 13). More than 100 electric vehicles have been introduced under a government-subsidized initiative which mainly targets individuals and private organizations. Four high-speed recharge stations

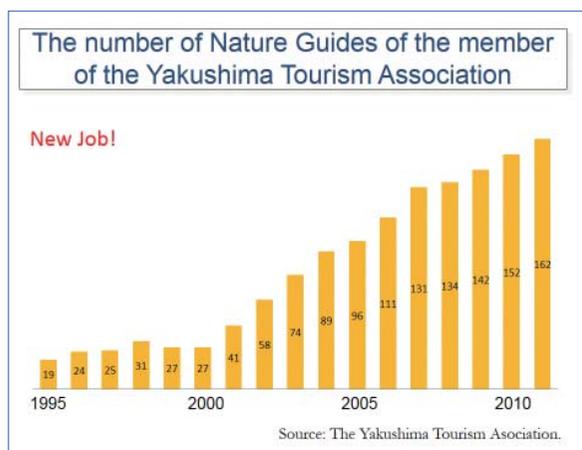


Figure 7.

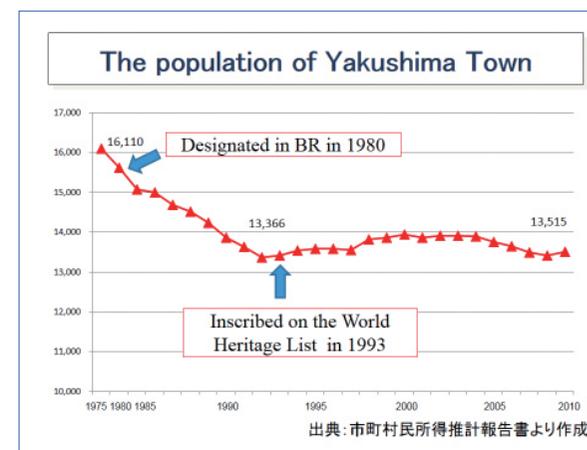


Figure 8.

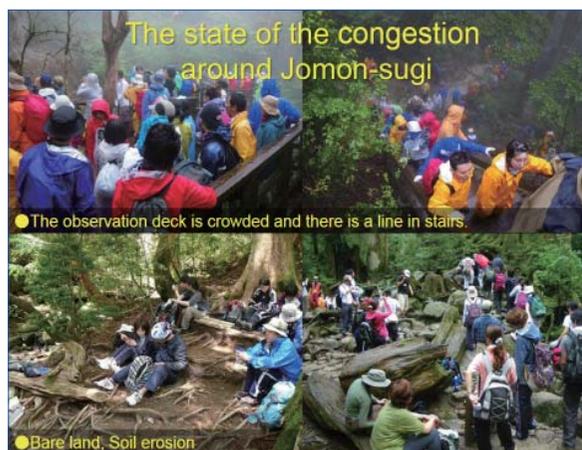


Figure 9.



Figure 10.

(1) The regulation for the conservation of sea turtles

- ◆ May 1 ~ August 31
Keep off during nighttime
- ◆ May 15 ~ July 31
Need to participate in the observation meeting held by local NGO.
A maximum of 80 participants per night
- ◆ August 1 ~ August 31
Keep off during nighttime
(Contact to Yakushima Rangers Office)

(2) The rules for the observation

1. A lecture is certainly received in advance
2. Guidance of the staff is followed
3. Light off
4. Keep path, Keep quiet
5. Don't touch Sea Turtle
6. Pictures and Movies prohibited
7. Alcohol prohibited
8. No Smoking
9. No Littering
10. Keep off after the observation meeting




Figure 11.

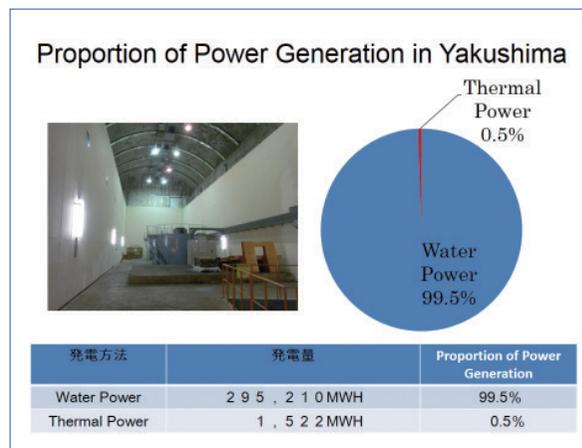


Figure 12.

have been set up in the island by the prefectural government. There are many delicious foods in Yakushima. The sea around this island is a good fishing ground. Spotted mackerel is very delicious to eat raw. Dried blue mackerel is made by handcraft with much time and effort. It is used to make soup for Udon and Soba noodles. Some fruits are produced in this island, such as ponkan orange and tankan orange.

Kagoshima University started a field trip program to study environment and culture in Yakushima Island since 2012 (Figure 14). This program has 4 courses, each on the Fauna, on the Flora, on the Local Industry and on Life and culture.

Yakushima is not free from problems (Figure 15). Firstly, there are negative impacts caused by an increasing number of visitors on popular tourist sites. Secondly, agricultural and fishery productions are decreasing.

Yakushima BR also has problems (Figure 16). There are no significant activities for sustainable development supported by local community efforts. This is because public awareness of MAB and BRs has stayed at low level in Yakushima. When this BR was designated as such in 1980, the government did not take sufficient efforts to talk with the local citizens and scientists about the concepts and functions of, or management plans for, BR. In addition, Yakushima BR has not modified its boundary since 1980. As a result, this BR does not have transition area. It has no marine area either.

Fortunately, Yakushima has a local project which adopts a similar idea to that of BR (Figure 17). Its name is “The Yakushima Environmental Culture Village Concept”. This project aims to promote enriched lifestyles while maintaining a balance with natural surroundings, based on

Zero Carbon Emission Island

- *Promoted by Kagoshima prefecture
- *More than 100 electric vehicles were introduced under a government-subsidized
- *4 high-speed recharging stations were set up in the island by the prefectural government.




Figure 13.

Field study of the environment and the culture in Yakushima by Kagoshima University

- For student
- 3 days and 2 nights
- 4 programs
Fauna, Flora,
Local Industry,
Life and culture
- 100 student per year
- Since 2012



Figure 14.

“Environmental Culture”. “Environmental Culture” is the relationship which has developed over the course of history between the splendid nature of Yakushima and its people.

Yakushima town has started the discussion for active use of BR concept based on the existing activities and the Yakushima Environmental Culture Village Concept. The mayor of Yakushima town set up the promotion committee for active use of Yakushima BR in the government office in April (Figure 18).

This committee has three main agendas; modifying the zoning, making a management plan and creating activity areas for sustainable development.

The most important issue is securing transition areas. They are also seeking for the possibility of extension to coastal area, marine area, and even to Kuchinoerabu Island. Kuchinoerabu Island has an active volcano, hot springs, and coral reefs. This island was included into National Park in 2007.

Creating activity areas for sustainable development based on local community efforts is expected. For example, hands-on ecotourism programs are attempted in collaboration with local fisheries and farmer groups. We hope that these ecotourism programs will lead to not only reduced overuse of popular sightseeing destinations, but also increased agricultural and fishery productions.

The Japanese Coordinating Committee for MAB, which assists Japanese National Commission for UNESCO, supported to set this promotion committee. We should continue to support Yakushima Town Municipality.

Problems of Yakushima

- Negative impacts caused by increased visitors to popular destination.
 - the congestion
 - the destruction of vegetation
- Decline in agricultural and fishery productions



Figure 15.

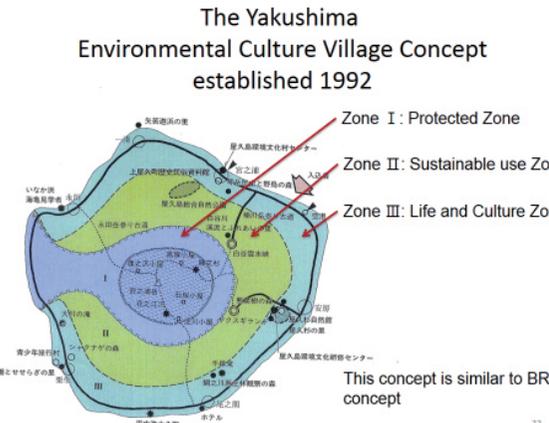
Problems of Yakushima BR

- Lack of action and recognition about BR! Because of
 - No management plan for BR
 - No meeting for BR was held during 1997-2011
- Not modified the zoning since 1980
 - No transition areas
 - Not covered the seaside area and the marine area



Figure 16.

The Yakushima Environmental Culture Village Concept established 1992



Zone I : Protected Zone
Zone II : Sustainable use Zone
Zone III : Life and Culture Zone

This concept is similar to BR concept

Figure 17.

The promotion committee of Yakushima Biosphere Reserve



- Started 30 April 2013
- Held by Yakushima Town
- Supported by the Japanese Coordinating Committee for MAB
- Agenda
 - Modify the zoning
 - Establish transition area
 - Extension to seaside area, marine area, Kuchinoerabu Island?
 - Make the management plan
 - Create activities for sustainable development

Figure 18.

Transition to Green Economy at Nanji Islands Biosphere Reserve

Houcai Cai, Zhijun Yi

3rd Meeting of the World Network of Island and Coastal Biosphere Reserves,
Hiiumaa and Saaremaa Islands, Estonia, 4 - 6 June 2013

Transition to Green Economy at Nanji Islands Biosphere Reserve



Houcai Cai

Chief of Scientific Research Division, Nanji Islands
Biosphere Reserve

Zhijun Yi

Invited Senior Expert for Nanji Islands Biosphere
Reserve

Introduction

A large expanse of golden beaches is unfolded outside the window, with sea-waves shining in the setting - sun light, roaring up to shores seemingly in a shocking momentum. However, they immediately recede, wrinkling soft and silk-like beaches and then slowly making them flat. Footprints of those paddling along the sea-side are somewhat fragmental, as if everyone on beaches had something fully on his/her mind. Some of them put up sandy buildings with a gorgeous illusion hard to be realized in reality, some release all their sorrow and grief by burying themselves into sandpits dug by themselves and some turn helplessness that they fell in a uncertain life into sighs and vent it into rolling and snow-like waves. Under absolutely charming setting-sun light, how many truly great people have disappeared through such waves since ancient times?

Over the sea, there is a vast expanse of pure blue which stretches far and wide. One would feel desolate white seeing such a scene for a long time, perhaps a sort of thing mixed with somewhat homesickness which is not so sure. Right in the farthest front where the sea blends with the sky may be Taiwan, suddenly giving rise to a kind of indistinctive affectionate attachment.

(by video; adopted from Luo Fu's prose: Setting-sun, Beaches and Nanji)

The above prose describes a kind of motivation of a very reasonable and sustainable utilization of natural resources including eco-tourism at Nanji Islands Biosphere Reserve. From the pictures shown in the text, people can see Nanji's rich biological resource, unique landscape, rich cultural heritage and long history. Also reflected by these pictures is the balance



Bird-view of Nanji Islands BR



Golden Beach before Longchuanjiao

of conservation and sustainable development achieved by the relevant stakeholders such as reserve managers, local residents and private sectors and so on. Nanji Islands Biosphere Reserve has abundant assets to develop green economy with.

The core zone of Nanji Island Biosphere Reserve has an area of 8.04 km², which covers Dashan, Shangmaan, Xiamaan, Poyu, Xiaochaiyu, Houjishan, Dalei and their nearby sea areas. The buffer zone covers 34.04 km². It serves as buffer between the core zone and transitional zone. The size of the transitional zone is 158.98 km². In this zone, economic activities such as fishery, business and tourism are allowed for green economy, but are under effective management.

Managers of Nanji Islands Biosphere Reserve have properly handled the conflicts between the increasing number of tourists to the islands and protection of marine bio-resources. They encourage such activities conducive to the sustainable use of resources as man-made fish reefs, fish incubation and releasing, etc. These activities will make these beautiful islands an example of harmonious coexistence of humans and the nature.

Nanji is well recognized as the gene pool of marine creatures as well as the kingdom of shells and algae. It is one of the five pioneer national marine nature reserves of China, one of the ten most beautiful islands in China and the first marine nature reserve designated by UNESCO and included into the

Network of World Biosphere Reserves.

1. Long History of Nanji Islands

Magma pushed up Nanji Islands above the sea level while fossilized algae record its life of hundreds of millions of years. Nanji islands are located dispersed in the Eastern China Sea like bright pearls. Dating back to the ancient time, it boasts strong local culture and records related to marine. Mr. Zheng Chengong trained his navy here and left cliffs-carving on Guoxingao, which proved Nanji's strategic significance in the Ming dynasty. In praise of Nanji, there is 'A picture of riding on winds to break waves' painted by a vassal in the Qing dynasty. Poets He Bai and Huang Qingxiao paid a deep admiration to the picturesque sceneries of Nanji. The late sage Liu Shaokuan in Wenzhou remarked on the development of Nanji in his 'Diary on Houzhuang' with such a verse; "Historical remains are left by diligent natives". Industrialist Wang Lifu, with the reputation as the first developer of Nanji, established a fishing and farming company and Langchang Thatched Hall on it, and 'personally planted 100,000 pine trees'. Through his persistent devotion, Nanji was made 'The land of fish and rice for one thousand households'. Song Meiling, wife of Jiang Kai-shek, once lived in Qifengju. Taiwan compatriots have planted *Acacia rachii* trees. Poet Luofu wrote poems on the beach. All these have contributed to Nanji's rich cultural heritage. Zeng Chengkui, then chairman of International Algae Association and an academician of Chinese

Academy of Sciences, named a new alga species discovered on Nanji Islands in 1963 as *Sargassum nigrifoloides*. In following years, Chinese and foreign marine scientists continuously visited Nanji, making scientific achievements through painstaking efforts.

2. Unique Landscape of Miraculous Nanji Islands

Nanji islands is regarded as one of ‘the top ten beautiful islands’ in China, and Su Buqing, the lord of mathematics, praised it as an island of immortal beauty on the blue sea

Renowned for its sceneries, Nanji islands consists of 52 islands which are scattered over the East China Sea like a string of splendid pearls. With a total land area of about 11.13 square kilometers, it boasts four major sceneries marked by Sanpanwei, Dashaao, coastlines around the islands, as well as historical and human resources. Tourists on Naji islands can enjoy different kinds of sceneries wherever they go. Four seasons on the islands reveal its uniqueness and serenity. During daylight hours and at dusk the hue changes with magnificence and elegant beauty. The far-reaching blue in the sky, which merges with the sea in one color in far distance, engenders an immortal beauty.

Nanji islands is a colorful tourist attraction, covering such scenic resources as mountains, the sea, forests and humane landscapes, Moreover, it is also suitable for science education and summer camping. All

over the islands, there are more than 180 peculiar natural and cultural sceneries, with unusual rocks, natural murals, precious sea-birds, lawns, bushes, cliff carvings interspersing like a fairyland across the archipelago.

Nanji islands enjoy unique scenic glamour though it is shaded by the special luminous mission featured by its function of protecting certain marine ecosystem. They are 30 nautical miles away from Aojiang Town, 50 nautical miles from the Wenzhou Port and 40 nautical miles from Jilong Port of Taiwan. This convenient location makes them a golden route for tourists. There is a wide variety of attractive sites across the islands, e.g. Zhuyu, Dalei Mountain, Xiaolei Mountain, Houji Mountain, Daotiao Mountain, Jianyu, Xiaochaiyu, Chaiyu, Xiamaan, Shangmaan, Pingyu and Menyu, etc., with each islet as a scenic area of special features. The islands have beaches with rare shells the nature created over eons.

The history and humanities of the islands also leave a deep impression on people. Nanji islands have very close relationship with Taiwan, since all inhabitants on these islands were forced to move to Taiwan in 1955. Nanji has a kind of tree named Lovesick Tree of Taiwan.

3. A Kingdom of Shells and Algae

Nanji archipelago is also termed by scientists in the field of marine biology at home and abroad as “a kingdom of shells and algae” and “gene pool of



Turbo cornutus Solander



Sargassum fusiforme(Harv.)Setch



Culture of fish, shellfish and algae



Eco-products labeled by Nanji Islands BR

marine biology’.

Nanji islands are characterized by highly diversified ecological environments. Lying at the convergence of Taiwan warm current and Jiangzhe coastal current, Nanji sea areas have varieties of currents and frontal surfaces. Such a complicated physical environment provides ideal habitats for marine fauna and flora. In the cause of protecting marine biodiversity, this reserve is devoted to protecting marine shells, algae, narcissus, migrating birds and the ecology environment. The reserve has 1,876 kinds of marine species, including 427 species of shells, 178 species of benthic macro algae, 459 species of nano- and micro-algae, 397 species of fish, 257 species of crustaceans and 158 species of other marine lives. Among them, there are abundant shells and algae in particular and each of them accounts for about 20% of the total species in China, and 80% of that in Zhejiang province, respectively. Nowadays, 36 species of shells are found only in Nanji sea areas along the coast of China, and the algae *Sargassum nigrifoloides* Tseng et Lu., *Sargassum capitatum* Tseng et Lu., and *Giffordia zhejiangensis* S.B. Wang identified here were recognized as new species. Another 22 species of algae are listed as rare species. These facts reflect the high level of biodiversity, high value of this ecosystem.

Nanji islands are a good place for conducting scientific investigation. Marine biologists endow it with the reputation of ‘famous Shennongjia (of the richest biodiversity in China) natural reserve, in the sea’.

4. Research, Eco-products and International Cooperation

With its advantages in geographic location, resources and sceneries, Nanji islands are well known among people. It is a museum of marine creatures. In 1963 *Sargassum Nigrifoloides*, a species of new alga, was discovered in Nanji area and named by Zeng Chengkui. The biological characteristics and biodiversity of Nanji came to be known to the academic field and have since drawn great attention from marine scientists at home and abroad.

It is a natural lab of marine biology. Since the 1960s, experts and scholars from over 30 Chinese institutions of higher learning have successively visited Nanji Islands for scientific investigations. And many important academic seminars have been held in Nanji as well. International marine research institutions and organizations placed much importance on it and the leaders of state and province visited it for inspections many times. It became a hot spot of the investigation into shells and algae in China.

It is an international base for sea-fishing. Besides, it has a very close relationship with Taiwan. Three international festivals for sea-fishing have been successfully held here. Sea-fishing maniacs of Hong Kong, Macao and Taiwan come here all the year round. Nanji islands are located opposite to Taiwan across the channel and people of these two places are of the same ancestral origin. Compatriots of Taiwan

are sentimentally attached to Nanji which receives a lot of Taiwan fishermen and tourists every year.

In 2007, Nanji stamps were issued. It served as a golden business card and earned Nanji more fame, and made it receive more care from people who love the sea creatures and science.

5. Institutional Arrangement in Managing Nanji Islands Biosphere Reserve

Nanji Islands is obliged to take the duty imposed by ‘China’s Agenda 21- White Book of Population, Environment and Development of the 21st Century in China’; to carry out experiments on the balance of conservation and development in Nanji Islands Biosphere Reserve. Since its establishment in 1990, thanks to standardized management, the reserve administration has embarked on the path of comprehensive consideration, meticulous protection and harmonious development.

In 1996, the Standing Committee of the Eighth People’s Congress of Zhejiang Province approved ‘Regulations on the Managing Nanji Islands Biosphere Reserve, Zhejiang Province’. It provides legal guarantee for the conservation and development of Nanji Islands BR.

In recent years, over 200 million Chinese yuan had been invested in the reserve. And the construction of important infrastructures of transportation, docks, telecommunications, and electric power, reservoirs, breakwater and sewage disposal has been completed.

In 2006, the inclusion of new functional areas of Nanji islands was approved by National Marine Bureau. The first-phase work for making the overall plan of the reserve has started.

Nanji Reserve has set up partnership with Zhejiang Marine Institute and Zhejiang Marine Aquatic Product Cultivation Research Institute as well as a close relationship in scientific researches with the Second National Marine Research Institute and the Third National Marine Research Institute. It also carries out many co-operative projects with many Chinese and foreign marine biologists in the forefront of science and has been listed by UNDP as one of the four model reserves concerning the projects of biodiversity management along the southern coasts of China.

At present, Nanji islands has become the first national demonstration base of Zhejiang province, a national sea-fishing base, a provincial showcase of marine product cultivation, a provincial base of science education as well as a model of advanced reserve management commended by Ministry of Land and Resources, National Bureau of Forestry, National Administration of Environmental Protection and National Commission of science.



Public Education



The Fishing village

Sustainable Development of Mt. Kuwol Biosphere Reserve and its Coastal Area

Kyong Min Kim Ph.D.

3rd Meeting of the World Network of Island and Coastal Biosphere Reserves,
Hiiumaa and Saaremaa Islands, Estonia, 4 - 6 June 2013

Sustainable Development of Mt. Kuwol Biosphere Reserve and its Coastal Area



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Bureau of International Scientific Cooperation



Landscape of Mt. Kuwol in autumn

1. SUMMARY

Mt. Kuwol Biosphere Reserve (BR) includes the forested core area on the borders of four counties (Anak, Unryul, Samchon and Unpha in South Hwanghae Province of DPRK) and adjacent agricultural area and coastal area in Unryul County.

It was designated as a MAB biosphere reserve in 2004, covering the area of 527.15 square kilometers altogether. Its core area takes up 12.45 square kilometers, buffer zone 29.40 square kilometers and transition area 485.30 square kilometers. It was created by extending the Nature Reserve (designated as such in 1976) of 47 square kilometers, centered at the forests of Mt. Kuwol so that it could well function as a biosphere reserve.

The West Sea of Korea borders Unryul County of Mt. Kuwol BR, with the coast length of 77.62km in the reserve. The coastline consists of 2 peninsulas and bays between them, along which wetlands are scattered. Agricultural area along the West Sea of Korea in Mt. Kuwol BR makes one of the major national rice granaries.



Landscape of Mt. Kuwol in spring



Needle-leaf and broad-leaf forests of Mt. Kuwol

2. NATURE HERITAGE

Mt. Kuwol BR is a famous sight-seeing place in DPRK due to its scenic beauty with the splendid fall colors in September, and the unique spectacle of the flat land and the West Sea of Korea which can be viewed from the mountain peaks. The name Mt. Kuwol stands for September, when the scenery is extremely beautiful.

It contains many peaks such as Sahwang Peak (954m, the highest in the vicinity), Jugo Peak (823m), O Peak (859m), Asa Peak (688m) and others, with a craggy skyline of granite cliffs. Clean water runs down through the rocky crevices or the deep valleys, leaving many small or big waterfalls here and there. The peaks of the mountain range look higher than they actually are because the feet of the mountains are at relatively low level.

Mt. Kuwol BR, located rather in the middle of DPRK, is known to have a climate gradually changing from that of the northern area into that of the southern area, and to have all the continental, maritime and peninsular climate characteristics due to its geographical complexity.

Annual average temperature is 9.2-11.2°C, with 24-25°C in August and -6.4°C in January.

Annual average precipitation amounts to 914.4mm in Anak County, and 807.5mm in Unryul County. Many vascular plant species (129 families, 403 genera, 742 species, 39 varieties and 5 forms) are found in the reserve. The temperate tree forests of *Pinus densifloras*, *P. densiflora-Quercus mongolicas* and *Q.*

mongolicas are scattered in the reserve.

Many species (20 species of mammals, 131 species of birds, 9 species of Reptilia and 10 species of amphibian) are found in the reserve. One of the well-known animals is *Hydropotes inermes*. On the other hand, *Grus japonensis* and *Platarea minor*, the global threatened bird species, are observed on their way of migration around Kumsan-pho (seashore wetland) in Unryul County. Waterfowls such as *Cygnus beedii* are also found in the wetlands of Kumsan-pho.

3. CULTURAL HERITAGE

Though Mt. Kuwol used to have many historic sites (Peyep, Woljong, Hungryul, Raksan Temples built in early 9th century), they were destroyed during the Korean War except Woljong Temple (built in 846). The red-and-blue pattern of Woljong Temple still stands the test of time.

Mt. Kuwol contains an old site of fortress wall (5.23km), which is one of the five famous mountain castles in Hwanghae Province, where food and weapons for several counties of South Hwanghae Province were stored during a Feudal Dynasty of Korea (1392-1910).

The transition area of Mt. Kuwol BR shelters more than 1,000 graves from the Koguryo Dynasty, of which the Kogukwon (a king of the Koguryo Dynasty) Royal Tomb is the most famous.

4. CONSERVATION AND MANAGEMENT OF MT. KUWOL BR

- Conservation and management

Core area of the Mt. Kuwol BR is covered with the needle-leaf and the broad-leaf forests (such as *Pinus densiflora*, *Quercus Mongolic*, broad-leaf *Acer coreanum* and *Carpinus laxiflora* and so forth) of a relatively long age. These forests are of great importance as nature restoration models because they show a way to restore the forests in South Hwanghae Province, where the forests had been severely wrecked.

One of the urgent tasks is to set up a planning framework and action plans for the conservation and management of the forests in the core area and the buffer zone, to regularly monitor them, to strengthen the management ability of biosphere reserve, and to establish the education system for the residents in the biosphere reserve.

- Restoration

In the buffer zone of Mt. Kuwol BR, it is important to pay attention to the forest restoration, sustainable agriculture and coastal management. It is needed to spread wide the green technology, so that all actions in the buffer zone would lead to socio-economic and eco-environmental benefits especially for local residents in order to encourage their involvement in restoring the destroyed ecosystem and thus enhancing the eco-service function.

5. SUSTAINABLE TOURISM

Tourism is thriving along the loop line road and around the recreation facilities in Mt. Kuwol BR. DPRK has currently set up the national policy for the development of international tourism, and selected Mt. Kuwol as a main sight-seeing resort for this purpose. Therefore, Mab National Committee of DPRK faces the task of establishing an action plan for a continuous development of tourism in the context of the conservation and management and sustainable development of biosphere reserve. It is of paramount importance to nourish eco-cultural and agricultural tourisms, taking advantage of the peculiarity of Mt. Kuwol area, to establish the standards for eco-tourism for this purpose, and to educate the local residents on the eco-tourism.

6. SUSTAINABLE DEVELOPMENT OF THE COASTAL AREAS IN MT. KUWOL BR, COPING WITH THE CLIMATE CHANGE

- Climate change

Global climate change exerts significant effects on the general climate of DPRK, bringing about natural damages (temperature rise, flooding due to heavier rains, typhoons, and rise of tidal waves, and so forth). According to the overall climate data, annual count of days of heavy rain (100mm) turned out to be five times as many since 2000 compared to that in 1990s. Due to the impacts



Grus japonensis



Platalea minor



Waterfowls inhabiting in a mud flat on the coast



Hydropotes inermes

of the global warming, typhoons occurred more frequently, rose in intensity and became more destructive with higher wind-speed and heavier precipitation. Water resources are most affected by climate change in DPRK, being followed by forests, coastal and agricultural areas in terms of the level of adverse impacts. The climate change in the coastal areas brought about increased flood-area, more typhoons, rise of the tidal waves, flooded estuaries, salinity of the river and ground waters, reduced coastal wetlands and severer damage in biodiversity, and so forth.

Damage caused by climate change is especially serious on the coastal areas and thus reduces coastal fish resources. In this context, the strategy to cope with the climate change should aim at restoring the degraded or destroyed ecosystems, improving the service-function of the ecosystem as far as possible, providing the socio-ecological and environmental infrastructures according to the scenario of the climate change, and enhancing the capacity to deal with disasters caused by climate change.

The measures to handle the climate change in the coastal areas lies in the establishment of the protective system in coastal ecosystem, reinforcing coastal banks, updating infrastructure and taking actions to minimize damages caused by disasters, so as to provide a better foundation for the sustainable development of the coastal areas.

- Sustainable development in the coastal areas around Mt. Kuwol BR.

It is important to continuously promote coastal fishery and agriculture, conserving the biodiversity. It is also required to strengthen the coastal protection capacity to reduce the damage caused by the tidal waves and typhoons, which tend to become more vicious due to the advancing climate change. As an effective way to pursue these two sets of goals, reforestation projects should be carried out on a large scale suitable to the areas along the seashore and river banks surrounding the fresh-water areas. There's no doubt that these projects might reduce soil erosion and enhance carbon sink capacity.

For the sustainable development of the coastal fishery, it is crucially important to conserve the tidelands formed in the coastal areas and to use them effectively, while promoting the protection and proliferation of the fish resources. This endeavor would help to transform the current fish capturing practice into fish farming.

Besides, fresh water fishes in coastal areas should be bred with green technology. To protect or promote the agriculture in coastal areas, it is necessary to solve the salinity problem. For sustainable agriculture, it may be productive to plant such species as the Lunex K-1, *Amorpha fruticosa* and *Tamarix* and to combine the agriculture with the dairy farming. This combination must be effective in fertilizing the cropland and overcoming the fluctuation in agricultural production, leading to a raised output per hectare.

On the other hand, planting the economic herbs

of salt resistance may be an efficient way to increase the income of farmers.

Bio-diversity in and around the coastal wetlands in Kumsan-pho should be well protected, where, as mentioned above, there is one of the main habitats for *Grus japonensis* and *Platalea minor*, the world threatened species. In this context, it is a must to monitor on the wetland environment, and to strive for the conservation and management of the wetlands.

Combining sustainable fishery, agriculture and sustainable tourism while protecting the wetlands is regarded as a task of paramount importance to the community in the Mt. Kuwol biosphere reserve.



The Wall of Mt. Kuwol



Woljong Temple

Sustainable Development and Ecotourism in Jeung Island, Korea

Jong Geel Je, Young Up Yoo

3rd Meeting of the World Network of Island and Coastal Biosphere Reserves,
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Sustainable Development and Ecotourism in Jeung Island, Korea



Jong Geel Je

City and Nature Institute

Young Up Yoo

Shinan Jeongdo Tidal Flat Museum

Shinan Dadohae region holds a special ecological significance. “Dadohae,” meaning “archipelago” in Korea, refers to the area of Korea’s island-dense south sea, which falls under the jurisdiction of Jeollanamdo Province and Gyungsangnamdo Province. The term is often used to refer to the western portion of the archipelago, which falls under Jeollanamdo’s jurisdiction, since the province designated a Dadohae Marine National Park in 1981. There are approximately 2,000 islands in Jeollanamdo, about half of which, 1,004, fall under Shinan County’s boundaries. Shinan County, in fact, consists exclusive of island areas, including 72 inhabited islands. Six of the inhabited islands, including their shores and mud flats, are designated as UNESCO Shinan Dadohae Biosphere Reserve. Of them, Jeungdo (do means island), lies closest to the mainland of the Korean Peninsula, and has a striking history in which its community has successfully established the island into an eco-tourist spot through sustainable development strategies, even before its designation as a reserve zone. This could be achieved by an exemplary collaboration between the local community and the local government.

Owing to their physical and topographical distance from the urban centers, the islands of Shinan county are comparatively isolated from urban development, and, as a result, retain a great deal of local ecosystems and cultures. In the past, the region was not well known outside of the immediately neighboring areas and was a rather secluded place. Recently, people have begun to realize that such well-preserved nature itself was



An aerial picture show the panorama of Jeung Island



Rural landscape of Jeung Island

a great resource, but also on ascendancy was the local community's desire for development. Ecotourism naturally came up as an attainable, sustainable solution to the emerging dilemma.

The first up on agenda was the need to expand people's awareness of the region. The best strategy the small, rural local governments could employ to this end was to designate the areas rich with natural resources as reserve zones, with, of course, the consent of the local community. A very desirable thing in this strategy was to become a "first," and indeed, Jeungdo, along with 3 other locations in Jeollanamdo Province, were designated as the first Slow Cities in Asia. A Slow City is defined as a community in which the residents pursue the ideals of calm and well-being, preserving and coexisting with the natural and cultural heritage of the area, trying to slow down the hectic pace of modern-day life. First begun in Europe, this practice is, of course, different from the practice of designating reserves and protection zones. The success of Jeongdo's development as a Slow City acted positively on the decision to designate some parts of the archipelago, including Jeungdo, as the Biosphere Reserves. UNESCO's criterion of Biosphere Reserve shares similar ideas with the Slow City practice in that they both aim for a sustainable coexistence between the local residents and nature, which contributed to the local community's relatively easy acceptance of their land being designated an international reserve area. This is a strikingly different

precedence in comparison to the usual resistance to such developments. The mud flats of Jeungdo were additionally named a Wetland Conservation Area by the Wetland Conservation Act and Ramsar Wetland Site.

With every addition to the island's list of protected zone designations, it gained increasing awareness outside of the immediate area, and it received increasing support from the government in its effort to preserve the local habitat. From the point of view of the island, it is a win-win situation. This remote island has spread its fame so much that it was recently polled as one of the most desirable vacation experience in Korea. In order to sustain such positive development, the local community and the local government have successfully undergone such campaigns as making the island entirely tobacco-free and using only natural soaps and detergents on the island. Similar efforts continue, such as making bicycles the main mode of transportation among the local residents and setting off parts of the island as automobile-free zones.

Ecotourism and sustainable development

Regarding the ecotourism, the definition: "responsible travel to natural areas that conserves the environment and improves the welfare of local people" by the International Ecotourism Society (TIES) is often quoted. Ecotourism originates

from nature tourism. As nature tourism grew in popularity, it often led to the local environment becoming damaged, prompting a campaign by a small number of such attractions to espouse an ecologically responsible tourism culture, eventually being named as a solution for a sustainable development for the local community. These changes reflect the evolution of the philosophy and conceptualization of ecotourism since its first proposal in the 1970's.

Despite the numerous varying interpretations of the word "ecotourism," the definition set by TIES is very clear. It states that tourism in naturally and/or culturally preserved areas should strive to minimize the damage to the region's nature, and that the profit garnered thus is used to improve the economy and the quality of life of the local communities. However, this is easier said than done. As tourism is an industry, it should be approached from a somewhat entrepreneurial angle. Tourism for the sake of preserving the environment often fails to properly benefit the local community and residents, who are inseparable to the local nature and who stand to risk as much as anyone else in opening up their land to tourism. In such cases, it becomes difficult to guarantee the sustained preservation and development of the local habitat and the local communities, respectably.

Despite the number of different views regarding ecotourism, it is worthy of note that, in essence,

ecotourism realistically works by generating revenue to strengthen the local economy, which, in turn, devotes its resources to better preserving the natural and cultural traditions of the region, ultimately completing a mutually beneficial cycle for all parties involved. This working model of ecotourism has been emphasized in Quebec Declaration of Ecotourism at the World Ecotourism Summit in Canada.

Ergo, ecotourism and sustainable development of the region are like two spokes of a wheel. Sustainable development entails an environmentally, economically, and socially balanced progression that blends well with the agenda of a long-term ecotourism. Ecotourism was initially contrived as a way to ameliorate the inconveniences and sacrifices asked of the local communities in designating their land as reserves. At this point, it became apparent that ecotourism could not successfully fulfill this role unless it worked as a viable industry. However, popular tourist locations with large tourist traffic are bound to suffer environmental and social consequences. To remedy this, ecotourism can be conducted under a comprehensive safety net of precautions and regulations, in addition to a sense of protectiveness and responsibility on the part of the tourists. As a result, ecotourism evolved into a highly responsible practice that focuses on minimizing the negative influence to the region's environment, economy, and society, while providing high-quality experiences to the



Producing salt as a popular ecotourism program



Producing salt as a popular ecotourism program



Halophyte garden provide several functions including ground for tourism and education



Blue spotted mudskipper is a symbol animal on the island's tidal flat

right-minded tourist, setting itself apart from the usual practices of mass tourism. As of today, ecotourism has come to be recognized as an important sector of tourism industry as a whole.

In order to engender a sustainable instance of ecotourism, it is crucial to opt for a community-based tourism (CBT). It is only natural that the local community takes the center role in ecotourism, which strives for the sustainability of local environment, society, and culture. CBT would ideally target visitors who wish to learn about the natural resources of the region and the way of life of the locals, and it would be run by the local community itself, possessed of a sense of responsibility and initiative. For the above self-evident reasons, it is not difficult for tourist companies or large corporations to strive for the ideals of true ecotourism. In order to compete with other companies and to maximize profit, it would become inevitable to put the local community in the back seat.

In summation, unless the local community itself takes initiative and holds agenda, it would be difficult to result in a beneficial end, and even if it were so, only a very few would actually reap the profits. Should the revenue generated by ecotourism be evenly distributed among the local community and strengthens the local economy, the natural resources of the region would surely become something for the residents to feel entitled to, something for them to protect, nurture, and

share. From that point, it would only be natural for the local community would take the initiative on protecting its assets, as the natural/cultural resources would be regarded. The aforementioned beneficial cycle of ecotourism could only be maintained when the local community thusly led the preservation effort. It would be in full accordance with the ideal guideline for ecotourism: “responsible travel to natural areas that conserves the environment and improves the welfare of local people.”

Natural and cultural highlights of Jeungdo

Jeungdo is not an island that boasts pristine natural environment or an isolated society untouched by the outside world. It is a place that has been inhabited by people for millennia, having undergone the anthropogenic changes to nature that accompanies human settlement. However, its geographical status as an island has lent it a considerable degree of environmental diversity, and the local culture, in coexistence with that environment, has also developed a unique flavor.

In the past, Jeungdo was not a single island, but divided into 3 separate islands called Apshiri, Dwitshiri, and Woojundo. During this time it was referred to as Shiri island, meaning that water was precious. Shiri refers to traditional Korean rice cake steamer, the bottom of which is dotted with draining holes. The etymological root of the

character “jeung” in Jeungdo, is said to originate from the same reference. Today, the character for “jeung” is root for “to add,” originating from the fact that the three islands are now unified via land reclamation. The area where the three islands were is now the largest salt farm in nation.

Jeungdo is a bountiful fishery where various species of fish can be found depending on the season. Mullet is the primary catch in the winter, bass and pomfret in the spring, croaker in the summer, blue crab in fall, and fleshy prawn in early winter. As such, Jeungdo possesses a rich spectrum of seasonal biodiversity. The mud flats are inhabited by mudskippers in the summer, and mud octopus is in season for fall. Mullet, being the main catch in winters, is often called Dong-uh, with the character for “winter.” The shallow waters between Jeungdo and other islands of the archipelago are ideal breeding grounds and many species of fish, and a great variety show up by the seasons. In the past, the waters around Jeungdo were in the migrating route of yellow croakers, and the species used to be an important part of the fishery. Even with the extensive overfishing, which has hurt the fisheries in the entire archipelago, a wide variety of fish species show up around Jeungdo by the seasons.

Woojun Beach is an elongated sandy shore area. In the areas where mud flats prevail, the sandy beach is often linked with sand flats and sand dunes. The flora in such areas functions to hold

the sand, and they cannot live without the sand. Of the thinophytes are the purple-flowered *Vitex rotundifolia*, rugosa rose, which blossom large red flowers all summer, and the grass like *Carex* species. There are also numerous mud flats in Jeungdo. Unlike sand flats, the mud flats are bordered by vegetated areas, more specifically salt marshes, which contain flora such as *salicornia*, species of *Sueda*, and reed. By the above characterizations, the sand flats and mud flats can easily be distinguished. Jeungdo is surrounded by a complex shoreline, which espouses a diverse range of mud and sand flats. Apart from the mudskippers and mud octopus introduced above, the flats are inhabited by various fauna, such as hard clam, short-necked clam, razor clam, ghost crab, and fiddler crab etc. A variety of different tools and contraptions were invented to effectively harvest the rich and diverse sea foods of Jeungdo. Many of these instruments and fishing methods are still used or preserved today by the fishermen of Jeungdo.

Local Food of Jeungdo

If you were to stay in a bed and breakfast place in Jeungdo, you would be able to experience the traditional food of Jeungdo area. The most common and predominant menus are ‘hard clam soup,’ ‘dried and steamed mullet,’ ‘salted baby octopus,’ and ‘kimchi.’ Of course, the all of the ingredients come from the local area. People have



Nakgi- horong, a local traditional food made of mud octopus



The island's ecotourism aims 'slow but happy travel' to conserve local nature and culture

started to recognize the fact that the food made from local harvests is the freshest and healthiest. And based on this belief, increasing number of tourists comes into Jeungdo for the local food. They assert that eating local food is also good for protecting the environment. A lot of energy resources are being used in transportation of good items, and great amount of carbon dioxide is being emitted in the process. The distance that food items are being transported is called 'food miles' and shorter the food mile is, better it is for the environment. Aside from the aforementioned menu items, 'croaker sashimi' and 'mud skipper soup' are commonly found in summer time and 'spicy stir-fried octopus' and 'octopus soup' can easily be seen in the tables of ordinary families in autumn. Spicy stir-fried octopus over rice and octopus soup make the best combination, but octopus soup can be replaced with 'bean-sprout soup' or with 'young radish kimchi' and 'cold seaweed soup,' made complete with hot pepper and soybean paste. In the past, transporting food items to the island was too difficult so the local food had naturally become the traditional food culture and the same food culture lives on till this day because the nature is still preparing the same kind of ingredients.

Some of the restaurants in Jeungdo are already advertising the fact that they provide the local food. There is a famous local food restaurant in a satellite island of Jeungdo called Hwado. The menu varies from season to season. For example,

during the summer time, spicy fish soup, salted large-eyed herring, squid seafood pancake, fried shrimp, small grilled fish, boiled crab, seasoned sea laver, toasted sea laver, nappa kimchi, and radish kimchi go up on the table. It is quite a feast, and 100% of the ingredients come from Jeungdo. Most of the seafood is from the fishing boats docked on Hwado, and the sea laver is farmed from the area. The owner of the restaurant is quite proud of the fresh ingredients and the way that food is prepared in his restaurant, and he explained: "Our restaurant is 'slow-city' approved. Every dish on the table now is from Hwado or Jeungdo."

Aside from the incredible local food, Jeungdo offers small but interesting variety of places worth visiting from Taepyung salt farm, to salt museum, salt marsh garden where hamcho(salt marsh grass, a traditional medicinal herb and a well-known health food) grows, Shinan wrecked ships relic excavation site observatory, stone-wall trap that used to be a fishing ground. It is full of natural scenes that cannot be found in the urban area.

Model case of local community-based tourism

Jeungdo is one of very few places that tourism is operated strictly based on the philosophies of the ecotourism. It 1) formed a good partnership with the local leaderships. The committee made of local

representatives and elders is the central decision maker, and some of the professionals from the younger generations lead the operation. It keeps a good relationship with the local government, lodgings, restaurants, and businesses in the island, as well as the outside experts and NGOs. Also, it constantly strives to increase the awareness and the capability of the stakeholders. 2) There is a visitor's center/ Jeungdo tidal flat ecological museum that serves the role of hub for ecotourism. This center is the place for the ecotourism activists to have discussions and share various experiences amongst themselves, and also it serves as the place to gather and provide knowledge and information. Moreover, it is a place that provides guide and commentaries for the local area. This visitor's center provides exhibitions, serving the function of a small local museum to attract tourists. 3) There is a local ecotourism company in Jeungdo called Gilbut(which means 'traveling companion') which is a social enterprise that leads the ecotourism in Jeungdo. All of the members of the company are local residents and they take on marketing, public relations, tour guiding, and even provide entertainments sometimes.

Number of tourists in Jeungdo has steadily increased, reaching 700,000 a year, and it has grown to a point where the number of visitors in slow seasons like spring and fall of this year has come be equal to the number of visitors that the island had during the previous summer, which is the peak season. Right now, they are charging entrance fee to the island to control the number of visitors, but nevertheless, it keeps on increasing. Jeungdo is now frequently visited by leaders of other local governments in Korea who are interested in bringing the biosphere reserve system to practice in their region or those who are keen on making ecotourism as their local industry. People and local governments of other islands in Dadohae region, who were opposed of being a part of biosphere reserve, are now eager to be a part of it. Jeungdo keeps on striving for the sustainable growth of the island.



Man and Biosphere logo on packing cloth of local salt product

The Role of Mangroves in Response to Climate Change in Coastal Zone in Vietnam: A case study of the Cat Ba Archipelago Biosphere Reserve

Dr. Nguyen Van Thanh

3rd Meeting of the World Network of Island and Coastal Biosphere Reserves,
Hiiumaa and Saaremaa Islands, Estonia, 4 - 6 June 2013

The Role of Mangroves in Response to Climate Change in Coastal Zone in Vietnam: A case study of the Cat Ba Archipelago Biosphere Reserve



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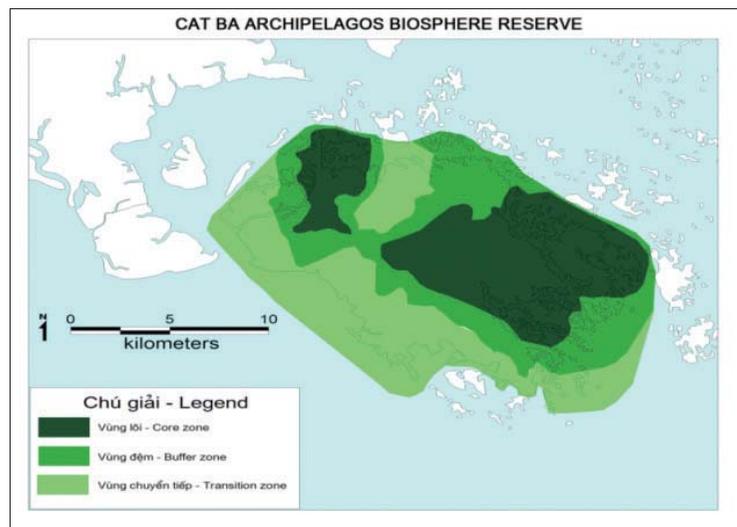
I. Introduction

Cat Ba Archipelago Biosphere Reserve was established by Vietnam Government and recognised within the UNESCO's Man and Biosphere Reserve Program in 2004. It covers 26,241 ha (9,200 ha marine and 17,041 ha terrestrial), comprising 366 limestone karst islands and islets within the Cat Ba Archipelago of Cat Hai District, Haiphong City¹, Vietnam. The Cat Ba Archipelago Biosphere Reserve harbours universally outstanding level of biodiversity with 3,885 fauna and flora species, several endemic species and ecosystems in a very unique rugged karst landscape. The site also possesses typical values of Vietnam's north-eastern coastal culture and tradition. It was established as the World's First Learning Laboratory for Sustainable Development in 2009 and nominated as a UNESCO World Natural Heritage (2013).

Reasons to select Cat Ba Archipelago Biosphere Reserve as a Learning Laboratory for Sustainable Development:

- High bio-diversity; primary forest in core zone.
- One of 16 Marine Protected Areas in Vietnam.

¹ Haiphong City is situated on the north-eastern coast of Vietnam, 102 km from Hanoi and 200 km from Vietnam-China border gate. It is a seaport city, the main gate to the sea for northern provinces, a key transportation hub of the northern region and nationwide. It is also a national First Class metropolitan city of Vietnam, a center for industry, commerce, services, and tourism.



Zoning Map of the Cat Ba Archipelago Biosphere Reserve (MAB Vietnam 2012)

- Sufficient conditions to become a Geo-Park;
- Long-standing culture and civilization.
- The endemic Cat Ba langur – one of the IUCN top 25 most endangered primate species.
- On-going model “quality economy” in buffer zone.
- A range of urban areas and resort along the coastal transition zone.
- A BR Management Board directly led by a Vice Chairman of the province/City to ensure unified and concentrated control and instructions.
- Active participation of stakeholders, especially private sectors (a potential source).
- Socioeconomic development plan of the city complying with sustainable development framework to ensure: natural protection, cultural protection and contribution to living conditions.

2. Local Government and its Coordination Role to Use Biosphere Reserve as a Sustainable Development Model

2.1 Role of the local government

- General management of the biosphere reserve according to Vietnam’s Laws and international legislations and signed commitments. Local Government does the management through the Haiphong City Biosphere Reserve Management Board.
- Control of preparation, appraisal, approval and implementation of important planning projects

- in the biosphere reserve.
- Re-structuring of production and consumption activities.
- Implementing models for restoration & marketing of local special products in the brand name of “Quality Economy”.
- Developing policies to strengthen green development.
- Development of products in Biosphere Reserve to meet requirements of sustainable development.

2.2 Objectives

- Forming connections between research, capacity building and interest groups.
- Increasing knowledge on the role of structures in sustainable development.
- By assistance programs of UNESCO and ICC to contribute to global knowledge and the achievements in the poverty alleviation and bio-diversity conservation.
- Establishing Cat Ba BR as the best site for experimenting Biodiversity Conservation and Poverty Alleviation.
- Awareness education on bio-diversity in conjunction with Convention on Biodiversity (CBD).
- Providing a mechanism to collaborate with other BRs within Vietnam and in the region for knowledge and experience sharing and contribution.
- Determining studies and capacity building activities necessary for a BR to provide

information and support provision: to minimize biodiversity loss (commitment to CBD-2010 Goals); Contribution to poverty alleviation (Vietnam 2003 Poverty Alleviation and Development Strategy and Global Priorities) or sustainable development (Millennium Development Goals).

- Assessing the relationships between the BR and Urban Area; ecological services and economy-based environmental innovation; contributing to the development of these two complicated systems.

2.3 Approaches

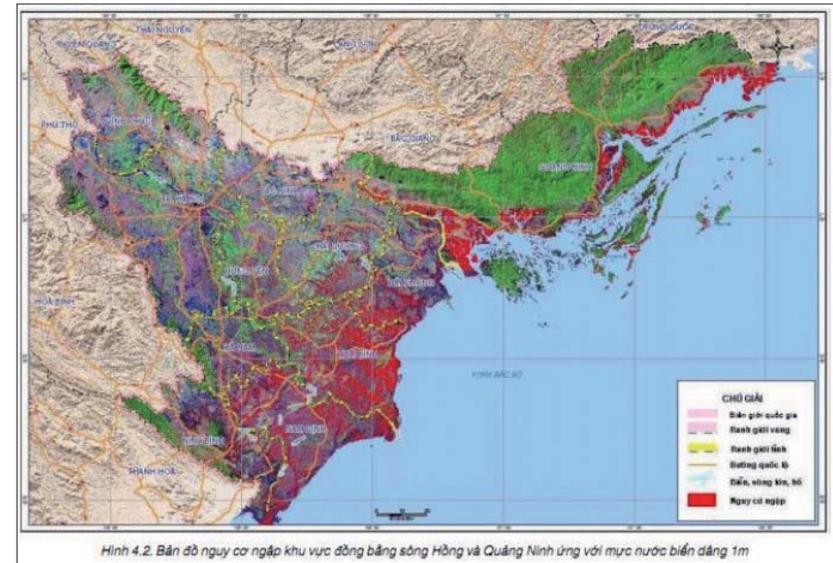
- Developing necessary structures to implement projects; creation of suitable conditions for multi-level dialogues between the government and the local communities.
- Creation of border parameters of the relationship between human being and ecology and identification of an efficient institutional process.
- Receiving ideas from Global Conferences on sustainable development.
- Establishing the biosphere reserve as a tool for sustainable development.

2.4 Products and activities that can be organised in Cat Ba BR:

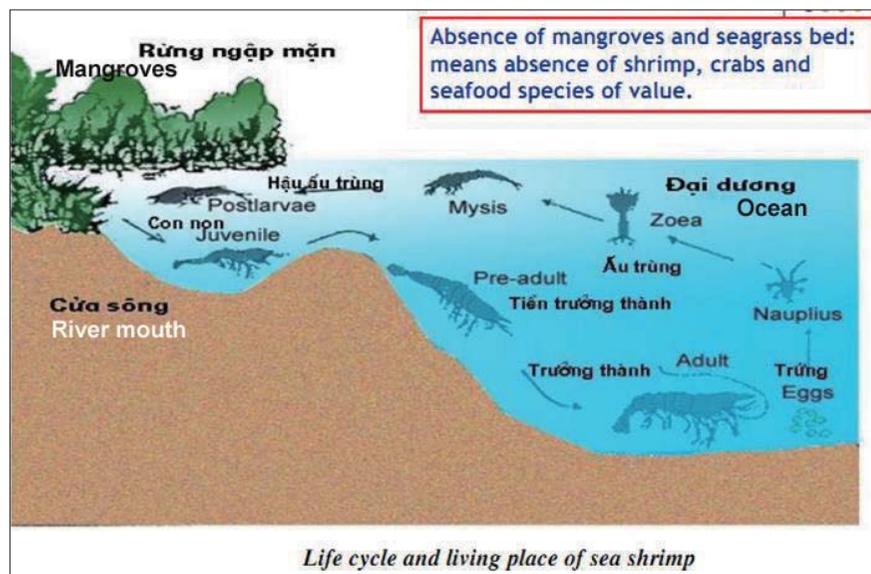
- Tourism and eco-tourism activities in Cat Ba National Park and buffer zones.
- Resort, entertainment, sport and picnic activities in buffer zone; community ecotourism in transition area.
- Scientific tourism activities.
- Caves exploration, mountaineering, kayak.
- Visiting natural beauty, salty swamp and valleys, etc.
- Underwater tourism activities.
- Activities in small and beautiful beaches.
- Services: films of special scenes, typical fauna and flora.

2.5 Challenges

- Weak management capacity in core zone of the Biosphere Reserve.
- Wasted economic foundation.
- Illegal activities.
- Insufficient institutions.
- Knowledge barriers.



Inundation risk map for 1m sea level rise scenario (MONRE 2012)



3. Climate Change and Mangroves

3.1 Climate change in Vietnam and the Cat Ba Archipelago Biosphere Reserve

According to Vietnam's Ministry of Natural Resources and Environment scenarios for climate change and sea level rise (B2), for the period up to the end of the 21st century, the annual mean temperature is projected to increase by 2.0 - 3.2°C, annual rainfall would increase by 2-7%, average sea level along Vietnam coast is projected to rise by 57-73 cm (In the area from Ca Mau to KienGiang, sea level may rise up to 105 cm).

The MONRE research (2012) shows that, with 1 m sea level rise, about 39% of the Mekong River Delta, more than 10% of Red River Delta and QuangNinh province, 2.5% of coastal provinces in central regions, and more than 20% of Ho Chi Minh city areas are at risk of inundation. Almost 35% of Mekong Delta population, 9% of the population of Red River Delta, QuangNinh, 9% of the population of the coastal provinces in Central region, 7% of Ho Chi Minh city population would be directly affected. More than 4% of railway system, more than 9% of national roads and 12% of provincial roads of Vietnam are likely to be affected.

Identified Impacts of CC in Cat Ba Archipelago BR:

- Increased risks of erosion, flooding and damaging fish ponds due to high tide in storms.
- Risk to lose mangrove forests due to rising sea level.
- More forest fires, diseases and weedpests.
- Increasing lack of fresh water for consumption and production, salination of well water.
- Flooding in ports and residential areas.
- Adverse impacts on tourism in rainy seasons, increased depth at beaches.
- Reduced productivity and area of cultivation land.
- Degradation of forest and ecosystems.

3.2 The role of mangroves in response to climate change and sea level rise

- Alluvial accumulation (roots).
- Wave buffering (roots, stems, leaf canopy).
- Current mitigation.
- Fauna protection.
- Life improvement of the poor thanks to mangroves reforestation.

3.3 Governmental Policy Responses

To pursue sustainable conservation and development of mangroves at a nation-wide level, the Vietnam Government has ratified and implemented several mangrove-focused policies, strategies and action plans. In 2007, the Government ratified the project “Reforestation and development of mangrove ecosystems for environmental protection and natural disaster control during 2007-2015”. The announcement No 98/TB-VPCP, dated 8/5/2007, of the Governmental Office on the idea of the Standing Deputy Prime Minister Nguyen Sinh Hung on this project stated:

- Ministry of Agriculture and Rural Development shall quickly generalize the results of the inventory of 3 types of forests; classify and report to the Government on organization, management, protection and development of mangroves, particularly coastal protection mangroves; propose specific mechanisms and policies to speed up rehabilitation and development of mangroves in coastal areas and islands.
- Ministry of Finance shall deal with budget matters so that all ministries will be able to conduct the above work in time.
- In another policy effort, Decree No 109/2003/NĐ-CP, dated 23/9/2003, of the Government “on conservation and development of wetland areas” specifies actions that are banned in mangroves and wetland areas (Article 7). Some of the banned actions include:
 - *Cutting down of mangroves; activities that cause changes to natural integrity of, destroy or damage typical ecosystems, leading to pollution and degradation of the wetlands.*
 - *Exploiting resources or building construction works on young accretions where naturally regenerated mangroves occur.*
 - *Activities adversely affecting benefit and livelihood of local communities living in or adjacent to wetland areas.*



Improved shrimp pond model: mangroves are sustained in Cat Ba Biosphere Reserve

ARCHIPIÉLAGO DE JUAN FERNÁNDEZ BIOSPHERE RESERVE

Mario GALVEZ

3rd Meeting of the World Network of Island and Coastal Biosphere Reserves,
Hiiumaa and Saaremaa Islands, Estonia, 4 - 6 June 2013

ARCHIPIÉLAGO DE JUAN FERNÁNDEZ BIOSPHERE RESERVE



Mario GALVEZ

Focal Point MaB- CHILE

General Background

Locations:

The Archipelago de Juan Fernandez is located at 670 km west of the Port of San Antonio, Chile, in the Pacific Ocean. (33° 37'S, 78° 53'W). Fig.1

It's composed of three main islands, all of volcanic origin: Robinson Crusoe, deeply sculpted by erosion, located 667 km away from the Port of San Antonio, with its geographic center approximately at latitude 33° 37' south and at longitude 78° 53' west; Santa Clara, the smallest, scanty of water and located 1.5 km southwest of Robinson Crusoe Island; and Mariner Alexander Selkirk, the youngest, much more compact and oval, located 187 km west of the island of Robinson Crusoe, with its geographical center approximately at latitude 33° 46' S, and at longitude 80° 47' W. (See Fig. 2)

Population and surface of protected areas:

San Juan Bautista, located in Robinson Crusoe, is the only permanently inhabited town on the archipelago, and is the capital of the commune of Juan Fernandez. According to the latest census carried out in 2002, it has 633 inhabitants. The island Alejandro Selkirk Colony houses around 60 people during the fishing season (October – May). The protected area corresponds to the Archipelago of Juan Fernandez National Park, created in 1935, with 9,570 hectares of surface.

The National Park and Biosphere Reserve of the Archipelago of Juan Fernandez, created in 1977, encompasses virtually the whole archipelago (96%), comprising the three main islands, except the town and the island airfield of Robinson Crusoe.

Fernandez is an activity typically carried out by hands and can be considered among Chile's oldest activities of its kind, dating its beginning in the late nineteenth century. Since then it has been subject to various regulatory measures, which have been modified and updated over time.

Permanent population of the municipality of Juan Fernandez reaches 633 inhabitants, which represents 0.04% of the regional population. It is primarily concentrated in the village of San Juan Bautista on Robinson Crusoe Island. For a fraction of the year there is a temporary population that resides on Mariner Alejandro Selkirk Island, specifically during the season of fishing the Juan Fernandez lobsters (*Jasus frontalis*).

The economy of the municipality of Juan Fernandez is based virtually exclusively on the fishing of the Juan Fernandez lobsters, an activity that accounts for great amount of local labor during the months when lobstering is permitted. Fishing other marine species like the common pandora, yellowtail amberjack, or Juan Fernandez tuna is carried out throughout the year on a smaller, more artisanal level.

The special interest tourism has increased in recent years in the archipelago. However, the tsunami in 2010 brought about a sharp decline in the level of this activity, which is now on the way to recovery.



Pic. 2. Lobster fishermen with traps. Robinson Crusoe Island. (Y. Prieto)

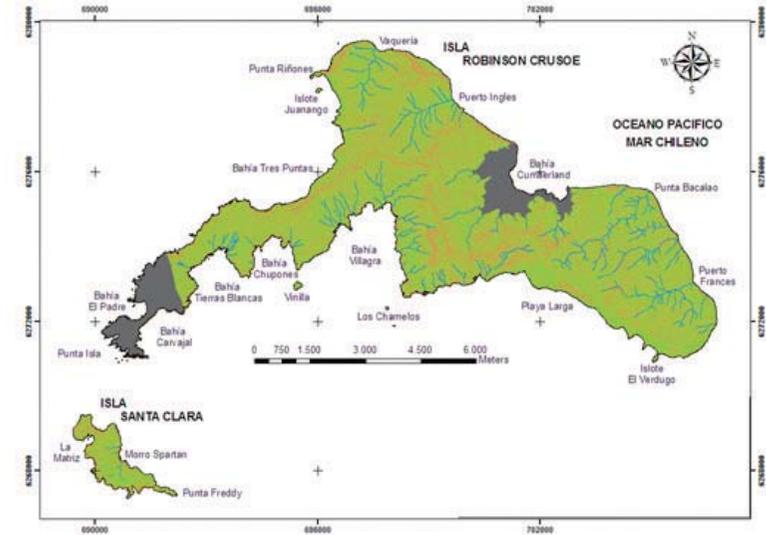


Fig. 3.1 Zoning in the Biosphere Reserve of the Archipelago of Juan Fernandez: Robinson Crusoe Island and Santa Clara Island

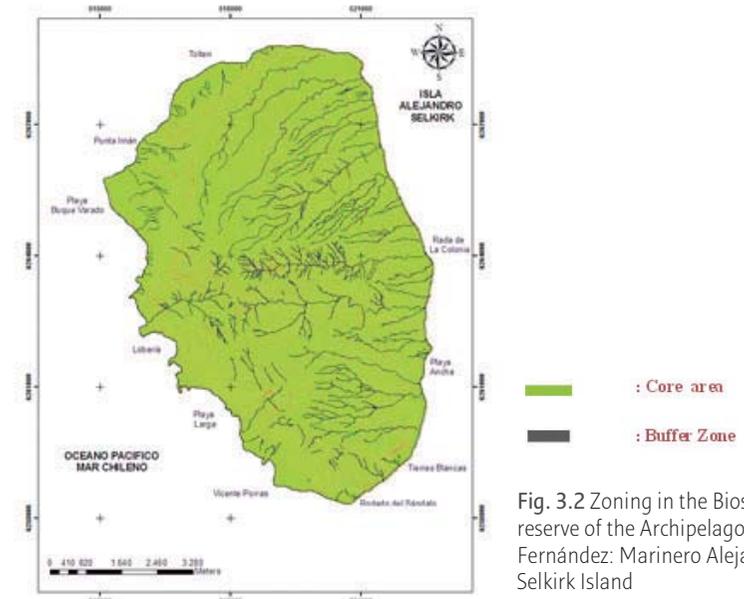
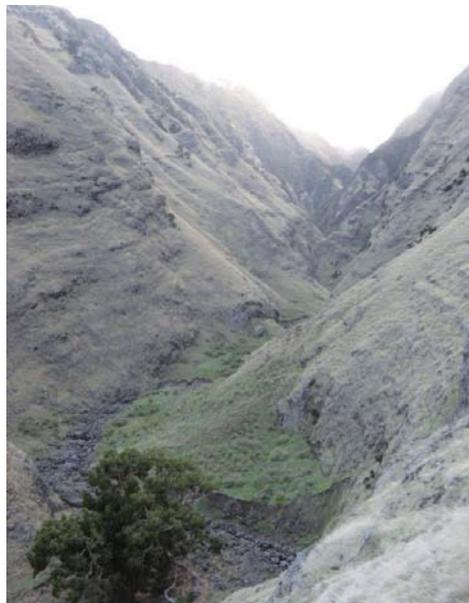


Fig. 3.2 Zoning in the Biosphere reserve of the Archipelago of Juan Fernández: Marinero Alejandro Selkirk Island



Pic. 3. Erosion in the Robinson Crusoe Island



Pic. 4. Erosion in the Marinero Alejandro Selkirk Island

Fragility of ecosystems

Despite the establishment of National Park in 1935, selective cutting of trees were still performed in endemic Robinson Crusoe until the mid-seventies (CONAF 1976) and probably in Alejandro Selkirk as well. Erosion and forest fires substantially reduced tree cover and abundance of endemic species. (CONAF 2009). Currently, it is estimated that around 700 ha. Robinson Crusoe (14%) and about 930 ha. Alexander Selkirk (18%) have suffered extreme erosion, which induces the loss of arable land and even the subsoil (CONAF 2009).

There is a clear difference among the three islands in the level of human intervention, which is evidenced by the presence of eroded areas, invasive plant species and animal species considered pests. Robinson Crusoe Island is where the problem is accentuated with large areas of native forests altered, mainly by maqui, (*Aristotelia chilensis*), murtilla, (*Ugni molinae*) and zarzamora, (*Rubus ulmifolius*).

The presence of animals such as rabbits, goats, cattle, coati and birds like the thrush and dove provokes extensive damage in the ecosystems of the island, which adds up to the historical damage caused by sheep and goats.

Santa Clara Island presents a clear example of how important it is to eradicate pests, because this place has developed a significant natural regeneration since the rabbits were removed in 2005, which is obvious at a

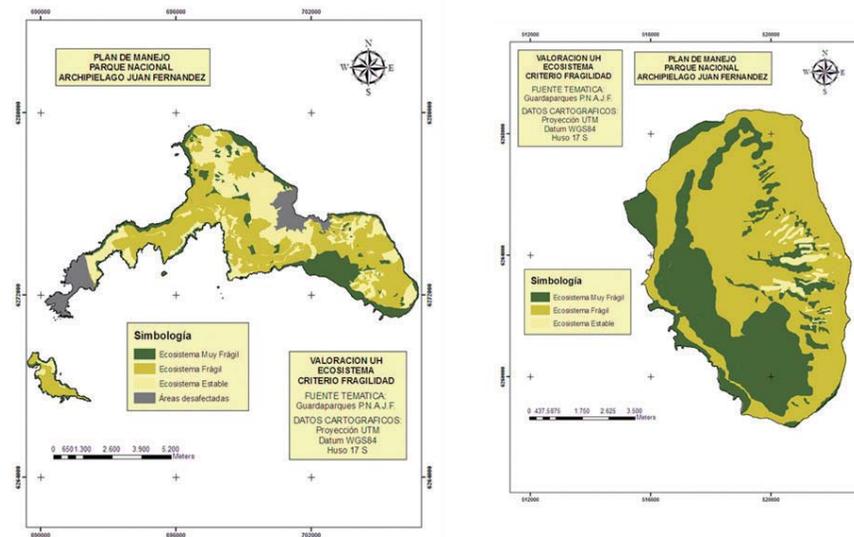


Fig. 4. Fragility of ecosystems in the Robinson Crusoe, Santa Clara and Marinero Alejandro Selkirk Islands

glance. Alejandro Selkirk Island presents ecosystems undisturbed by man, but there are much localized populations of invasive shrubs which have to be quickly controlled to avoid further damage.

Natural Heritage

Flora

The flora of Juan Fernandez Islands is unique in the world; a total of 133 endemic species have been identified (63% of the species), which has brought on its declaration as the island with the greatest density of endemic species (1.31 endemic species/km²) in the world.

The importance of this archipelago does not only stem from its sheer number of species, but the evolutionary processes that have taken place here and still do at present day. For example, these species may have an utterly important role in facilitating the release of angiosperms, and many of them provide basic elements for the understanding of the evolution of certain groups (Stuessy et al., 1998).

From among the species that are vital to understanding evolution, two taxa stand out in the form of living fossils: *Lactoris fernandeziana* (monospecific endemic family) and *Thyrsopteris elegans*, which have experienced virtually no morphological modifications whatsoever over time (Danton, 2004).

A particular nature of the process of speciation of arboreal composites (from the daisy family) is to be highlighted on the Island, with a more arboreal

architecture on Juan Fernandez, while of a far more herbaceous nature on the continent. Two regions of elevated importance in terms of the diversity of flora and fauna exist on the Islands: the Neotropical and the old province of Gondwana, bearing witness to the influence of the historic connection between South America and other Austral lands, such as Australia.

The relatively recent formation of the archipelago (3-4 million years ago), combined with the aforementioned factors, provide this corner of the earth with an extremely high potential as a “living laboratory” to explain, comprehend, and observe evolutionary phenomena and the speciation of plant groups (Danton, 2004).

In accordance with what stated above, Stuessy and Ono (1998) pointed out that these islands are key for understanding the questions regarding evolution, due to their proximity to sources of immigration and their endemic vegetation.

Fauna

The birds of the Juan Fernandez Archipelago are taxa of temperate areas, sub-Antarctic and Neotropical.

This island’s ecosystem is highly valuable as a habitat of endemic birds, with 45% (considering 3 species and 2 subspecies) of all endemic birds of Chile. On Robinson Crusoe Island, the only hummingbird on oceanic islands in the entire world can be found. This is an endemic species and its sexual dimorphism provides an evidence of the particular nature of its isolated evolution.

Just as the Islands have a high level of biodiversity,



Pic. 5. Native plants(Y. Prieto)



Pic. 6. Juan Fernandez Firecrown hummingbird, an endemic species



Pic. 7. *Arctocephalus philippii*, Juan Fernandez fur seal (J. Meza)

they also show a correspondingly high level of endangered species, which unfortunately applies to several species of both flora and fauna. In the case of fauna, 3 of 12 classified species fall in the category Rare and Endangered, 7 Endangered, and 2 Vulnerable. As for flora, out of 75 classified species, 3 have already been declared extinct, 49 fall into the categories classified as Endangered or Rare, 11 Endangered, and 11 Vulnerable.

It must be pointed out that, in the archipelago, there are 14 species of flora that have less than 10 remaining individuals living wild in nature. While the Island indeed represents less than 0.1% of Chilean national territory, an astounding 60% of extinct species were found here, 55% of the species classified as Endangered, and 59% of those classified as Endangered and Rare. This makes the region the most critical in the entire country by a large margin. The primary cause of this elevated level of risk of extinction can be attributed to historic human activities, like tree felling and cattle farming, while at present it is the exotic invasive species of flora and fauna that exert the greatest pressure on the valuable biodiversity of the Islands.

All these factors have made the Juan Fernandez Islands to be recognized by several different international organizations as a crucial area for conservation, with the island's elevated value and a large number of endangered species:

- Durrell Wildlife Conservation Trust catalogued in 2008 the Juan Fernandez Islands as a top global priority eco-region for conservation. This helped increase the validity and preoccupation regarding the constant threat to the biodiversity of species as a

consequence of invasive species or the introduction of new taxonomic groups.

- The Alliance for Zero Extinction (AZE) defined the Islands as a priority location in 2002, given their most urgent need for conservation to prevent the imminent extinction of species.

- Conservation International declared that the islands that make up the Juan Fernandez Archipelago are part of the Critical Conservation Area for Biodiversity "Chilean Winter Rainfall – Valdivian Forest" (ACCCh). The islands are also part of the Critical Conservation Area for Biodiversity in Polynesia – Micronesia.

- In 1998, BirdLife International declared the Islands as a priority-1 (critical) Area for Endemic Birds of the World.

- In 1984, the International Council for Bird Preservation (ICBP) declared the islands as one of the 10 regions of top priority for the investigation of marine birds on a world level.

- The International Union for Conservation of Nature and Natural Resources (IUCN) identified the Juan Fernández Islands as one of the 12 most threatened national parks in the world.

SUCCESSFUL EXPERIENCES

Management of the core area

The conservation of biodiversity in the core area of the Biosphere Reserve falls in the hands of the CONAF. Currently, there is a Management Plan in place that regulates National Park activities and a team of workers made of an Administrator and 9 park rangers.

Given the extremely critical condition of the archipelago's flora and the scarcity of resources, the team has been organized in such a way that each park ranger is directly responsible for a determined number of species of the over 23 endangered species of the reserve. Each park ranger must perform censuses for his or her assigned species and carry out both in situ and ex situ conservation activities.

This structure has brought positive results, especially in the case of the *Dendroseris gigantea*, which had but one specimen until two years ago.

As of today, 5 more specimens have been reintroduced, after great reproductive efforts were carried out ex situ. For ex situ reproduction, CONAF makes use of a nursery in the village of San Juan Bautista.

OIKONOS project for conservation of the Juan Fernandez Islands

This was developed by OIKONOS Ecosystem Knowledge, with the mission of protecting the ecosystem on a long term basis in regards to functionality and vitality of the Juan Fernandez Islands, through a combination of basic and applied researches in conservation and environmental education, and in active collaboration with local residents. The primary concerns of this project were the work and participation of the local community regarding the exploration and knowledge of the Islands' natural resources. Thanks to a large part of donations from other organizations, research projects have been developed, like that on the hummingbird of Juan Fernandez (control of invasive species and predators, monitoring of the population and the

awareness program for the general populace), the pink-footed shearwater (biology, behavior, feeding, migration, competition, and predation), and the Masafuera rayadito, a member of the ovenbird family (population census, habitat patterns, occupation of artificial nesting sites).

Hummingbird of Juan Fernandez project

This project is managed by the Union of Ornithologists of Chile (Aves Chile). As part of the project's activities, field trips have been made to the archipelago starting in the year 2001 to gather census information, to make field observations during the reproductive season, and to identify any threats to this species especially made by the introduction of exotic species.

It was determined that the domestic cat is one of the principal threats as predatory agents, and a campaign was initiated for feline sterilization.

It was later realized that the invasive species *rubus* and *maqui*, or Chilean wineberry, represent a threat to the nesting habits of the Juan Fernández hummingbird, because their presence in the potential nesting sites limits their nesting behavior.

In 2003, with the support of American Bird Conservancy Grants and RSPB Small Grants, and with the support of the CONAF, priority areas received protection and a census of nests. These activities are still being carried out. Scientific studies were also developed regarding habitat and ecological requirements for the nesting of this species.

In 2005, a census protocol was defined and activities of mechanical control of the exotic invasive species were performed. The most aggressive intervention



took place in the year 2006, at the most important nesting site at the Plazoleta del Yunque, achieving the eradication of the invasive species of flora using both mechanical and chemical measures.

Currently, Aves Chile is part of the Commission created for the National Strategy of Conservation of the Juan Fernandez hummingbird.

Ecology and conservation of the Juan Fernandez fur seal

This project was developed by the Blue Whale Center as a method to enrich the limited knowledge on the Juan Fernandez fur seal. The goals of this project included the evaluation of the current state of conservation of this species around the Juan Fernandez Islands and the study on their biology to develop a conservation and environmental education program.

The Juan Fernandez fur seal is considered the flagship species for the future implementation of a program for sustainable tourism that would include the protection of the species and its ecosystem. The principal arguments would include the susceptibility of the species to anthropogenic pressure, which have brought this species very near extinction.

Between the years 2003 and 2005, the research team of this center carried out censuses of the population around the Islands, with a particular focus on around Alejandro Selkirk Island, where important data were collected on the behavior and the dynamic nature of fur seal population.

Additionally, the growth of the pups was measured and the diet of the mature animals was studied through the analysis of their feces (Blue Whale

Center, 2009). These censuses are currently updated by CONAF.

Strengthening National Frameworks for Governance of Invasive Exotic Species: Pilot Project in the Archipelago of Juan Fernandez

The project “Strengthening National Frameworks for Governance of Invasive Species: pilot project in Juan Fernandez Archipelago,” aims, on the one hand, to control the threat of invasive species to species of native plants and animals endemic to the archipelago, considered one of the most important in the world for its high level of endemism, and on the other, to prevent the entry of new invasive species to the islands.

The project will be implemented with the input from the GEF (Global Environmental Fund) of the United Nations Agency for Development UNDP and with funds provided by the Ministries of Environment, Agriculture (through SAG and CONAF), Foreign Affairs, the Municipality Juan Fernandez Island Conservation NGOs and Oikonos.

The initiative, led by the Ministry of Environment, aims to create policy, legal and financial, to create a biosafety system on the Juan Fernandez archipelago, and it can be replicated in other parts of Chile, especially in islands with high biodiversity value.

Ecologic Monitoring of Gulf of California Islands Biosphere Reserves and marine protected areas around

Carlos Ramón Godínez Reyes

3rd Meeting of the World Network of Island and Coastal Biosphere Reserves,
Hiiumaa and Saaremaa Islands, Estonia, 4 - 6 June 2013

Ecologic Monitoring of Gulf of California Islands Biosphere Reserves and marine protected areas around



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In anticipation of the environmental dangers resulting from tourism, pollution, and unregulated economic exploitation, on August 2nd 1978, the Mexican government declared all the islands in the Gulf of California, Reserve Zone and Refuge for Migratory Birds and Wildlife. In 2000, the categories in the Environmental Mexican Law (Ley General del Equilibrio Ecológico y Protección al Ambiente) changed, and the official name of the Reserve was also changed to Flora and Fauna Protection Area Gulf of California Islands (Área de Protección de Flora y Fauna Islas del Golfo de California). The Management Plan for the reserve was completed and published on April 17th 2001.

The Gulf of California represents an extensive and unique area where biologists attempt to explain the distribution of animals and plants in terms of

climatic and ecological actual conditions. The Gulf of California and surrounding areas (mainland, peninsula and gulf islands) also represent a unique area where biogeographers may test the relationship between the land areas of islands and the diversity of life they support. Nevertheless, to test hypotheses concerning origin, migration, evolution and extinction of organisms, it is important to know the geologic evolution of a given area (Carreño y Belenes, 2002).

Although many scientists of island biogeography consider the Midriff islands of the Gulf of California one of the world's last major refuges of pristine desert-island biota, humans have been part of that ecosystem for possibly 10,000 years or more. Humans have long affected the terrestrial and inshore marine biota, but the most serious injuries they have caused apparently



Figure 1. Gulf of California Islands Biosphere Reserve, and other marine and coastal Protected Areas of the Gulf of California form a Serial World Heritage Site in the Heritage List of UNESCO

began in the mid-to-late nineteenth century with the start of guano mining on Patos, Rasa and San Pedro Mártir islands. Since then, most of the major human impacts affecting the Midriff are related to rapid population growth in the northwestern Mexico, and increasing demands on the midriff's fishery and tourist resources (Bahre and Bourillon, 2002).

Mexico has 41 Biosphere Reserves under the MaB Program of UNESCO. Three Mexican biosphere reserves were among the first in the world to become part of the MAB network of biosphere reserves. One of these reserves was in the Chihuahuan desert, in the arid north of the country. This simple fact created consciousness among decision-makers in the Federal Government that protected areas could be established in different types of ecosystems, for conservation, restoration and sustainable use of resources. Additionally, the international success of the Mexican Biosphere Reserves caught the attention of the environmental authorities, who realized that large natural areas could be better protected under the new scheme as it does not preclude resource use but rather pursues an adequate utilization, based on scientific information and with community involvement.

Eight of the Mexican Biosphere Reserves under MaB Program are in the Mexican Pacific Region. Five of them are in the Gulf of California, including Gulf of California Islands. They form an internal network of insular, marine and coastal protected areas in this Mexican interior sea. These Biosphere Reserves are: Alto Golfo de California

(includes El Pinacate) (1995); El Vizcaino (1993); Islas del Golfo de California (1995); Islas Marietas (2008); Islas Marias (2010).

All the Islands and Protected Areas of the Gulf of California were inscribed in the World Heritage List of UNESCO. The natural property comprises 244 islands, islets and coastal areas located in the Gulf of California in north-eastern Mexico. The property ranks higher than other marine and insular World Heritage sites as it represents a unique example of a geography which holds in a very short distance both 'bridge islands' (covered by land during the time of sea level decline caused by the glaciation) and 'oceanic islands' (covered with sea water). Moreover, almost all major oceanographic processes are present, and are of extraordinary importance for the study on the marine and coastal processes. These processes are indeed supporting the high marine productivity and biodiversity richness that characterize the Gulf of California. The diversity and abundance of marine lives resulting in spectacular submarine landscape and high water transparency makes this place a diver's paradise.

In CONANP, conservation is governed by the principle of adopting the best available knowledge in decision-making. The generation, transfer and application of knowledge in the field of conservation is a prerequisite for consistent policies and actions. To pursue the effective policies for conservation, it is particularly important to integrate biological and ecological

knowledge that has traditionally been the subject of the environmental science with the economic and social knowledge.

This knowledge has been promoted by the demand that a society has to solve their most pressing problems. The role of institutions mandated to manage protected areas, such as CONANP, is not to conduct a research but to encourage its performance and, in some cases, fund it when the results are crucial for decision making. One of such research activities is monitoring the sentinel species, for the detection of early changes in the ecosystems of the Gulf of California.

Due to the importance of the biodiversity richness of the Gulf of California, some of their resources have been systematically monitored. A main human activity that uses marine resources from this sea is fishery. And above all fisheries, sardine fishery is the most important in Mexico, because it accounts for half the catches of all marine resources landed in all the Mexican marine

waters every year.

With a study on the impact of El Niño anomalies in the Gulf of California, Velarde et al (2013) have shown that seabird breeding success was severely reduced by warm-phase oceanographic anomalies when the increased thermocline depth prevented seabirds from reaching their prey. Lastly, after an abrupt fall in sardine landings in the Gulf of California in 1990, the total sardine catch lost the positive relationship it had exhibited with the fishing effort and has followed a widely fluctuating pattern with increasing amplitudes (Fig. 2). Among other potential theories about fishery management, Velarde et al, tested whether these fluctuations could be better understood and forecasted by using seabird diet composition as a simple monitoring variable (Velarde et al. 2013).

In general, small pelagic fish catching shows wide fluctuations, generally attributed to oceanographic anomalies. Most data on these fisheries come from

landings, often reporting sustained catches-per-unit-effort (CPUEs) until a decline occurs. Data obtained from other indicators, independent from data of the fishery itself, are important in practicing management tools. Velarde et al. (2013) found that the proportions of Pacific Sardine and Northern Anchovy in the diet of three seabird species (California Brown Pelicans *Pelecanus occidentalis californicus*, Heermann's Gulls *Larus heermanni*, and Elegant Terns *Thalasseus elegans*) nesting in spring in the Gulf of California show significant relationship with CPUEs during the following season in gulls and terns, or during the same season in pelicans. As sardine availability for seabirds declines, CPUEs remain high until the fishery falls one or two seasons later. A declining proportion of sardines in the seabirds' diet, combined with the status of the Pacific warm-phase anomaly (El Niño), gives a reliable forecast of diminishing CPUEs and signals the need to reduce fishing efforts in the ensuing season (Velarde, et al. 2013).

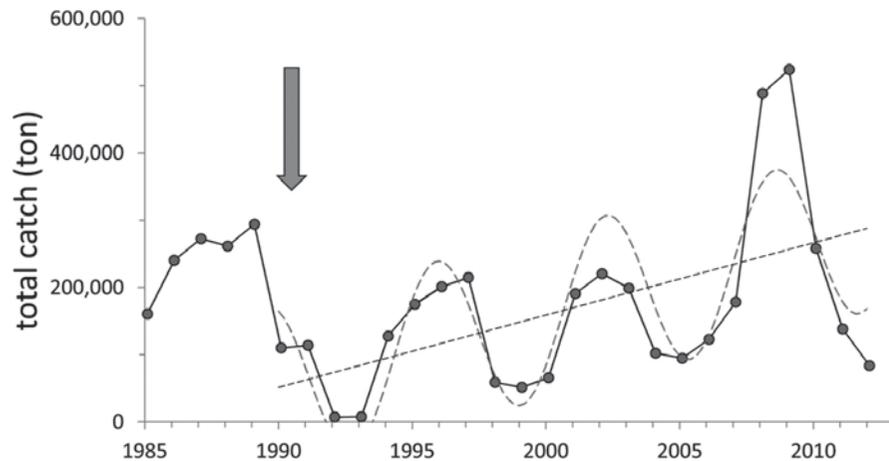


Figure 2. Total sardine landings in the Gulf of California between 1970 and 2011. The arrow shows the first steep fall in fishery landings in 1990. After that point, the fishery has followed a quasi-cyclic pattern with a 6-year period. The dotted lines between 1990 and 2011 show the general time-series linear trend (partial $r^2 = 0.29$; $P = 0.003$) and the fitted periodic oscillation (partial $r^2 = 0.47$; $P < 0.001$).

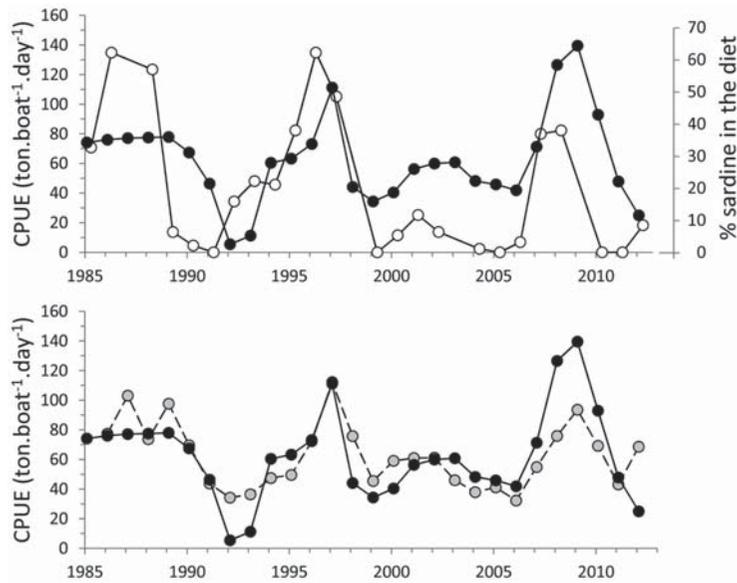


Figure 3. (top) Proportion of Pacific Sardine in the Elegant Terns' diet between 1985 and 2011 (white data-points) and fleet CPUEs (ton.boat⁻¹/day⁻¹) for the same period (black data points). Note the clear one-season lag between both data sets. (bottom) Fleet CPUEs between 1985 and 2011 (black points) and values predicted (gray points) by the Southern Oscillation Index and the proportion of Pacific Sardine in the terns' diet in the previous season ($r^2=0.51$).

The capacity of the fleet to maintain high catches as sardine availability declines for other ecosystem components may be at the root of the fluctuations observed in the Gulf of California fishery. Wide fluctuations in landings, similar to what has been observed in this sardine fishery in the last decades, have been reported in other fisheries. It has been shown that fishing per se amplifies fluctuations in landings and theoretical models suggest these fluctuations are largely due to fishery-induced changes in the fishes' age structure, which become amplified by non-linear processes in the population dynamics. In conclusion, sardine catchability is much higher for the fleet than it is for seabirds (and possibly for other ecosystem components) (Velarde et al. 2013).

The increased sensitivity of the seabird diets to CPUE suggests that the seabirds are more diversified in their prey base and able to switch to other prey species when sardine availability starts to decline. Observed reductions in the proportion of sardines in seabirds' diets in the Gulf of California Midriff before the beginning of the fishing season may provide a useful way of monitoring the fishery and forecasting the success of the fishing fleet (Velarde et al. 2013).

Other species at the top of the food web in the Gulf of California, and easier to monitor than sharks and other marine mammal is the California Sea Lion. The California sea lion (*Zalophus californianus*), as well as California Brown

Pelicans, Heermann's Gulls, and Elegant Terns, can be found every year during the breeding season in the same 13th rookeries on the islands of the Gulf of California. As well as California Brown Pelicans, Heermann's Gulls, and Elegant Terns, we have a time series data on California sea lion for the last 4 decades.

The main population of California sea lion (*Zalophus californianus*) in the Gulf of California is in the Midriff Islands region, around Granito and Angel de la Guarda Islands, through San Esteban Island (6 of the 13 rookeries in the whole Gulf of California), where around 8,000 pups are reproduced that represents 82% of the annual production in the whole Gulf of California (Aurioles-Gamboa and Zavala, 1994). This region is the place of the highest concentration of school fishes (Cisneros-Mata et al., 1995).

Censuses of the California sea lion colonies since 1978 have revealed the changes in the total abundance of colonies and pup production. After reaching its peak at the end of 1980s, the repup production began to fall in the 1990s, and then stopped and stabilized in some places at the end of that decade (the rookeries of El Partido, El Rasito and San Esteban), but still continue falling in other places (rookeries at Granito Island, and Los Cantiles and Los Machos at Angel de la Guarda Island) (Fig. 4).

The colonies of California sea lion diminished

significantly in a relatively small area, around Angel de la Guarda Island through San Esteban Island, in the central northern region of the Gulf of California.

Two points can be highlighted about the numeric reduction of some rookeries in the Gulf of California; 1) the abundance variation of California Sea lions in this area has no clear relation with El Niño events (Aurioles y Le Boeuf, 1991) and 2) the colonies concentrate in a specific area, which hints at local causes, probably associated with prey availability. Several studies on the diet of California sea lion suggest that Pacific sardine (*Sardinops sagax*) is an important prey in some colonies, constituting 63% of their diet (Orta, 1988; García y Aurioles, 2004; Porras-Peters et al., 2003).

The importance of the sardine in the diet of California sea lion in the Midriff Islands region has been

confirmed by some studies (Porras-Peters et al., 2008). Pacific sardine has been considered a keystone species in the so-called “center of biologic activity” in the Midriff Islands Region (David Aurioles, not published).

Now it is important to analyze this long term studies of monitoring on several sentinel or keystone species for the ecosystem in order to make better management decisions on the conservation of the regional ecosystems, improving at the same time the life quality of the communities that depend on the natural resources inhabiting there, which is one of the main mission of CONANP in these Natural Protected Areas in the Gulf of California.

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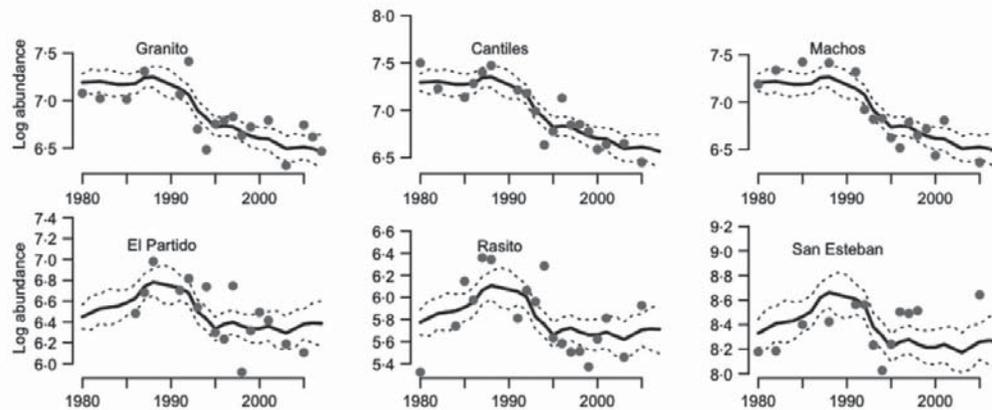


Figure 4. California sea lion colonies in the central part of the Gulf of California that reached their maximum number at the end of 1990 decade, and declined afterwards (from Ward et al., 2009).

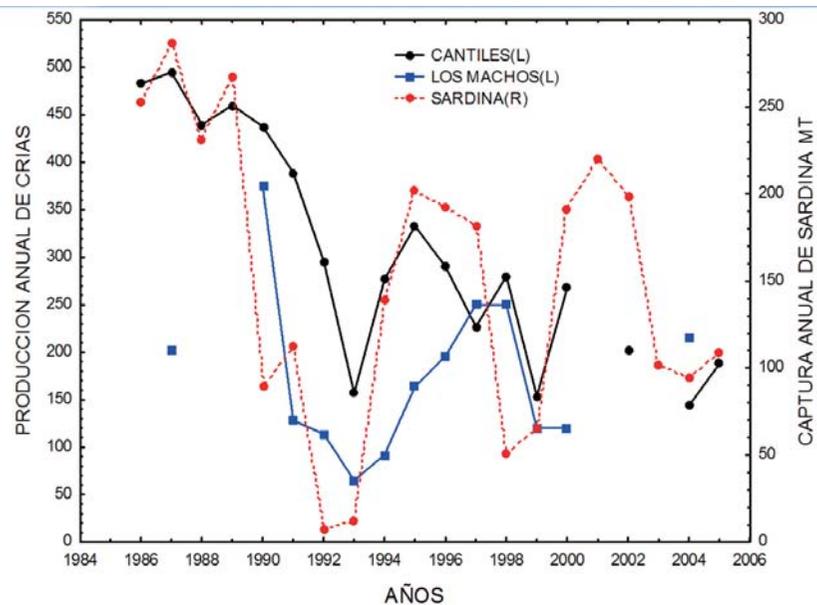


Figure 5. Relationship between annual landing of Pacific sardine and the pup production in the Midriff Islands Region (Auriolos, not published data)

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ST.KITTS AND NEVIS ST.MARY'S BIOSPHERE RESERVE

Antonio Maynard

3rd Meeting of the World Network of Island and Coastal Biosphere Reserves,
Hiiumaa and Saaremaa Islands, Estonia, 4 - 6 June 2013

ST.KITTS AND NEVIS ST.MARY'S BIOSPHERE RESERVE



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FACTS AND PROGRESS

The St. Mary's Biosphere Reserve (SMBR) is the first Biosphere Reserve in the English Speaking Caribbean.

The certificate declaring St. Mary's as a Biosphere Reserve was handed over to the Federation at the 36th Session of the UNESCO General Conference, in early November 2011. The St. Kitts - Nevis Man and the Biosphere National Committee was launched 5 months later on April 23rd, 2012.

The SMBR is approximately 4,297.125 hectares in size is located about 4 miles from the Capital of Basseterre.

The SMBR has a ridge to reef topography that encompass the communities of Canada, Keys and Cayon.

The SMBR is home to areas of interest such as: Historic Sugar Plantation Estate Ruins; Cayon Village Historic District; Maroon Settlements; Spooners Level & Cotton Ginnery; Bayford's Historic Dairy Farm; Jack in the Box Mountain Passage; Cayon River Historic French/English Division, Keys "leatherback turtle nesting" beach and a Central Forest Reserve that is home to many endemic birds.

SMBR



ST. KITTS AND NEVIS



Core Area

This is an area that is devoted to long term protection and conservation of the biodiversity within the SMBR.

There is a marine core zone (212.37 ha) and a terrestrial core zone (192.16 ha).

The marine core area encompasses the nesting habitat of both leather back (endangered species) and hawksbill turtles (critically endangered species). It is home to coastal avifauna, two reef systems located north and south of the Cayon River and promote activities such as fishing conch diving and sea grapes and sea moss harvesting.

The terrestrial core zone is located in the Central Forest Reserve National Park (CFRNP) which is the first national park to be designated in the Federation of St. Kitts and Nevis. This zone is home to many endemic bird species, plant species, and areas of high historic and heritage value.

Buffer Zone

This is an area where activities that are compatible with the protection and conservation efforts of the core area take place.

There is a marine buffer zone (199.48 ha) and a terrestrial buffer zone (723.57 ha).

The marine buffer zone is the area from the setbacks of the island main road to the Coast. This area includes the Keys's Bat Cave and the Great Heeds Pond.

The terrestrial buffer zone encompasses historic sites, various streams and ghauts (Cayon River, Wash Ghaut and Ottleys Ghaut) and the ridgeline of the Canada Hills above the villages of Canada, Keys and Cayon.

Transition Area

This is an area where sustainable resource management practices are promoted and developed.

There is a marine transition area (1927.01 ha) and a terrestrial transition area (785.68 ha).

This area is not a defined area of land but instead an amorphous landscape that shifts with the challenges and opportunities in the biosphere reserve. This area includes the Villages, Heritage Sites and a major University.





National MAB Committee

After our site was inscribed on the list of biosphere reserves, one of the first tasks was to establish an Official UNESCO Man and the Biosphere National Committee, and management system in order to help coordinate and manage the activities on the particular site. Hence the St. Kitts and Nevis National MAB Committee was launched, and a plan of action developed on May 11, 2012.



Inter-Ministerial Conference

An Inter-Ministerial, and expert Conference on the UNESCO Man and the Biosphere programme was held in St. Kitts & Nevis, on 27 March 2013.



St.Kitts and Nevis declaration, and action plan

The Ministers and other Heads of Delegation of the Caribbean Small Island States present at the Inter-Ministerial Conference in St. Kitts & Nevis, on 27 March 2013, agreed upon a final Declaration, and action plan that would see Biosphere Reserves in the Caribbean Small Island States be to utilized as Tools for sustainable development and growth.



Buffer Zone



Transition Area



THE ATLANTIC FOREST BIOSPHERE RESERVE AND THE CONSERVATION OF MARINE ECOSYSTEMS IN ABROLHOS-TINDADE REGION- BRAZIL

Clayton Ferreira Lino
Maria Heloisa Dias e João L. Albuquerque

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When the Portuguese arrived in Brazil more than 500 years ago, the Mata Atlantica - the Brazilian Atlantic Forest - was a great rainforest occupying 1,300,000 km², or 15% of the current territory of Brazil, especially in the coastal zone.

The historical process of colonization and modernization of Brazil reduced the Mata Atlantica to only 7.5% of its original area, roughly corresponding to 80,000 km², but its remnants are still of great beauty and importance, being one of the five “Biodiversity Hotspots” among the 25 existent on the planet, according to Conservation International.

The Mata Atlantica area concentrates most of the Brazilian population, urban areas, industries, tourist centers, petrochemical complexes, ports, road systems, and

about 3,220 (three thousand, two hundred and twenty) municipalities.

Most of the Mata Atlantica was recognized by UNESCO/MAB from 1991 to 2009 as the Mata Atlantica Biosphere Reserve (RBMA in Portuguese). The RBMA covers 17 Brazilian states and has about 780,000 km², of which 162,000 km² - more than 20% of the area - belongs to the marine zone, as illustrated in figure 2.

Along the Brazilian coast adjacent to the Mata Atlantica there are more than 400 islands, all included in RBMA. They greatly vary in size, ranging from very large to very small, and are at different distances from the continent. Most of them are uninhabited and some shelter large and important Brazilian cities, such as Santos for example, where is situated the largest and most important port in Brazil.

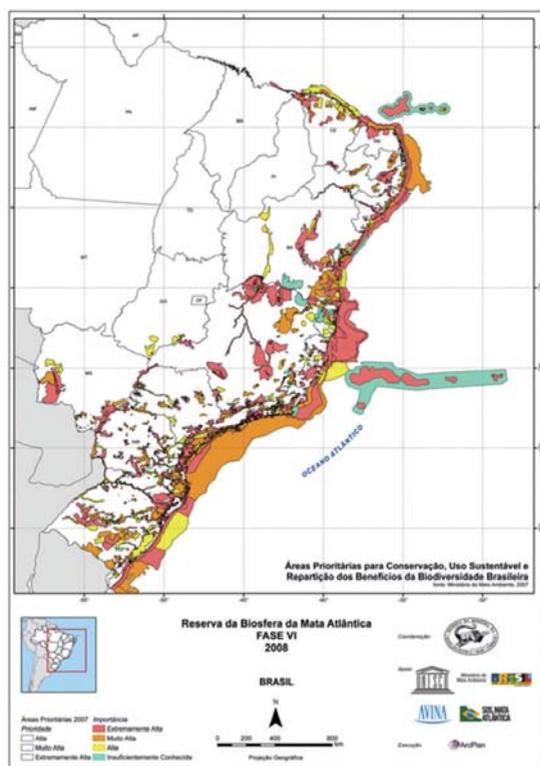


Figure 1

With the intention of preserving and supporting the sustainable use of the coastal and marine regions, the RBMA created in 2010 the Sea Collegiate, composed of government representatives and non-governmental organizations, whose main function is to collaborate in managing the Mata Atlantica Biosphere Reserve, focusing on coastal and marine issues.

The Sea Collegiate of the RBMA is responsible for formulating the Coastal and Marine Program for the Reserve, and it has Strategic Lines of Action such as: Biodiversity and Protected Areas; Mobilization /

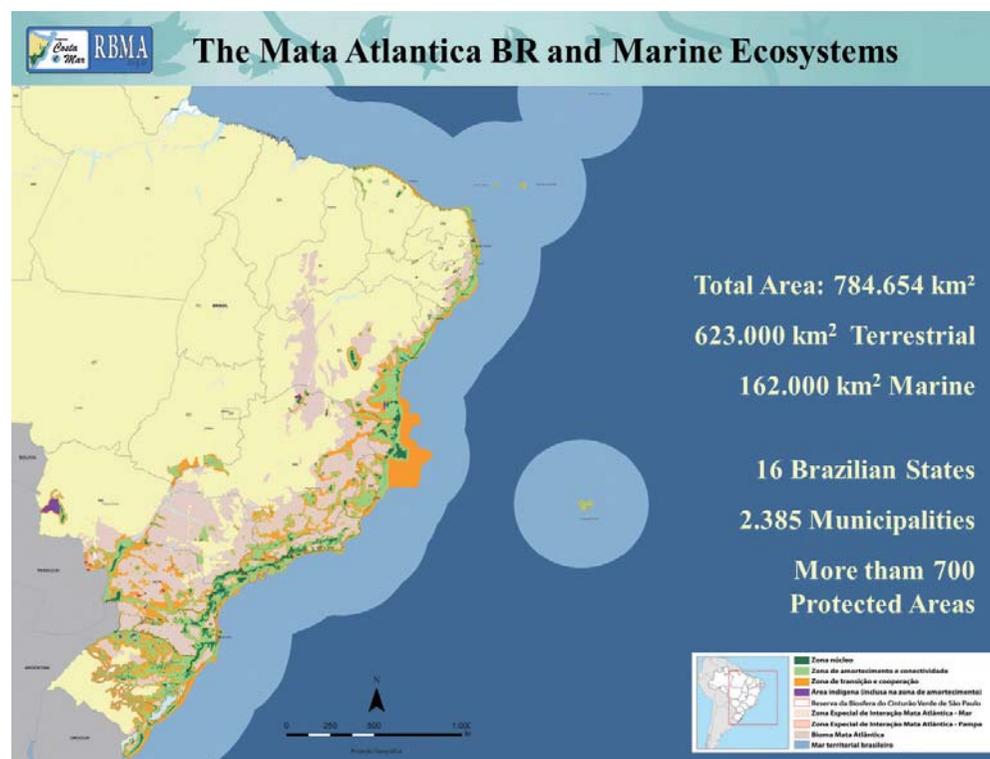


Figure 2

Communication and Participation; Pressure Vectors in Coastal and Marine Areas; Public Policy; Traditional Communities and Sustainable Use of Natural Resources and Territories.

Among the priorities of its Strategic Plan 2008 - 2013, the RBMA is focusing on the implementation of a program which proposes the creation of marine and coastal protected areas and institutional linkage to promote the conservation and sustainable use of the Abrolhos - Trindade Region, in the states of Bahia and Espírito Santo.

In this context, the Mata Atlantica Biosphere Reserve has been working in the region covered by the Abrolhos Bank and the Vitoria –Trindade Chain (Figure 2), that is a chain of underwater mountains and volcanoes that come very close to the surface, and form banks here and there.

This region is defined as an area of high priority in the Coastal and Marine Program, in terms of the development and implementation of strategies, conservation instruments and sustainable use which can be applied in this region. Among them, we highlight the support for the expansion of the Protected Areas System and the constitution of a Mosaic of Protected Areas; support for field research, survey and systematization of information and holding events for dissemination of scientific and traditional knowledge about this important region.

This region is considered of high priority in terms of conservation, sustainable use and benefit sharing of biodiversity by the Brazilian Ministry of Environment (PROBIO / MMA), and it was recently approved by the request of the Brazilian Government as a an Ecologically or Biologically Significant Marine Area (abbreviation EBSA) (CBD 2009) (Figure 4) and as a “National Strategic Territory”, focal areas of the GEF SEA Program approved in 2012 (Figure 5).

The synergistic effect of the presence of high diversity of coastal and oceanic environments, together with the geomorphological and oceanographic factors, provides the occurrence of a high biodiversity in the region of the Abrolhos Bank and Vitoria-Trindade Chain. Some prominent attributes of the region in the aspect of biodiversity are: 1) the presence of the largest and most diverse ecosystem of coral reefs in the South Atlantic, 2) the largest breeding site for humpback whales in the South Atlantic,

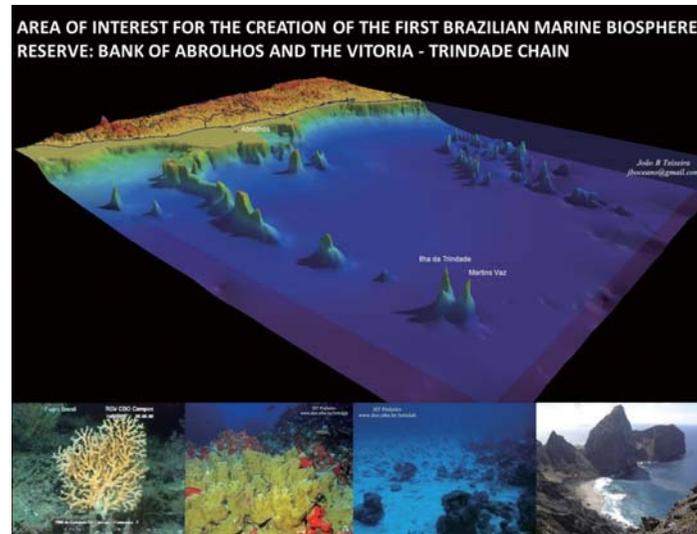


Figure 3. Tridimensional image of the Abrolhos Bank and Vitoria –Trindade Chain.

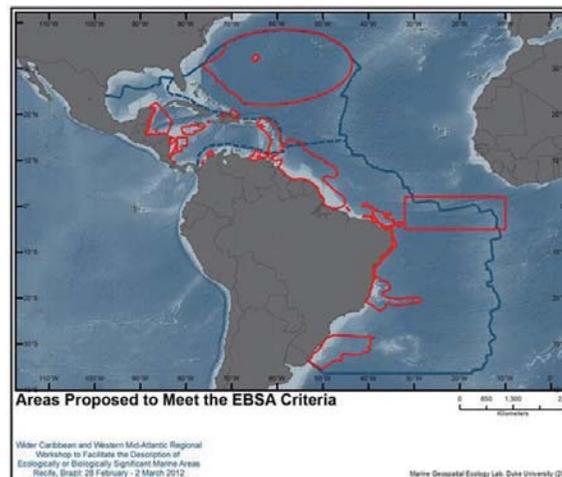


Figure 4. Ecologically or Biologically Significant Marine Area (EBSA) – CDB.

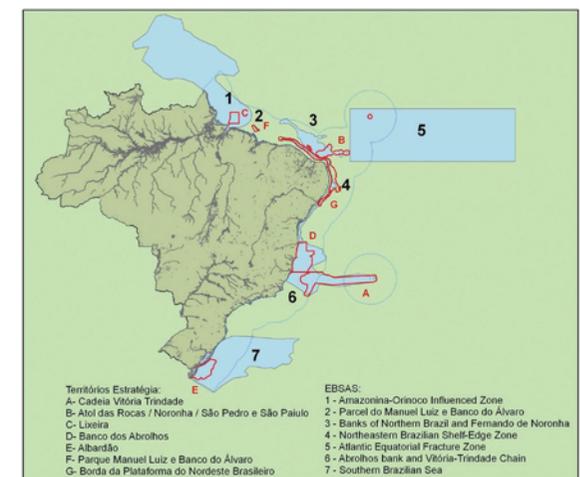


Figure 5. Ecologically or Biologically Significant Marine Area (EBSA) – CDB in Brazil South Atlantic and Strategic National Territories (GEF- Mar).

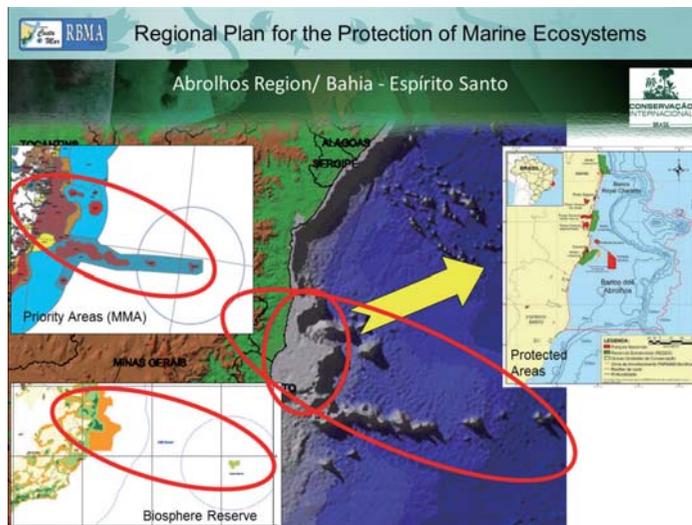


Figure 6



Figure 7



Figure 8

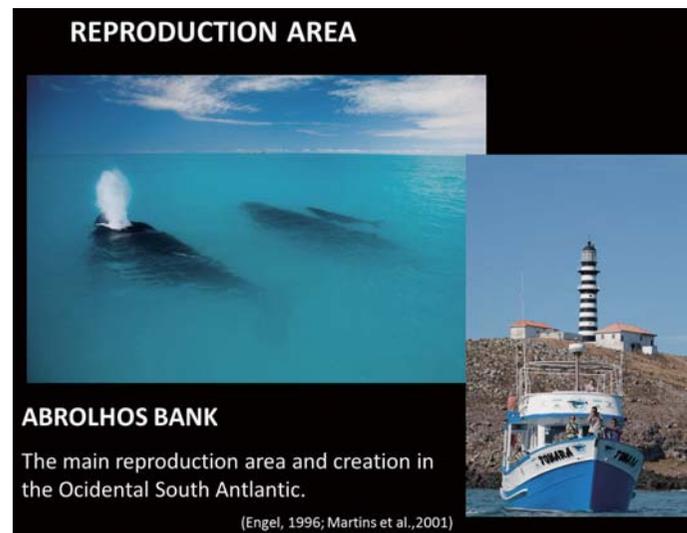


Figure 9

3) greater diversity and endemism of reef fishes of the South Atlantic and 4) singular importance for different species of turtles and seabirds, among others.

On the other hand, the operation of port facilities and the processing of oil and gas are causing significant environmental and socio-economic impacts such as: the removal and transformation of natural and socio-economic change in the structure of coastal sites, with intense negative effects on those traditional communities and dependent conservation and sustainability of natural environments. These great transformation vectors require a constant monitoring on plans, programs and projects for the implementation of public and private enterprises to influence the adoption of constructive practices and environmental regulations that safeguard populations and marine and coastal ecosystems.

In addition to these threats, it also can be emphasized that the coral reefs, despite its vast marine biodiversity (Sale et al., 1994), are fragile habitats and vulnerable to many sorts of dangers such as overfishing, sedimentation and climate changes effects.

In this context, and considering the economic and environmental importance of conserving biodiversity and specificity

of local environments that form the Abrolhos Bank and Vitoria-Trindade Chain, this area deserves, in our view, an international recognition as the first Brazilian Marine Biosphere Reserve.

The region of Abrolhos Bank – Vitoria-Trindade Chain whose recognition is being proposed as a Marine Biosphere Reserve provides a huge amount of ecosystem services, and contributes greatly to supporting a high biodiversity and many associated economic activities. It is also highlighted by researchers for their regulatory climate services and for the fact that it shelters a great number of species used for human consumption, generating resources for about 3,000 fishermen.

The ecosystems of the region are also a good nursery for traditional tourism activities and leisure. Fishing is a traditional activity in many communities, mainly involving many craft activities. Leisure activities in the area include scuba diving, snorkeling, angling, kayaking, surfing and whale watching, among others. The coastal and oceanic islands have extreme scenic beauty, being regarded as must-sees for appreciation and inspiration. Moreover, the diversity of environments and organisms provides enormous material for scientific research and education, which should be shared with the Brazilian and global society.

Conservation efforts in the region of Abrolhos Bank and Vitoria-Trindade Chain are also assumed by about 50 Conservation Units of municipal, state and federal governments, such as the Abrolhos Marine National Park and the Extractive Reserve of Corumbau that compose the core, buffer and transition zones of the proposal Biosphere Reserve.

The Abrolhos - Trindade Marine Biosphere Reserve will add significantly to conservation, management and governance of this vast region, which has exploration activities and complex natural systems extremely important in relation to the biodiversity capacity support. The Reserve should strengthen the governance process of this territory and may also be a great tool to be used by the Brazilian Government to achieve the Millennium Development Goals (MDGs) and to fulfill the commitments made by Brazil as a signatory of the Convention on Biological Diversity and Climate Change.



Figure 10

Archipelago Sea Area Biosphere Reserve, Finland

Katja Bonnevier

3rd Meeting of the World Network of Island and Coastal Biosphere Reserves,
Hiiumaa and Saaremaa Islands, Estonia, 4 - 6 June 2013

Archipelago Sea Area Biosphere Reserve, Finland



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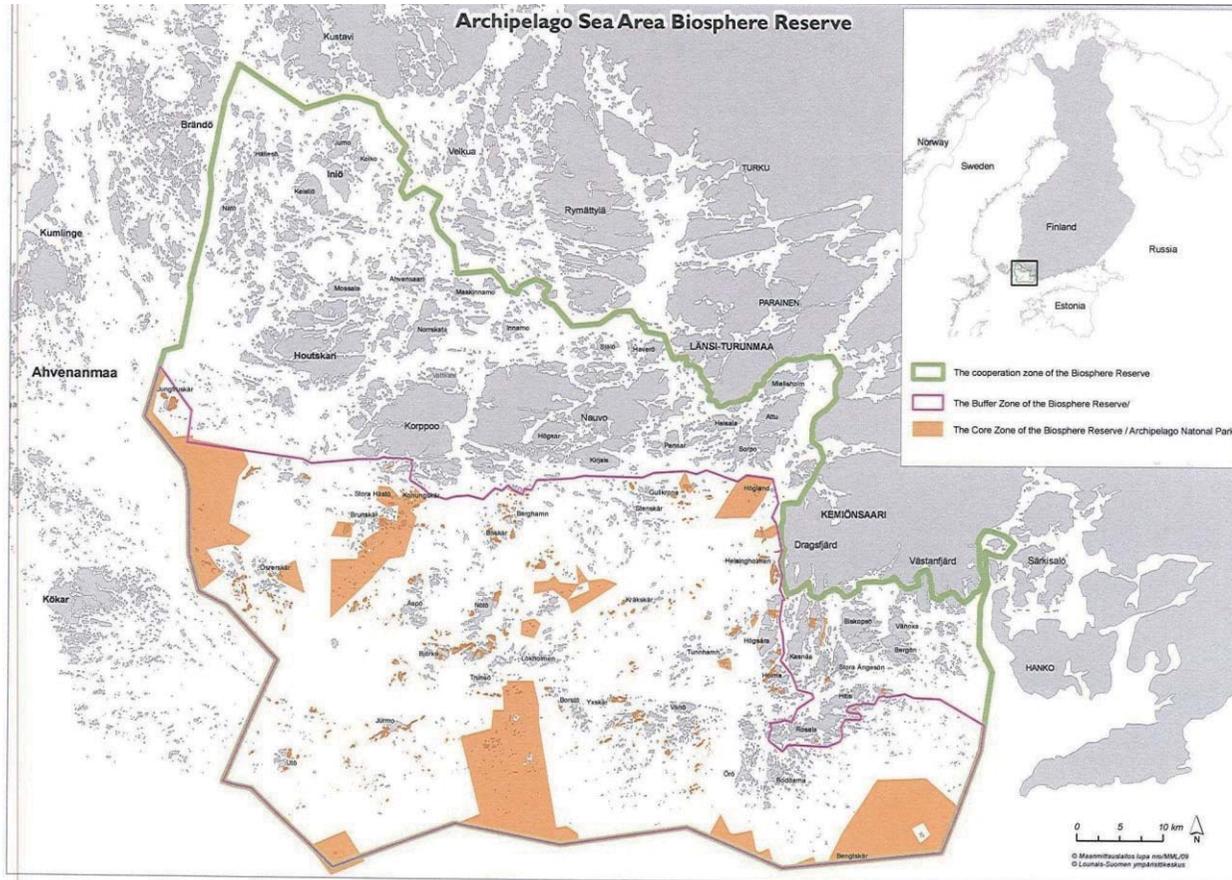


The means of communication is essential for living in the archipelago.
Harbour at Nötö island. Photo: Katja Bonnevier.

The Archipelago Sea Area Biosphere Reserve is located in the archipelago of south-west Finland in the Baltic Sea in Northern Europe. On a global scale it is an unusually island-rich archipelago with about 41,000 islands, islets and skerries. The site consists of the Archipelago National Park and the surrounding archipelago. The total area of the reserve is 5,400 km², of which 85% is water. About 3,600 people are living in the area, and the majority of them are Swedish speaking. The Biosphere Reserve strives to attain a balanced relationship between economic and ecological goals by promoting sustainable development and the conservation of natural and cultural values. The work is executed by local partners and the activities are managed by a coordinator.

The nature is very distinctive as it is shaped by the ice during the ice age and the severe maritime climate. It mainly consists of bare rocky islets, and islands covered with windswept pine and deciduous forests. However, in some areas the vegetation is lush, with a high diversity of species.

Human activity has also contributed to the shaping of the environment and has created valuable traditional cultural landscapes, such as coastal meadows, pastures and heaths. These areas are crucial for many species of plants, birds, butterflies and other insects that need open habitats to survive. Cultural landscapes need constant maintenance which means that restoring of former grazing grounds is an important part of the Biosphere Reserves activities.



The outer border of the Archipelago Sea Area Biosphere Reserve is marked with a green line and the buffer zone with a red line. The core area, consisting of the National Park, is marked with brown color.

The Biosphere Reserve hosts many different nature types ranging from rocky skerries and dry meadows to lush meadows, deciduous forests and pine forests. The marine nature in the Archipelago Sea Area includes, for instance, blue mussel *Mytilus edulis* bedson rocky bottom sand meadows of common eel grass *Zostera marina*. There are many nesting sea birds in the area, such as the common eider *Somateria mollissima*. During spring and autumn many migrating birds rest here.

The Archipelago Sea Biosphere Reserve was founded in 1994. It has no legal status and thus does not restrict human activity in the area. One reason for the establishment of the reserve was the need to manage the semi-natural meadows that were threatened by over-growth due to the decreased amount of cattle grazing. Human impact and cattle grazing had kept the landscape open for centuries. Today's daily life in the archipelago is easy compared to the life 100 years ago. The human population in the area is nevertheless decreasing. To counteract the depopulation and to promote sustainable development of the local society, are key issues for the Biosphere Reserve. As a matter of fact, both the Nature and the Culture are spontaneously changing over time, but it is a chagrin to see that valuable elements are lost partly because of the relatively fast changes in the human population.

The Biosphere Reserve Office is run by three partners, the Center for Economic Development, Transport and the Environment in Southwest Finland,



Celebrating midsummer in Wattkast village in Korpo.



Konungsskär in the outer archipelago. Formerly permanently inhabited and nowadays a popular nature and culture attraction in the National park. Photo: Katja Bonnevier.

the Town of Pargas and the Municipality of Kimitoön. The office is small, with only one full-time coordinator, and it is funded by the state. At the moment the office has two EU-funded project leaders, employed by different partners, working on special issues in the Biosphere Reserve. When needed, the personnel resources are strengthened by expertise help from the main partners of the Biosphere Reserve. The Biosphere Reserve functions as a cooperation program and doesn't have a legal body for administrating projects. Its activities are always funded by external resources or by the partners.

The Biosphere Reserve has a Steering Group with members representing the University of Åbo Akademi and Turku University, municipalities, the National Park Management and the regional environmental authorities. Once a year, the Biosphere Reserve organizes a forum for a larger public, to reach out to people with interest and connection to the Biosphere Reserve.

The deteriorating condition of the Baltic Sea and the ongoing depopulation are two major challenges that the archipelago faces today. The Biosphere Reserve strives to meet the needs of the area through its activities. The activities are focused on development projects, on raising



Students from Vietnam and Finland doing group work in 2012 on the intensive course in Cat Ba. Photo: Katja Bonnevier



Sheep grazing in the outer archipelago. Photo: Mikael von Numers.

environmental awareness and on coordinating the cooperation between researchers, authorities and the local inhabitants. The work of the biosphere reserve is focused on five main subjects: Cultural landscapes, Water conservation, Nature tourism, Housing and livelihood and Quality Economy and branding.

Recently the Archipelago Sea Area Biosphere Reserve has collaborated on a fruitful educational program for Sustainable Tourism with another island biosphere reserve, the Cat Ba Biosphere Reserve in Vietnam. In addition, the Turku University of Applied Sciences in Finland, together with the Haiphong University in Vietnam, has arranged student and teacher exchange and an intensive course on Sustainable Tourism for a mixed group of students from both countries and from different disciplines at the Cat Ba Biosphere Reserve.

Since the management of Nature and Cultural landscapes has been one of the most important issues for the Archipelago Sea Area Biosphere Reserve, quite a lot of the projects have been related to the overgrowth of meadows due to the reduced number of grazing animals. There have been several projects to build up a structure for the management of semi-natural pastures in the archipelago, including supporting elements like planning, education for entrepreneurs, inducing cooperation between landowners and cattle breeders, and supporting the small-scale sheep industry.

All the activities are designed to meet the needs for both the Nature preservation and the development of a viable society. One of the ongoing EU-funded projects, called KNOWSHEEP, is conducted together with the Western Estonian Archipelago, which is also a Biosphere Reserve. This project is about developing a knowledge-based sheep industry on the Baltic Sea

islands. The KNOWSHEEP project is increasing the knowledge and interest of sheep industry that adds value to the local economy by creating jobs in processing, marketing and tourism, and promotes the preservation of biotopes and biodiversity. Together with the sheep entrepreneurs and people interested in sheep handicraft or food production, the project has arranged occasions for sharing knowledge, produced handbooks based on both new and traditional knowledge and inspired the stakeholders to develop a small-scale sheep industry together.

The Archipelago Sea Biosphere Reserve has played a central role in developing the Archipelago Fund for Åboland, which is mainly focused on living and livelihood issues on the small islands in the outer Archipelago. There is a strong cooperation between the Archipelago Fund and the Biosphere Reserve. They have together developed a “living model” for a socially, ecologically and economically sustainable development of the sparsely populated outer archipelago, by buying and reconstructing an old, socially and culturally important property in the island of Brännskär and renting it out to a young entrepreneur for living and running his business there all year around.

The activities of the Archipelago Sea Area Biosphere Reserve can be observed in the social media or at homepage:

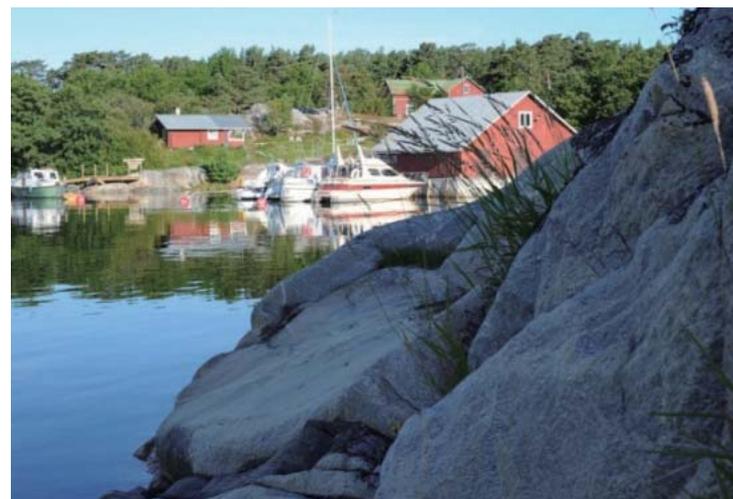
Facebook: Archipelago Sea

Twitter: ArchipelagoBios

www.archipelagoseabioepherereserve.fi



KNOWSHEEP course about skin preparation and products.
Photo: Sonja Tobiasson



Brännskär during tourism season.

The Santana / Madeira Biosphere Reserve

Fábio Costa Pereira

3rd Meeting of the World Network of Island and Coastal Biosphere Reserves,
Hiiumaa and Saaremaa Islands, Estonia, 4 - 6 June 2013

The Santana / Madeira Biosphere Reserve



Fábio Costa Pereira

Member of the Management Committee
Financial Director of the municipal company Terra Cidade
(An entity responsible for the management of the
Biosphere reserve)

To be able to share and absorb the experiences achieved in the 3rd Meeting of the World Network of Islands and Coastal Biosphere Reserves, which took place in Estonia and was superbly organized by its National Committee, reinforced the importance of global debate over a common strategy of development of the territories.

A member of the network since its establishment, the Santana-Madeira Reserve owes much to the experiences exchanged among the members of this network –strategies and know-hows were learned and practiced to the benefit applied of the territory. To the same extent, Santana-Madeira Biosphere Reserve intends to make contributions and become a model case to the world, by sharing the developed as well as future projects with Network members.

In this context, since June 2011, the strategic direction of the territory has heavily focused on the following aspects:

Implement and disseminate strategies to preserve biodiversity and heritage:

Educational and Culture projects

• Education:



Between 2011 and 2013 financial years, an extensive cooperation program was developed covering all the schools in the territory on the themes proposed by the UNESCO

National Commission, planning to raise biodiversity awareness of the local population.



Fig. 1. Socially supported recovery of thatched houses.



All schools in the municipality of Santana belong to the network of schools of the Biosphere Reserve, which endows the territorial communities with a sense of shared responsibility. Every year, it developed work programs to raise awareness on the issues of conservation and preservation of the territories, as well as on the associated science.

• Culture:

Being an area under a strong rural predominance, the Santana Madeira Biosphere Reserve has taken upon itself the safeguarding of one of the greatest cultural heritages of the autonomous region of Madeira: thatched Houses.

Once a widespread way of use of an agricultural by-product (wheat), the thatched houses now rely on a social support program that helps the holders of this heritage to maintain traditional trait and identity. The raw material is provided by the Management Commission of the Biosphere Reserve.

Mitigate the effects of climate changes:

Environmental Projects

Environment:

Besides the daily work of raising awareness of individual local residents, three projects are being developed that will certainly contribute to

mitigating the effects of climate change.



The provision of a manual of good environmental practices in households, with a number of recommendations on energy efficiency, recycling and proper use of natural resources, will allow all citizens to be aware of and to contribute to a better ecological footprint.



The cooperation between the BR and the University of Madeira (UMa) in developing integrated technological solutions, as a means

to promote energy efficiency in buildings, public spaces, transport services, among others, will be complementary to the project aforementioned. It also aims at promoting and/or strengthening such activities as observing stars, which is expected to offer a new promising niche market. (<http://santanamadeirabiosfera.com/pt/2012-04-08-23-20-15/observacao-de-estrelas>)



After the emphasis on the roles of families and public spaces and

services, the Sustainable Development System (SDS) is already in practice aiming to mitigate the effects of climate change, now with the involvement of the main activity sectors and local economic agents (restaurants, hotels, transport services, the primary sector, etc.).

Promote sustainable development

Primary Sector:

In Santana, the recent development in the primary economic sector leads to a rather even income distribution. Agriculture is dominated by small-scale operations and low technical skills. A project called "Madeira Agricultural" was developed which provides local producers with relevant techniques and helps them sell their products to large distribution warehouses, to the farmers' benefit.

Imports of agricultural products in the autonomous region of Madeira takes up about 60% of the local consumption, therefore the development of local production would contribute significantly to the reduction in food waste and the ecological footprint caused by transport.

Tourism

With the catchwords "natural heritage" combined with the titles of World Heritage Site (Laurissilva forest), Biosphere Reserve (MaB) and Natura 2000 (Mountainous Massif of Rocha do Navio marine reserve), the municipality of Santana attracts thousands of tourists every year. The most prevalent

activity is hiking along the "Levada Walks", which offer hikers about 120 km² of conversing with nature.

In pursuit of sustainable development, the Management Committee of the Biosphere Reserve is promoting new business opportunities related to local skills and Nature. In this way, one of the measures is under way to recover more footpaths (Biosphere Walks), boosting the attractiveness of the territory, creating new businesses, increasing value added the local economic agents could enjoy, and combating the depopulation problem in the territory.

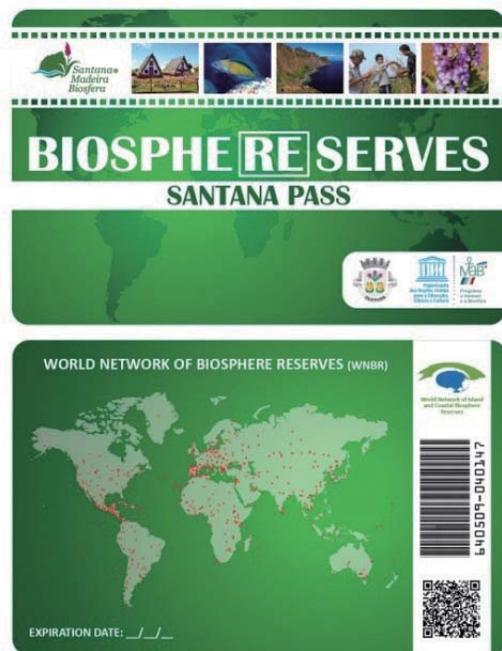
Biosphere Reserve Pass-Model of shared responsibility

The Biosphere Reserve Pass is a project presented at the 3rd Meeting of the World Network of Islands and Coastal Biosphere Reserves (Estonia), and derives from a project that will have been developed by the end of 2013 at Santana Biosphere Reserve.

This project aims to disseminate the concept of sustainability of the territories, to make local communities and its visitors share the responsibility, to induce commitment from key actors, and to actively contribute to the development of concepts to be assumed by the Biosphere Reserves.

A main feature of this model is shared responsibility because it is an instrument supported by a network of partners that have their services and products available to users to their won advantages. Part of the income earned by the Biosphere Reserve Pass





will be donated to projects in line with the purpose of the biosphere reserve (green economies, the preservation of ecosystems, combating climate change, etc).

In this way, the network of partners or users would, in a harmonious way, contribute to the upgrading of the territory, fostering the sense of ownership over the projects so that everyone can claim that he has contributed to the development of the territory.

To promote a model for sustainable development of a territory and to contribute on a global scale to the creation of new projects to be shared by Reserves are two of the main objectives of this project of shared responsibility.

The Santana Biosphere Pass

The Santana Biosphere Pass is another tool that will be implemented in the management of the territory of Santana and will promote products and services certified by the Sustainable Development Authority. It will also guide all who make use of the territory to develop their activities, helping them to do it consciously and in a sustained manner.

The Santana Biosphere Pass will be prepared in order to be recognized internationally and could, in our view, be a pilot project helping the concept to evolve and that in the near future can be a valid instrument to the World Network of Islands and Coastal Biosphere Reserves, by being shared not only by the members of the management team of each Biosphere Reserve, but also by all the stakeholders in each member country that will be an integral part of the network.

Santana Biosphere Reserve Pass has the possibility of being shared by all the Biosphere reserves and thus giving greater benefit to all the stakeholders.

Communication and Territory Promotion;

The dissemination of the concepts inherent to a Biosphere Reserve allows a certain territory to;

- Grow into a more enlightened society familiar with sustainability principles;
- Develop concepts of sharing and enriching the territories;
- Promote green economies and build the capacity to combat the depopulation problem in the territories;
- Promote local products and services;

In www.santanamadeirabiosfera.com, we hope you can find some information which you can use for the promotion of a territory and its local agents as well as all network members, partners and projects.

Photos



Pico Ruivo: Highest point of Madeira Autonomous Region with 1851 m above sea level, located in the municipality of Santana



Star Observation: Achada Grande
<http://santanamadeirabiosfera.com/en/2012-04-08-23-20-16/star-observation>



Caldeirão Verde
<http://santanamadeirabiosfera.com/en/2012-04-08-23-20-16/hiking>



Nature Reserve Rocha do Navio: Rede Natura 2000
<http://santanamadeirabiosfera.com/en/2012-04-08-23-20-16/rocha-do-navio-nature-reserve>

Using Phylogenetic Diversity as a baseline indicator to propose conservation priorities for the flora in the Biosphere Reserve of Gran Canaria

Juli Caujapé-Castells,
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Introduction

The phylogenetic diversity (PD from now on) estimates for the endemic flora of the Biosphere Reserve of Gran Canaria (BRGC henceforth) have furnished reliable, reproducible quantitative indicators of the amount of “genetic evolutionary diversity” contained within each of the 754 quadrats of 1 km² that this territory contains (Caujapé-Castells 2013, Jaén-Molina et al., in prep.). Unlike similar approaches in other enclaves (e.g. Wales, de Vere et al. 2012; or the Cape Flora in South Africa, Forest et al. 2007), these estimates refer to an insular hotspot with an extremely high concentration of floristic, ecological and geographical diversity despite its small size (ca. 205 endemic Canarian taxa are known in the BRGC), which sets forth challenging territorial and taxonomic questions. Consequently, many implications of these results are expected to contribute to a better conservation and management of biodiversity in this complex part of the island of Gran Canaria. Needless to say, although the considerations in this contribution will refer only to genetic data associated with the endemic flora, the BRGC is also a space for human development through the sustainable use of natural resources, entailing that the implications of our genetic results should be integrated in the multiple social, political, economic, or land-use dimensions without which the BRGC would not fulfill its missions.

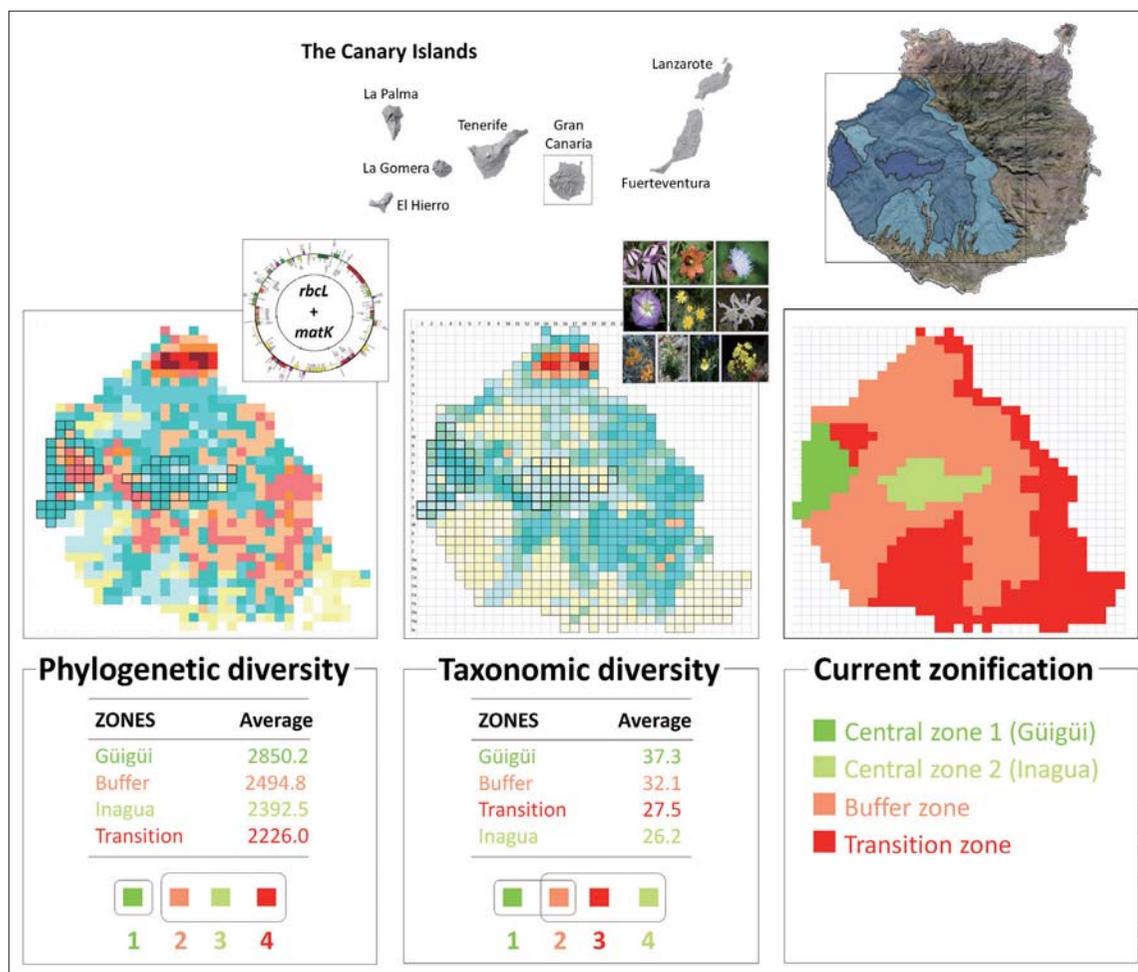


Figure 1. Geographic situation of Gran Canaria within the Canarian oceanic archipelago, and current limits of the Biosphere Reserve of Gran Canaria island. The two core areas (designated “core area 1” and “core area 2”) have been coloured in different tonalities of green because they were considered independently in our tests. The grid of squares shown is the territorial compartmentation used to assign TD and PD (with the sequences of the *matk* and *rbcl* regions combined) estimates to each km² of this territory. As shown by this figure and discussed in the text, one of the current nuclear zones (Güigüi, coloured in bright green) is the area with highest PD and TD in the current Reserve’s zonification, but not the area which contains the squares with the highest PD, which concentrate in the northern part of the Reserve. In the representation of PD and TD, dark red squares indicate the quadrats with higher PD and TD values, and light yellow squares the quadrats with lower values of these parameters. Support for the groupings of zones in both PD and TD was significant with $P < 0.001$, and it corresponds to non-parametric Kruskal-Wallis tests. These groupings were also supported by parametric tests (ANOVA). For clarity, the quadrats corresponding to either core area have been framed in black on the representations of PD and TD.

Territorial conservation implications

Considering the obtained PD values in the context of the current administrative zonification of the BRGC (Figure 1), it turns out that many quadrats in the buffer zone or in the transition zone (with much less frequency) have much higher PD than any of the quadrats within the two core areas of the BRGC. Although one of these core areas (Güigüi’s Special Natural Reserve) is indeed the area with the highest average PD, the other core area (Inagua’s Integral Natural Reserve) does not stand out in terms of either PD or taxonomic diversity. Both core areas possess however other extremely important “natural values” not necessarily related to the flora, which motivated their consideration as core areas. For instance, Inagua is the most important and best preserved dry pine forest on Gran Canaria, it is geographically strategic for the subterranean hydric reloading of the island, it constitutes the preferential habitat of the Canarian blue finch (*Fringilla teydea polatzeki*) in Gran Canaria, and it hosts the exclusive distribution areas of some island plant endemics (e. g. *Helianthemum inaguae* [Cistaceae]).

Given that the molecular and distributional data obtained by our project were not available when the current zonification of the BRGC was proposed and approved, they may help complement the criteria employed in the past to this purpose, thereby facilitating the straightforward implementation of the natural value represented by the “feature genetic diversity” of the BRGC’s endemic flora. Hence, the PD estimates strongly suggest that part of the current transition zone at the north of the Reserve, encompassing a large area of Tamadaba’s pine forest and the Andén Verde, could form another core area. Furthermore, the considerations based on the PD values may bring about the extension of the Reserve to include other areas bordering its

current boundaries which feature sufficient natural values in terms of vegetation richness, or other. Nevertheless, these proposals need be discussed in the Reserve's Scientific Committee, and their eventual implementation should take into account other diverse elements (e. g. private ownership of some territories, current and projected land uses) and steering committees important for its governance.

Taxonomic conservation implications

The Cabildo de Gran Canaria is a public administration with competences in the management of biodiversity on the Canarian oceanic hotspot, and has to seek and glean sufficiently objective data to establish taxonomic priorities for conservation and management. Although biodiversity managers in many oceanic islands apply IUCN categories to that purpose, the exclusive application of these criteria may be questionable, and their use is being increasingly criticized especially on insular enclaves (see e. g. Trusty et al 2011 in Cocos island).

Due to the lack of long-term monitoring for most taxa and other caveats, in many cases IUCN categories could be more related to the current population sizes and known distribution areas of the taxa at issue, rather than to their future survival chances (which is what really matters). Most remarkably, the hypothesis that many species holding the "CR" category may not be as threatened as those in other IUCN categories is gaining ground, thanks to recent multi-disciplinary reviews of large data sets. For just one instance, Pérez de Paz and Caujapé-Castells (2013) show that populations of several Canarian endemic angiosperms in the IUCN "CR" category often have higher levels of neutral genetic diversity, and less reproductive problems, than more widespread taxa.

In combination with phylogenetic data for the lineages to which the species in a given territory belong, our PD estimates can help infer the relative antiquity of the taxa in the BRGC within their respective lineages. In the afore-mentioned context, these data may be of utmost importance for helping define biodiversity conservation priorities. Indeed, the older a given species is, the less efficient (if at all) its adaptation to the rapid current global changes may be; thus, older species should perhaps deserve a higher conservation priority, quite independently of their IUCN category. This is not to say that newer species do not deserve conservation efforts. Of course they are important and need be preserved for different reasons (i.e., they may give rise to other endemics in the future, or they may be important for ecosystem services). As underscored earlier, a reliable chronological gauge may help rank the different endemics, and thus contribute to a better decision making.

Our classification of the plant taxa endemic to Gran Canaria that occur within the BRGC in terms of their relative antiquity (Caujapé-Castells et al., in prep.) shows that, save for six species for which the available information does not permit a certain conclusion, only 10 of the older species are critically endangered (CR) according to the IUCN criteria, whereas seven are endangered (EN), seven are vulnerable (VU), and 13 are at lower risk (LR). Neo-endemics in our classification include six CR taxa, two EN, five VU, and 15 LR.

Of course, such "chronological" classification should be considered preliminary, as the phylogenetic information for many of the taxa assessed is not based on a thorough sampling of their Canarian congeners (in some cases, there is no phylogenetic information at all, and our inferences only rely on the sequences obtained for the PD project). However, these first data show that, if the palaeo-endemics deserve higher conservation priority than the neo-endemics, then we should devote more resources to the conservation

of moderately widespread taxa (i.e., most of those in the EN and VU categories) than we have done until now. Importantly, unlike many taxa in the CR category, some EN, VU or LR taxa still have genetic resources that can be used for their effective conservation through genetic diversity data and other appropriate multi-disciplinary methodologies. In this respect, reliable genetic diversity indicators for the selected lineages are of utmost importance if reinforcements or reintroductions are to be carried out (Figure 2).

Disseminating science-based biodiversity management to society

Apart from applying research results to an efficient management of biodiversity, scientists also have a tacit obligation to explain to society the implications of their activities in a non-specialized language. Only in this way will society have

the chance to gain a thorough perception of why and how research is important for preserving, managing and using biodiversity sustainably. In line with this necessity, our project also created an information platform to disseminate research results and conservation actions (Greentank, <http://www.greentank.es>), together with the discussions in the different steering committees of the BRGC, or other important actions undertaken in insular enclaves that share conservation problems with Gran Canaria. As emphasized in an earlier paper (Caujapé-Castells 2013), Greentank is open to contributions and news from members of the Global Network of Insular and Coastal Biosphere Reserves.

Future prospects

The objective of generating reliable genetic indicators to contribute to the

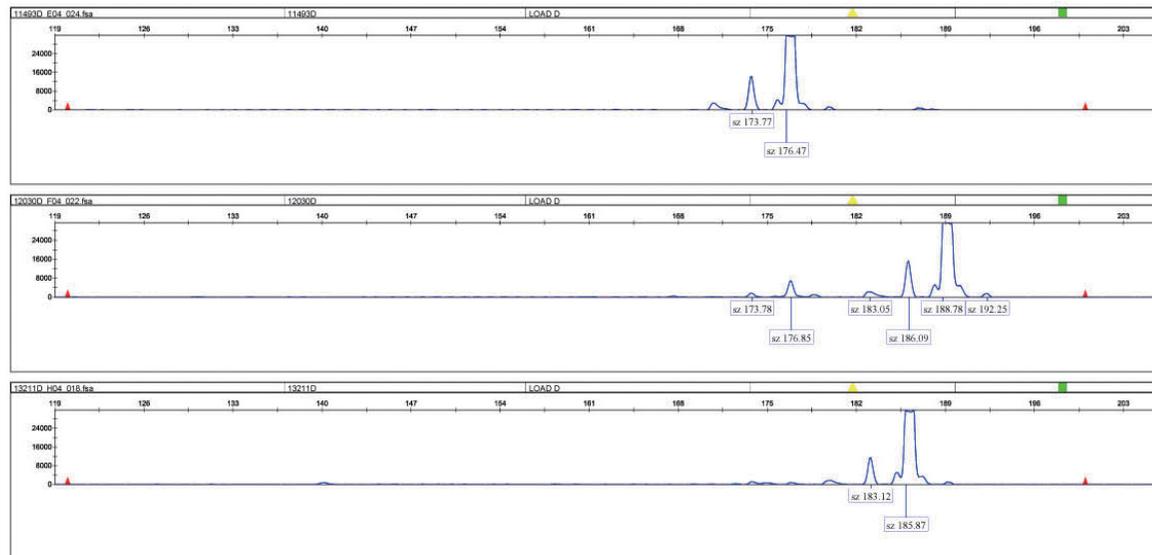


Figure 2. Nuclear microsatellite peaks showing different alleles detected in several specimens of *Parolinia ornata*, a Gran Canarian endemic Brassicaceae for which genetic diversity estimates are under way to contribute to its conservation and eventual population management (González-Pérez et al., in prep.).

management and conservation of the terrestrial flora in the BRGC has been achieved properly, but our data further suggest the streamlining of applications to facilitate a fast availability of the results derived from molecular data to managers and society. This is a challenging objective that will require the creation of bio-informatic tools to answer important questions based on genetic super-matrices and meta-analyses. Some of the most crucial questions under consideration now are (1) which are the species whose extinction would determine the highest downward slump in the values of PD of a territory?; (2) what is the effect of disturbing the biodiversity of a given area on the overall PD?; (3) are the territories with the highest PD also those with the highest genetic diversity per taxon?; or (4) which are the most appropriate genetic sources for reintroductions or reinforcements of a given taxon? Answering such questions will require both the implementation of highly advanced programming routines, and the use of super-computing methods to manage large amounts of genetic and multi-disciplinary data.

Another challenging issue will be to design more streamlined protocols for dealing with an ever-increasing volume of biological collections (leaves, DNA aliquots, molecular data, and the associated herbarium vouchers), entailing the setup of a comprehensive managing workflow. As part of our institutional mission at the Cabildo de Gran Canaria, we have defined the main steps required to ensure a high efficiency in all the stages from sample collection to data analysis. In order to increase the volume of sequences to be included in the super-matrices, a thorough “gap analysis” has been carried out to detect which Canarian endemic taxa have not been included in our DNA bank yet.

Furthermore, standard lab protocols (96-well microplate DNA

extractions, quality evaluation, DNA amplification, preparation of amplicons to be shipped to a sequencing facility, long-term storage, etc...) have been designed to facilitate proper tracking from the moment a sample enters the DNA lab and is registered in the DNA bank database, to the final step of interpreting the resulting genetic data (alignment of barcode super-matrices, generation of phylogenetic trees, calculation of PD values, design of maps with the PD output data, estimation of genetic diversity per taxon or territory, etc...). Setting up such workflow in compatible applications is important in order to ensure success in our future goals, especially as regards the PD estimate of the whole endemic and native Gran Canarian (and later Canarian) Flora.

Given the highly specialized informatics requirements of all these conservation-oriented objectives, some of our future projects count on the collaboration of the software engineering department at the Instituto Tecnológico de Canarias (which was also responsible for the implementation of the ideas underlying the Demiurge information system, see <http://www.demiurge-project.org/> and Caujapé-Castells et al. 2013), and of a group of the informatics college at the Universidad de Las Palmas de Gran Canaria (ULPGC).

One of our most important objectives in these new research endeavors will be to create tools that can be used in any territory of the planet where the data needed to estimate PD and other genetic diversity parameters exist. Thus, the foreseeable outputs of these projects will be of potential interest for members of the Global Network of Insular and Coastal Biosphere Reserves, among other.

Acknowledgements

We thank the Cabildo de Gran Canaria and the Spanish Ministry of Environment for the co-funding of the project that allowed us to refurbish the molecular facilities of the Departamento de Biodiversidad Molecular y Banco de ADN at the Jardín Botánico Canario “Viera y Clavijo”-Unidad Asociada CSIC of the Cabildo de Gran Canaria, and to obtain the PD estimates and other data discussed in this contribution; the ‘Consejera de Medio Ambiente y Emergencias’ of the Cabildo de Gran Canaria (M^a del Mar Arévalo Araya) and her team at the ‘Consejería’ for continued support to the applications of our research to the management and conservation of the biodiversity on the island of Gran Canaria; all the scientific and technical staff at the ‘Jardín Botánico Canario “Viera y Clavijo”-Unidad Asociada CSIC’ for effective multi-disciplinarity; the ‘Fundación Canaria Amurga-Maspalomas’ for collaboration in the development of this Project during 2012; the Software engineering Department at the Instituto Tecnológico de Canarias (especially Izzat Sabbagh, Rafael Nebot and Juan Francisco Rodríguez) and the Informatics college at the ULPGC (especially Mario Hernández-Tejera, José Juan Hernández-Cabrera and Francisco José Santana-Pérez) for collaboration in potential bioinformatic applications; and Dr. Toomas Kokovkin and the delegates of the World Network of Insular and Coastal Biosphere Reserves for meaningful interaction during its 3rd meeting in Estonia in June 2013. We also thank Youngsoo Chun for comments on the manuscript.

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LA PALMA WORLD BIOSPHERE RESERVE SCENARIO OF SUSTAINABILITY

Antonio San Blas Álvarez

3rd Meeting of the World Network of Island and Coastal Biosphere Reserves,
Hiiumaa and Saaremaa Islands, Estonia, 4 - 6 June 2013

LA PALMA WORLD BIOSPHERE RESERVE SCENARIO OF SUSTAINABILITY



Antonio San Blas Álvarez

Manager of the World Biosphere Reserve La Palma

La Palma was the first Spanish island to have a biosphere reserve when 511 hectares of the “El Canal y Los Tiles” estate were declared as such in 1983. Although it was the smallest Spanish Biosphere Reserve in size, it contained a highly interesting sample of laurel forest, a relict forest from the Tertiary Age. In 1998, it was extended to include the north-east arc of the island, increasing its size to a total of 13,931.15 hectares (19.67% of the island).

Finally, on 6 November 2002, in a Plenary Session of the UNESCO’s International Co-ordinating Council, the La Palma World Biosphere Reserve (LPWBR) was declared as it is today. This latest extension meant that it now includes the entire land surface of the island (70,832 ha) and part of the sea, with an area of 9,870 ha, giving a total area of

80,702 ha. The 14 municipal boroughs of the Island form part of the present La Palma WBR.

With its 708 km² of land surface and a large submarine volcanic edifice, the La Palma WBR hosts a good representation of the characteristic ecosystems of the Macaronesia Region in an excellent state of conservation, from the abyssal depths of the Atlantic to the highest point on the Island, El Roque de Los Muchachos, at an altitude of 2,426 m.

GEOGRAPHIC FEATURES			
Area (km ²)	708	Nº of Zonal Ecosystems	5
Altitude (m)	2426	Nº Species	5979
Coastline (km)	126	Endemic Canary Island Species*	1106
Age (m yrs)	1.7	Endemic La Palma Species*	275
		Forest Area (ha)	27907

LA PALMA WBR ACTION PLAN 2013-2022

The La Palma World Biosphere Reserve has had two action plans to date. The expiry of the latest action plan, 2006-2012 and the adaptation of the La Palma World Biosphere Reserve to the new regulatory context and the new challenges that have emerged over the last six years have highlighted the need to renew the reserve's management policies that act as guidelines to be followed for the next 10 years.

CONCEPTUALISATION OF THE ACTION PLAN

Although this synthesis focuses on the main lines of strategy set forth, we feel it is necessary to refer to the Conceptual Framework that has acted as the foundation on which the Programme Framework as a whole has been built. This sets out the emerging challenges and the main governing principles and general objectives of the La Palma World Biosphere Reserve programme for this new period:

VISION

The Vision of the La Palma World Biosphere Reserve has to revolve around a fragile island territory with a tri-continental vocation equivalent to a place of excellence that conserves tangible and intangible resources on land, sea and in the sky, by enhancing the assets that represent the identity and underpin local socio-economic development of a people who embrace the world, while at the same time promoting co-existence as a reservoir of life, protecting society and inclusion and a shared management to enhance the quality of life and the welfare of the final beneficiaries: people, both local residents and visitors.

“From Protected Area to Area Protecting Society”

MISSION

The Mission of the La Palma World Biosphere Reserve has to focus on promoting, executing and demonstrating a balanced relationship between human beings and the biosphere on all levels, operating as a place for testing and learning methods of conservation and sustainable development, driving planned and co-ordinated management with the effective and concerted agreement of social actors, and making an ethical commitment to the protective function with research, innovation and the right practices as a reference for the efficient use of resources, with a view to preserving the environmental and cultural assets that identify the reserve and promote the integral development of the local population.

“All Voices, All Hands”

LEITMOTIF

The leitmotif of the central issue of the Action Plan for this period extracts the strong points to be promoted:

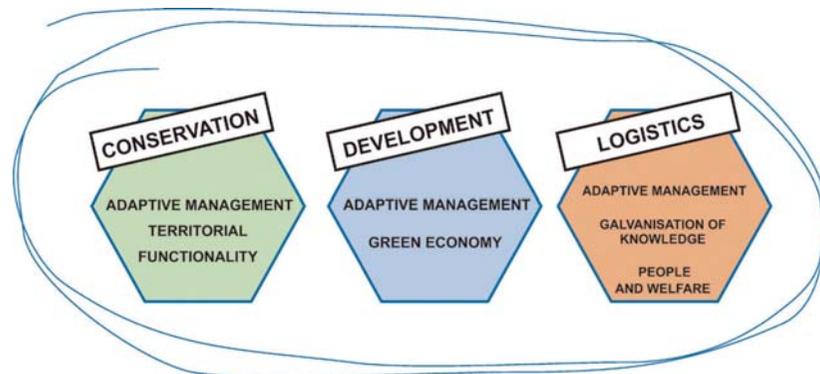
“Green Economy beyond the Tangible The human being as value added and a cohesive link in an area of life”

PROGRAMME FRAMEWORK

The programmatic framework encompasses the working scenarios, fields of action and the actions identified as priorities for rolling out over the next 10 years. This is a programme that intends to act as a tool for adapting the conservation, development and logistical

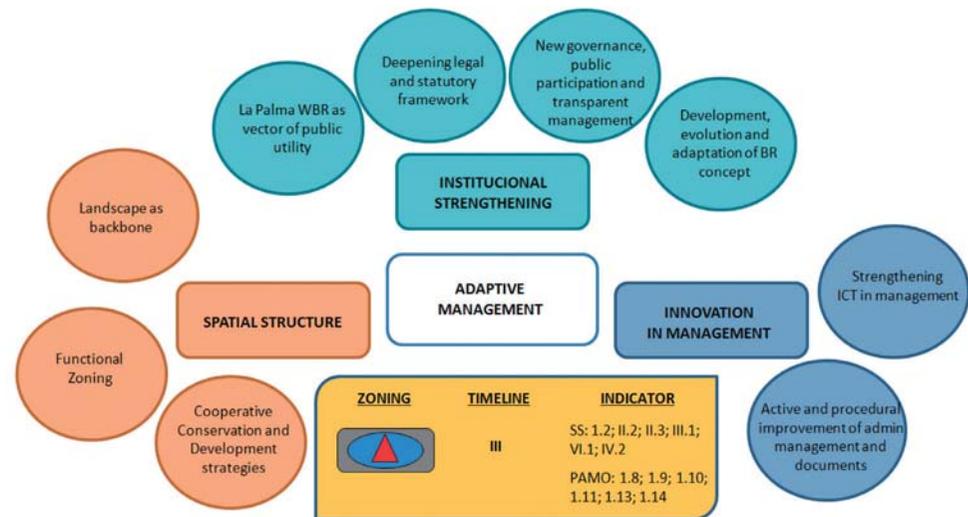
actions set forth since La Palma was declared a World Biosphere Reserve to the reality of today's world. Hence, specific objectives are included in the following sections to give material form to the Conceptual Framework explained above. Taking the main governing principles considered in the La Palma WBR Vision as the starting point, this is a new road map aimed at orienting short, mid and long-term management policies in the shift from protected area to area protecting society in the framework of sustainability, setting forth the terms and conditions to continue to move forward and face the new challenges arising from global and local change with greater confidence and determination.

Five Scenarios distributed among the functions of Conservation, Development and Logistics comprise the Programmatic Framework. This section systemises their content, breaking down and defining both the strategic axes and the actions in each area of work. Consideration, however, must be given to the long period encompassed by the plan, and the flexibility that is required to face any future challenges and requisites that may emerge.



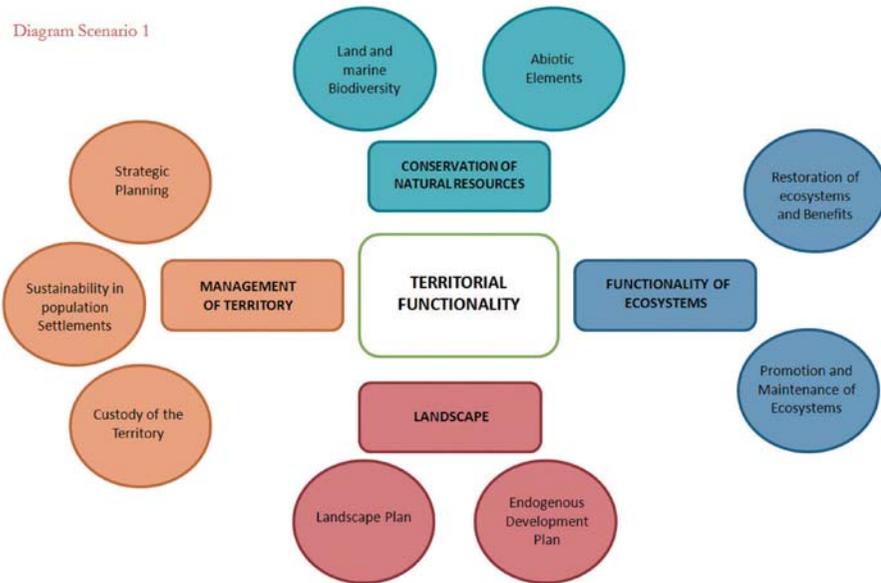
ADAPTIVE MANAGEMENT

This first common scenario to the functions of the Conservation, Development and Logistics of Biosphere Reserves, aims to enhance the govern ability and the efficiency of management by introducing specific objectives of the Seville Strategy, the Madrid Action Plan and the Montseny Action Plan for individual Biosphere Reserves, associated with management, by binding the function of Biosphere Reserves to the area and, in short, by adapting to the new regulatory and institutional framework for this period.



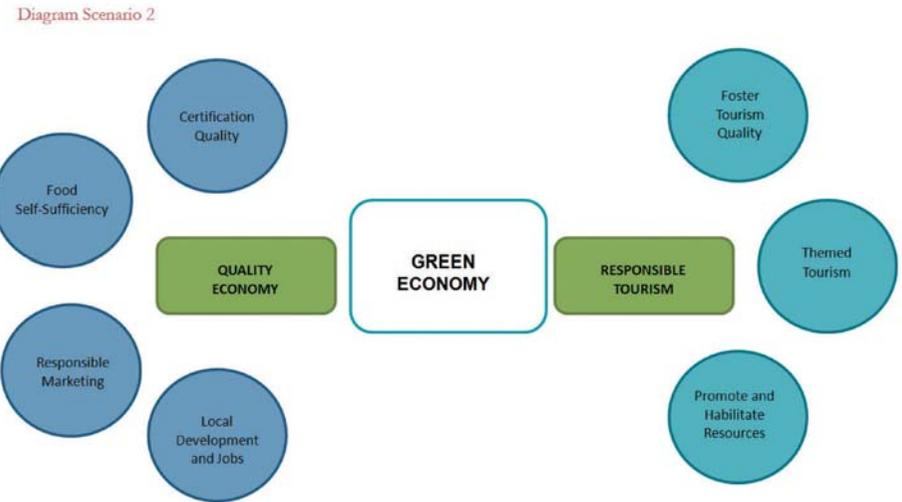
TERRITORIAL FUNCTIONALITY

Set within the Conservation Function, the territorial functionality scenario articulates a set of preferential lines over the territory (understood as the physical terrestrial-marine-sky space) for providing solutions and new focuses aimed at planning and managing the use of resources rationally in a manner that is compatible with the preservation of ecosystems and biological and cultural diversity.



GREEN ECONOMY

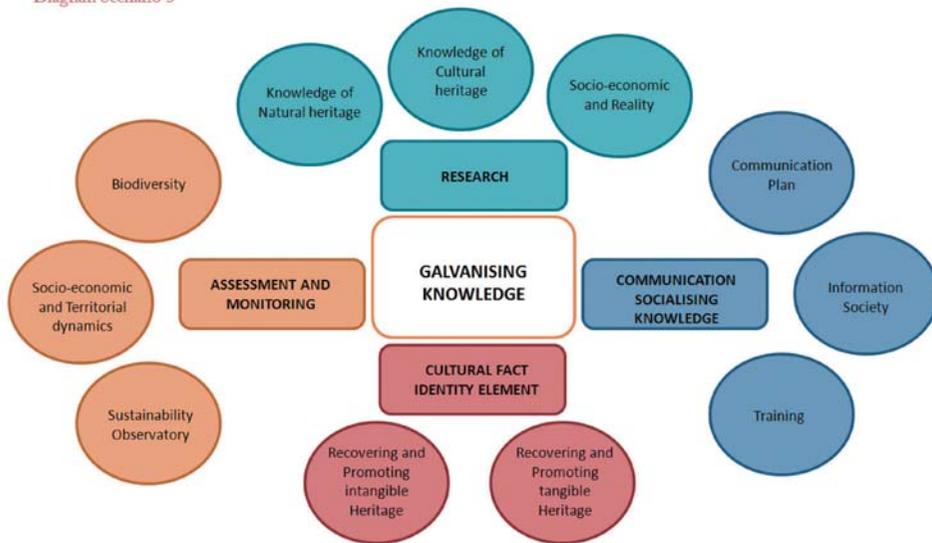
This scenario, set in the Development Function, encompasses the lines of work that can generate a competitive, fair and sustainable economy. The efficient use of resources and promoting icons of identity are incentives that can make a positive contribution to setting the Island’s products and services apart.



GALVANISING KNOWLEDGE

A fundamental part of the Logistics Function includes the Galvanising Knowledge Scenario, with the prime purpose of activating and strengthening those activities associated with rescuing and promoting identity, basic and applied research, monitoring and evaluation and information, dissemination, communication and training.

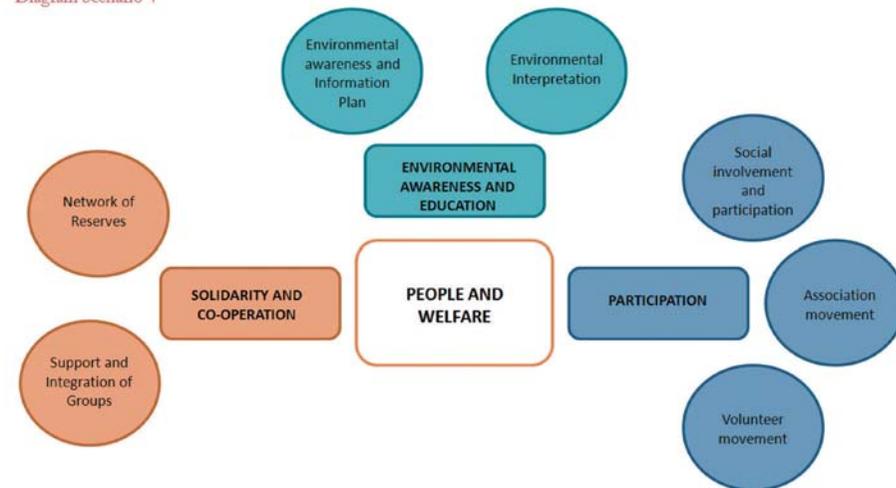
Diagram Scenario 3



PERSON AND WELFARE

This scenario, common to the rest and falling within the Logistics Function, sets out the preferred lines and strategies to follow to attain a greater involvement and social participation, an improvement in social cohesion and respect for and understanding of the surrounding environment.

Diagram Scenario 4



EXPERIENCES

Within the new Action Plan, the La Palma WBR is conducting a series of experiences that can be summarised as follows:

- LANDSCAPE
- MARINE ENVIRONMENT
- GREEN ECONOMY
- ICTs APPLIED TO MANAGEMENT

LANDSCAPE

The La Palma World Biosphere Reserve has been working on landscape since 2006. That was when the Biosfera Paisapal project was first launched, to analyse the island from a scenic point of view for the first time. This project defines a total of 10 major macro-units for the island as a whole, in which a description is made, rather than an analysis, of how the landscape is organised in them. These macro-units are the starting point for the La Palma Special Landscape Regional Planning Document. It is worth mentioning that the Biosfera Paisapal project culminated in the publication of the book “Los Paisajes de La Palma” (The Landscapes of La Palma), which gathers together the basic ideas that are developed in the project.

The Biosfera Paisapal project revealed the deficiencies identified in landscape matters on the island of La Palma, which is why a decision was taken to draw up the La Palma Special Landscape Planning Document.

Along the same lines, a Landscape Charter has also been signed, as an instrument for concerting agreements between stakeholders. Its objective is to promote actions and strategies for improving and promoting the landscape.

The Landscape Charter took the form of the public signing of a document setting forth the commitments accepted by each of the

signatories in favour of the landscape and a calendar for attaining the objectives. In this Charter, the La Palma WBR has accepted the challenge of leading and galvanising the initiative.

On the other hand, the La Palma World Biosphere Reserve has been working on defining a Network of Scenic Itineraries to facilitate the contemplation and enjoyment of the Island’s natural environment by promoting the outstanding heritage of its roads, public paths and livestock trails, which run through places of special interest and offer splendid views. Following the provisions of the European Landscape Convention (ELC), its objectives include disseminating the scenic assets of the island among the local population, “involving them in the task of protecting the Island and conserving its landscape”. It also offers the chance to discover, care for and enjoy the landscape through low-impact activities such as rambling, acting as an accessory to the island’s network of trails.

The work around the landscape includes another of the projects developed: IMPACTOPALMA. The objective of this project is to draw up an inventory and catalogue of all impacts, be they on the landscape, the fauna, vegetation, soil, air, heritage, etc. that are perceptible from the island’s roads and tracks, and it proposes alternatives to minimise or eliminate these impacts. The steps followed break down into five phases:

Phase 1: Selection of areas of action

Phase 2: Establish categories of impact

Phase 3: Inventory of impacts in the form of files of kinds of impact

Phase 4: Corrective measures and proposals

Phase 5: Environmental monitoring plan (Grid of Indicators)

LA PALMA SPECIAL REGIONAL LANDSCAPE PLANNING DOCUMENT

(PTEOP, from the Spanish)

MARINE ENVIRONMENT

As La Palma is an island, we in the Consortium could not turn our backs on this environment. Instead, we have converted it into a cornerstone for developing our work. Several actions are being carried out with the marine environment as the leading player:

MARINE ECOSYSTEM CONSERVATION INDICATORS AND PREDICTIVE MODELS, by creating a specific system of indicators to determine the state of conservation of marine ecosystems by analysing the degree of incidence of the main impact suffered by the coastal ecosystems of La Palma, over-fishing. This action establishes a data base for the whole shoreline for the first time and lays the foundations for a future time series of data sets from which predictive models can be developed for the entire island.

CREATION OF A DATA BASE ASSOCIATED TO A MANAGEMENT UNIT To establish, classify and organise the information gathered in previous phases, a data base was created that provides support for geographic information systems (GIS). This data base is open to new data, which facilitates its development and improvement. In turn, it is a fast and simple instrument for consulting about the different areas of the Island's coastline. A working unit has been established to do this, the UTM square of 500 metres x 500 m, in which data on a range of environmental variables are uploaded. In total, 691 squares have been registered.

ENVIRONMENTAL COASTLINE CLASSIFICATION AND ZONING MODEL During this activity, a zoning model of the Island coastline was made, based on the most important environmental variables. Before establishing the zoning, selection criteria have been established that have helped to evaluate the different units of work. The model has been constructed by using Spatial Territorial Analysis Methods (Multi-criteria Analysis), using geographic information systems (GIS) for this.

We have also conducted an **ANALYSIS OF THE DEGREE OF CONFLICT BETWEEN HUMAN ACTIVITIES AND THE CONSERVATION OF THE COASTAL ENVIRONMENT**, which includes the exploitation of fish and sea-food resources; the impact of fishing activity; the exploitation of sea-food resources and fish farming.

Another important aspect has been **THE STUDY OF THE LA PALMA MARINE**

PLAN TERRITORIAL ESPECIAL DE PAISAJE LA PALMA (PTEOP)

La creación de la "Red de Itinerarios de Paisaje de La Palma" persigue la potenciación del acceso a la contemplación y el disfrute del paisaje con el que cuenta la Isla de La Palma.

Su diseño surge a raíz de la colaboración ciudadana, siendo las personas de cada lugar las que seleccionan los recorridos más emblemáticos de sus paisajes. Así garantizamos la identificación de la ciudadanía con El Proyecto, además de la valoración de sus paisajes.

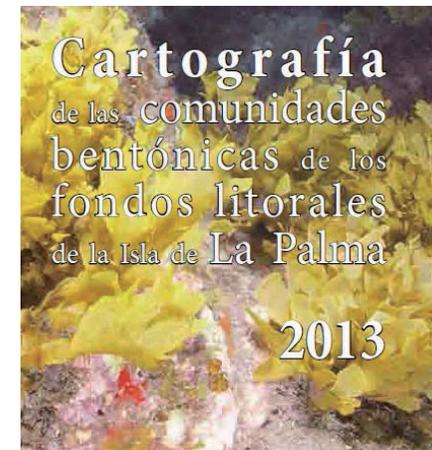
La Red combina la posibilidad de realizar itinerarios a pie y en coche, sin superar nunca las 2,5 horas de duración.

La Red garantiza la valoración de los recursos locales, ya que el diseño de los itinerarios se realiza de forma que los valores etnográficos y naturales del entorno puedan ser disfrutados, a la vez que se ofrece al usuario la posibilidad de realizar actividades alternativas en el entorno del itinerario.

Se ofrece una visión poco conocida de la isla, con rincones singulares, haciendo que el visitante tenga una alternativa diferente de conocer La Palma.

Bajada a Juan Adalid

Iconos: Hiking, Car, 4x4





RESERVE, one of the core zones of the La Palma WBR, and its influence on the recovery of the benthonic communities of the Island of La Palma, focussing on assessing and identifying the change in the conservation status of the rocky sea-beds of the island since the reserve was created.

And finally, we must briefly talk about the CARTOGRAPHIC ATLAS OF THE BENTHONIC COMMUNITIES OF THE SHALLOW SHORELINE OF LA PALMA, which shows the spatial distribution of the main communities and top-priority marine habitats for conservation in the sea between a depth of 0 and 50 metres of the island of La Palma.

GREEN ECONOMY

Within the framework of the Man and Biosphere Programme, the UNESCO launched an initiative aimed at promoting the products of territories declared Biosphere Reserves. La Palma was selected to form part of this programme, using the “La Palma World Biosphere Reserve” brand and logo.

The aim of rolling out this action is to identify and promote the quality and origin that is characteristic of our products by promoting the craft skills that has been handed down from one generation to the next for so many years and by providing incentives for using raw materials produced and made on the Island, thus fostering the renovation and conservation of the natural heritage, emphasising its typical characteristics by forming part of an area

classified as excellent by UNESCO.

The creation of its own brand and logo has promoted and disseminated local resources, products, goods and services; both on the Island and beyond, by traditional circuits or by using new technologies, especially farming produce and food, handicrafts and cultural and recreational tourism, which reinforces traditional economic activities and the new social economy in the framework of island sustainability.

On the other hand, the work done by the La Palma World Biosphere Reserve in the area of tourism has been based on an approach of an Integral Tourism Policy, with the prime objective of actively incorporating tourism stakeholders in the policy of the sector, in an attempt to raise its quality and by paying special attention to the local population.

Bearing in mind the new scenarios in the area of world tourism, there is an evident need to make changes in the way tourism is conceived, managed and consumed in the framework of new participative models that understand that tourism now “involves everybody”. Based on these parameters, we are designing actions from the point of view that tourism policy is far from being something that is isolated from society; something that we can develop without being aware that it impacts society, the life of the island and the education and conception that people have in the area where they live and engage in their activities.

The La Palma World Biosphere Reserve considers that a rationally developed tourism can make a contribution to implementing a model that is not aggressive to the environment and an enriching

model from a social and cultural perspective, for which we are trying to foster the idea presented by the World Tourism Organisation that certification systems applicable to tourism play an ever-more-important function in regulating tourism services by providing significant benefits to the environment and to society as a whole in the destinations where they are applied.

The result of this joint work and suitable planning is that the island of La Palma has been declared a “Biosphere Destination” by the Institute of Responsible Tourism (IRT), an organisation linked to UNESCO and the World Tourism Organisation (WTO). It has also been declared a Starlight Reserve and a Starlight Tourist Destination.

EXPERIENCES: ICT

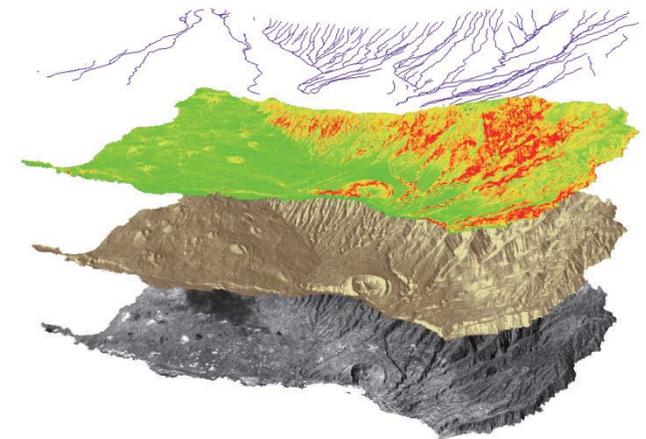
To conclude, we will briefly present the work that the La Palma WBR Consortium is carrying out with regard to the ICTs.

The projects include the work done on DIGITAL MODELS, where we have digitally obtained Elevation, Slope and Orientation Models, Visual Basins, Hydrological Calculations, Risk Analysis and Predictive Models. We have compared the changes undergone by the territory between 1956 and 2009 with special attention to the scenic modifications that have occurred and to the demographic and urban settlement impacts that have affected the Island during this period.

In innovation for Eco-tourism, we are working on

an application available for Iphone and Android Platform 3.0 to promote eco-tourism experiences. This reduces ecological impacts and provides a tool for managing the public use of protected natural areas, allowing us to locate routes, register itineraries and share adventures on the social media with information.

In short, Icairn is a rambling guide, a community, a game, an MKT tool and an environmental education tool for the sustainable development of Eco-tourism destinations.



Lanzarote Biosphere Reserve, Canary Islands, Spain

Reflections, lines of action, and proposals for the Network

Aquilino Miguélez López

3rd Meeting of the World Network of Island and Coastal Biosphere Reserves,
Hiiumaa and Saaremaa Islands, Estonia, 4 - 6 June 2013

Lanzarote Biosphere Reserve, Canary Islands, Spain Reflections, lines of action, and proposals for the Network



Aquilino Miguélez López

1. Drinking Water in the Edo Period, Japan, 19th Century

Two hundred years ago, Japanese culture still considered rivers and mountains to be sacred. At that time the capital of Japan was called Edo, and was already home to more than a million inhabitants. This is what I recall hearing and seeing magnificently well staged in the Japan Pavilion at the Water Expo in Zaragoza (Spain) in 2008:

'As the river that passed through the city was sacred, nobody dared to dump waste in the water. There were people whose job it was to lead packhorses with special containers out to the farmland to take the vital nutrients contained in animal and human excrements.'

In this way, the river water continued to be of high quality and was perfectly fit for consumption. Being able to drink pure water at no risk is something crucial. Although this seems impossible in cities today, in Edo then everyone had access to top quality drinking water from the river in the middle of the city.

Japanese culture thus shows social cohesion (1) and consensus (2) on the sacred nature (3) of the river or, in other words, of water as a shared resource. Thanks to this awareness, the main human nutrient in terms of quantity and frequency of intake, which is also a universal solvent and a vehicle for the transmission of infectious diseases, became a readily accessible and reliable common good. Respect for something that everyone needs to trust led to the birth of a logical system that completed the plant nutrient cycle and



image 1, Hokusai



image 2, starlight

ensured water of maximum purity close to all users.

Proposal for the Network

What cultural elements (e.g. 1, 2, 3, 4, 5...) have contributed to conserving the social utility of recognised commons in each BR (fertile soil, drinking water, fisheries, woodlands, etc.) up to the present day?

Recommended reading (See in wikipedia.org):

Elinor Ostrom, 1990, 'Governing the Commons: The Evolution of Institutions for Collective Action'

Jared Diamond, 2005. 'Collapse: How Societies Choose to Fail or Succeed'

2. Bring Back the Stars on the Network's Coastlines

Another example of a common good that is cared for and beneficial to society is the light-pollution-free night sky. On the island of La Palma this has been achieved by means of legislation (4) and its application (5), which prohibits light pollution in order to ensure the best possible use of the telescopes operating at more than 2,000 metres above sea level on the island. But this democratic, institutional and social decision with international repercussions, which protects a source of employment and wealth and makes it an identifying trait, also allows residents and visitors alike to look deep into the night sky all over the island, clouds permitting.

It is particularly easy to enjoy the view on the shore, and before your eyes there are so many stars that your gaze is drawn up into the firmament.

As street lighting represents a considerable expense for local authorities, and in the absence of measures to protect the night sky more than half the energy used for this purpose is wasted. Cuts are to be achieved both in financial costs and in carbon dioxide emissions.

The image of the El Reducto beach in Arrecife, featured in a publicity campaign on alternative energy sources to oil, is a false image because the stars (added on) are not visible when the glare from street lamps lights up the building fronts above them. This image is thus a **proposal** that we put before the World Network of Island and Coastal Biosphere Reserves. It could become an identifying trait of the network, turning all coasts into astronomical observatories, to amaze us every night without using a telescope.

Furthermore, turning our attention to the Universe around us may help to remind us that this marvellous planet is getting too small for us but it's currently the only valid alternative.

And if it's the only one, shouldn't we be protecting our commons more?

3. Main Targets Achieved in the BR in 2012-2013

- Updating of the Biosphere Reserve Action Plan (1998-2013-2020)

Lanzarote was chosen in 2012 as a pilot area to implement the first Integrated Sustainability Management System in Spain, a methodology that has already been successfully applied in many other territories and European cities and which is based on a broad participatory process involving the public and private sectors, the academic world and social stakeholders. This effort by the Observatory of Sustainability in Spain has allowed the updating of the BR Strategy, whose definition began in 1998. The initial objectives of the project financed by the Biodiversity Foundation were concerned with biodiversity and climate change, and were complemented by the Island Council to include other aspects of governance and human activity on the island. The participatory process seeks to involve all official bodies and social stakeholders on the island as a BR, renewing the commitment with Unesco, and seeking greater social cohesion to meet the challenge of improving the future for all. 2020 is the horizon year set by the European Union for environmental targets that affect possible financial aids.

- Covering the bare ground to prevent erosion

In support of legal rubble disposal and earth excavation businesses, the BR restored an old quarry site. After filling the hollow with building rubble and covering it with topsoil, a layer of lapilli was added in order to prevent the strong wind and first rains from eroding away the earth from this slightly sloping land. To complete the project, and

as an example to show that bare ground is a source of problems, a family outing was organised which involved the planting of different native species. The results were enjoyed by all, and will be helpful to future replanting initiatives.

- Greenhouse Gases: real change from polluting methane to biogas and electricity

At the Zonzomas waste management complex, the BR financed part of the machinery whose operation is now allowing fuel savings in the anaerobic digestion of organic matter, and producing electricity from the methane generated by waste digestion in controlled conditions. The satisfactory results of the first experience of its kind in the Canaries encourages the installation of more wells and pipes in old landfill areas in order to extract more methane gas and prevent its diffusion into the atmosphere.

- Plastic pollution of our coasts and waters

A campaign which cost the least, but has had a great impact, focused on the presence of plastics in our coastal waters, either washed in from the sea or dumped from the island due to carelessness or bad management. All of this started when three young people, Wendy, Hevila and Cristóbal, came into the RB Office for two weeks of environmental work experience. When requested to work on the issue of wastefulness and plastic pollution, they decided to set up a Facebook profile 'Agüita con el plástico' (a local expression that means "fed up with plastic" and hints

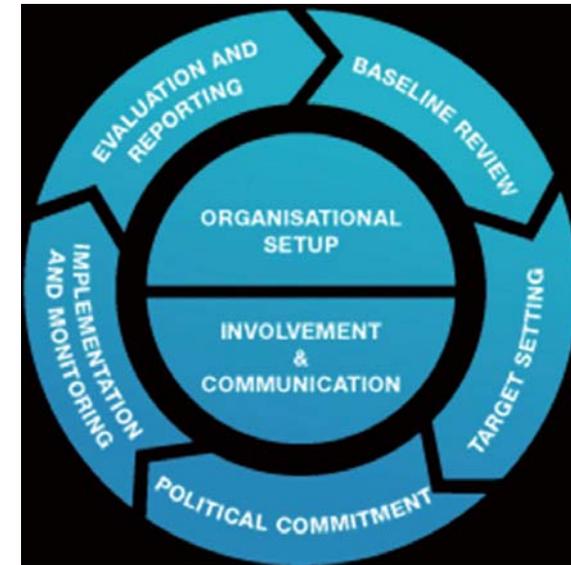


image 3, methodology



image 4, families planting



image 5, Zonzamas

Diesel Saving:	5.000 liters/month
Biogas :	1.200 m ³ /day
Burned during	6 Hours/day
Electricity production:	2 MWh/day
(junio 2012 - junio 2013:	800 Mwh)

the words ‘water with plastic’) where they posted messages, videos (including some they made themselves) and compiled other Internet posts. After their stay, the Office followed up their efforts and other people contributed to keeping the website updated, and this was taken up by several media companies, even inspiring national television programmes (El Escarabajo Verde, RTVE, 14 and 28 June 2013) to concentrate on this new problem which is unknown to most of Spanish society.

Please promote awareness of this problem.

2 Proposals for the World Network of Island and Coastal Biosphere Reserves

1. Identify cultural elements that have contributed to conserving the social utility of recognised commons in each BR (fertile soil, drinking water, fisheries, woodlands, etc.) up to the present day.
2. Define and apply a protocol to avoid light pollution (e.g. Starlight) and bring back star gazing on islands and in coastal areas.



image 6, Facebook: Aguitaconelplastico

EL HIERRO BIOSPHERE RESERVE

The first 100% Renewable Energy Island

César Espinosa Padrón

3rd Meeting of the World Network of Island and Coastal Biosphere Reserves,
Hiiumaa and Saaremaa Islands, Estonia, 4 - 6 June 2013

EL HIERRO BIOSPHERE RESERVE

The first 100% Renewable Energy Island



César Espinosa Padrón

El Hierro Biosphere Reserve

The island of El Hierro, nicknamed the “Meridian Island”, has a population of 11,030 inhabitants and an area of 269 km². It was declared a biosphere reserve in 2000. It is the smallest island of the Canary archipelago and a sustainability model for the whole region. El Hierro is an active member of the World Network of Island and Coastal Biosphere Reserves (WNICBR).

From the end of 2013 El Hierro will be the first energy-isolated territory in the world able to power itself entirely from renewable energy sources. For the first time the traditional problem of intermittency of renewable energy sources is overcome through combining the power generation of a wind farm with a hydraulic storage system.



THE WIND-HYDRO PUMPED STORAGE POWER PLANT

The wind-hydro system consists of a wind farm (11,5 MW), two water reservoirs, a pumping unit, hydropower plant, and seawater desalination plant. The wind farm supplies electricity directly to the network and excess power feeds the pumping unit that raises water to a higher reservoir dam, which works as energy storage system. The power plant uses the stored potential energy, ensuring power supply and network stability.

The operation's philosophy is based on supplying the electrical demand of the island with renewable sources, thus guaranteeing the stability of the electrical network. The diesel engine plant will only operate in exceptional or emergency cases, when there is not enough wind or water to produce the demanded energy.

This wind-hydro project will avoid the annual consumption of 6,000 tons of diesel, equivalent to 40,000 barrels of oil imported by sea to the island, saving over 1.8 million euro yearly if compared with conventional power generation costs. Likewise, it will avoid the emission of 18,700 tons of CO₂ per year into the atmosphere. That amount of CO₂ is equivalent to that fixed by a forest of 10,000-12,000 hectares, about the double of the forests in the island.

The project, whose cost amounts to approx. 80 million Euros, is promoted by the local corporation Gorona del Viento El Hierro, S.A., whose shares are held by Cabildo de El Hierro (Local Authority - 60%), Endesa (30%) and the Canary Islands Institute of Technology - ITC (10%).

TOWARDS SUSTAINABLE ENERGY COMMUNITY

The Energy Sustainability Strategy of El Hierro aims not only at electric self-sufficiency. Taking into account that about 46% of energy consumption is due to internal transport, the El Hierro Biosphere Reserve, with the support of IDAE and the Canary Islands Government, has launched the Sustainable Mobility Plan (PDMS). The PDMS is a clear commitment for a change in the transportation modes and vehicles aimed at local population and tourists. El Hierro bets on the generalization of electric vehicles and alternative modes of transport, and gives also high priority to public transport or innovative solutions such as transportation on request.

Seawater desalination is essential in order to ensure a constant supply of water for the wind-hydro system. It is also clear that another of storing the surplus energy generated by the wind farm is to produce desalinated water. In this context, the final implementation of the 100% RES project implies an important increase in the desalination capacity of El Hierro and, as a consequence, a significant increment in water for fragile ecosystems and irrigation capacity. In this way, new organic farming projects can be linked to renewable energy.

The energy sustainability strategy is complemented by other measures such as the promotion of domestic solar water heating systems, distributed PV microgeneration, exploitation of biomass resources and, particularly, the energy saving campaigns jointly developed by the Biosphere Reserve and the ITC (with the support of the Canary Islands' Regional Ministry of Industry).





LESSONS LEARNED AND POTENTIAL REPLICABILITY

The experience of El Hierro demonstrates that it is actually possible to achieve energy self-sufficiency using renewable energy sources in certain areas such as small mountainous islands and isolated rural areas. It also teaches that the process of replacing energy sources should be accompanied by the development of a culture of energy saving and efficiency and by new ways of governance.

The Wind-hydro project provides a viable and innovative solution replicable in small and medium island territories and areas isolated from the energy grid. The experience is serving as a reference for territories such as Aruba, Easter Island, some Japanese islands, and other biosphere reserves such as Menorca.

The 3rd Meeting of the World Network of Island and Coastal Biosphere Reserves (Statement)

Period: 4 - 6 June, 2013 (3 days)
Venue: Islands of Saaremaa and Hiiumaa,
West-Estonian Archipelago
Biosphere Reserve, Estonia

3rd Meeting of the World Network of Island and Coastal Biosphere Reserves,
Hiiumaa and Saaremaa Islands, Estonia, 4 - 6 June 2013

The 3rd Meeting of the World Network of Island and Coastal Biosphere Reserves



STATEMENT

The World Island and Coastal Biosphere Reserves are suitable for research on climate change that the whole world faces, through which sustainable development can be achieved through continuous and active dialog among scientists, researchers and local residents.

The World Network of Island and Coastal Biosphere Reserve was established to fulfill the Madrid Action Plan, together with Jeju Island Biosphere Reserve, Menorca Biosphere Reserve, MAB-Committee of the Republic of Korea, MAB-Committee of Spain, and UNESCO. The first meeting was held in Menorca in February 2012. It was agreed that Secretariats will be in Jeju and Menorca, and the Network will make efforts focusing on climate change and sustainable development. Menorca published a casebook based on collected information and experiences.

The 2nd meeting was held by Jeju in September 2012. In this meeting the Network decided that it would try to attract funds for the activities of the Network and to expand its membership. It also decided to promote joint research projects and hold meetings on a regular basis. UNESCO, Jeju and Menorca decided to select joint projects and promote them.

For the activities of the Network, Jeju signed an agreement with UNESCO to provide 500,000 USD and has so far given 100,000 USD in the first annual installment of support, while Menorca is planning to provide 40,000 Euros for the project. Already 30,000 Euros has been secured for the technical secretariat in Menorca.

The 3rd Meeting of the Global Network of Island and Coastal Biosphere Reserves was held at Saaremaa and Hiiumaa, Estonia 4-6 June 2013. Participants came from Estonia (West-Estonian Archipelago BR), Republic of Korea (Jeju Island and Shinan Dadohae BRs), Spain (Menorca, Gran Canaria, La Palma, Lanzarote and El Hierro BRs), São Tomé and Príncipe (Príncipe BR), Philippines (Palawan BR), Japan (Yakushima Island BR), China (Nanji Islands BR), DPR Korea (Mount Kuwol BR), Vietnam (Cat Ba BR), Chile (Juan Fernandez Islands BR), Brazil (Mata Atlantica BR), Mexico (Islands of the Gulf of California), St. Kitts and Nevis (St. Mary's BR), Jamaica (future Portland Bight BR), Haiti (La Selle BR), Finland (Archipelago Sea Area BR), Portugal (Santana Madeira BR), the MAB National Committees of the Republic of Korea and Spain, and UNESCO/MAB. Together they examined future action plans and made a few decisions as follows.

Conclusions:

1. Dates and venue of the next meeting

The 4th meeting will be held in Palawan, Philippines in 2014. UNESCO and the Secretariats of Jeju and Menorca will actively promote the participation of the island and coastal biosphere reserves.

2. Publication of a casebook study

Varied information and experiences presented in this meeting will be presented in a book to be published by the Jeju Secretariat with Menorca's support, and presenters need to provide appropriate content and submit it within a set period.

3. Sharing information on the web

Menorca and UNESCO have already established respective websites for the network. The website of the Jeju Secretariat is under development and will be launched at the end of August 2013.

4. Establishment and sharing of detailed implementation plans

Detailed implementation plans, schedules, expenses and public relations will be decided based on the conclusion of the meeting through separate Secretariat meetings. The agenda will be decided and shared among all the members.

5. Suggestions on research projects and training workshop

Joint research projects on climate change will be elaborated and implemented by Jeju Island and Menorca Biosphere Reserves and UNESCO, and suggestions on this research project would be appreciated. Also a training workshop on climate change is planned in Jeju Island, and active support from members will be needed for that. Moreover, it is envisaged to launch initiatives in the Pacific, the Mediterranean and the Baltic regions. It is also envisaged to work on indicators of island sustainable development.











3rd Meeting of the World Network of Island and Coastal Biosphere Reserves, Hiiumaa and Saaremaa Islands, Estonia, 4 - 6 June 2013

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Sustainable Management in Island and Coastal Biosphere Reserves

