

# Ship & Ocean Newsletter

Selected Papers

No. **6**  
February 2006

**Ocean Policy Research Foundation**

# Director's Message

As mankind moves into the 21st century, integrated policies of ocean governance are necessary for the sustainable development and use of our oceans and their resources and the protection of the marine environment.

Towards this end, the Ocean Policy Research Foundation (formerly: Ship & Ocean Foundation) has started an "Ocean Policy Research", with the mission statement "Living in Harmony with the Oceans".

The Ocean Policy Research Foundation aims to conduct cross-sectoral research in ocean related issues in order to initiate debate on marine topics and formulate both domestic and international policy proposals.

We publish a Japanese-language newsletter called the "Ship & Ocean Newsletter" twice a month. The "Ship & Ocean Newsletter" seeks to provide people of diverse viewpoints and backgrounds with a forum for discussion and to contribute to the formulation of maritime policies to achieve coexistence between mankind and the ocean. Our Foundation believes that the Newsletter can expand effective communication on these issues through its function as editor, publishing timely research and welcoming responses from readers, which might then be published in turn.

"Ship & Ocean Newsletter Selected Papers No.6" contains English-language versions of papers from the Japanese Newsletter edition, published from No.71(2003.7.20) to No.90(2004.5.5).

It is our sincere hope that these Selected Papers will provide useful insights on policy debate in Japan and help to foster global policy dialogue on various issues.

Hiroshi TERASHIMA  
Executive Director

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# Offshore Wind Power Generation and its Legal System in Germany, with an Emphasis on Locational Regulations

**Yoriaki Narita**

*President, Japan Energy Law Institute / Professor em. Dr. jur. Yokohama National University.  
(Ship & Ocean Newsletter No.73 August 20, 2003)*

Wind-generated power presently consumed in Germany accounts for only about 4% of all the energy consumed in the country; however, the German government has established a policy to supply one fourth of all energy from wind-generated power by 2015. As suitable land is no longer available for vast wind farms, the government is now working on locational regulations for the construction and operation of offshore wind farms. There are a number of regulations that should be instructive to Japan, such as a systematic licensing system for territorial waters free from the special act, consideration for the environment, and domestic legal regulations in the exclusive economic zone.

## 1. From land-based to offshore wind power generation

As is widely known, wind power generation is actively pursued in Germany. Though wind-generated power consumed presently in Germany accounts for only about 4% of all the energy consumed in the country, wind-generated power consumed in four waterfront provinces in the northern part of Germany accounts for a higher percentage, of from 19% to 26%.

Since the rush to construct wind power generators on land from the end of the 1980s, they have greatly increased in size and concentration with the advancement of technology. The new environmental problems brought on by this include adverse impacts on landscapes, nature conservation problems, wind noise, diffused reflections, and electromagnetic rays. As systematic regulations on land use are extremely strict in Germany in comparison with Japanese regulations, the lack of available land suitable for the construction of 30 to 40 wind generators has prompted serious consideration for the construction of offshore wind farms. Of 16 provinces, including three cities in Germany, only four provinces located on waterfronts are available for the construction of offshore wind farms. However, given the many wetland areas caused by the shallow waters of the North and Baltic Seas, the busy sea traffic, and a keen concern for the protection of marine life, consideration has been given to locating wind farms in coastal waters eight to ten kilometers offshore or in the 200-mile exclusive economic zone. However, the German government does not allow the construction and operation of wind power generators freely in these sea areas and it only approves of use that is organized according to German laws, a system more advanced than in Japan.

## 2. Legal system concerning mandatory purchase of wind power energy

The German government has adopted a policy rejecting nuclear energy under the coalition government of the Social Democratic Party (SPD) and the Green Party (Grüne Partei). Germany's amended Nuclear Energy Act in 2002

stipulates that nuclear power plants that are currently in operation may be operated for 35 years, the lifetime of nuclear power reactors, but no new nuclear power plants may be constructed. On the other hand, the government has now established a policy to supply one fourth of the total domestic demand for electricity from wind power energy by 2015, with a special emphasis on strengthening wind power generation. While there is some doubt whether this goal is actually attainable, the government has expanded the mandatory area for general energy suppliers purchasing wind power energy to the North and Baltic Seas in the exclusive economic zone under the Renewable Energy Law (EEG), which was enacted in 2000; at the same time, it has granted offshore wind power generators which would be built till the end of 2006 and located from three to two hundred nautical miles off the coastline the benefit of guaranteeing the purchase of wind power energy at a fixed rate of 17.9 pfennigs (9 cents) per kWh for nine years (five years for general wind power energy). The Power Input Act (StrEG), which was enacted in 1991, prior to the above-said Renewable Energy Law, faced frequent lawsuits due to a number of questions in relation to the constitution, the EU Law, and the Cartel Law, but the European Court of Justice ruled in March 2001 that the German domestic law did not conflict with the EU Law, so the legitimacy of mandatory purchase in relation to the EU Law is confirmed for the present.

## 3. Locational regulations concerning offshore areas within territorial waters

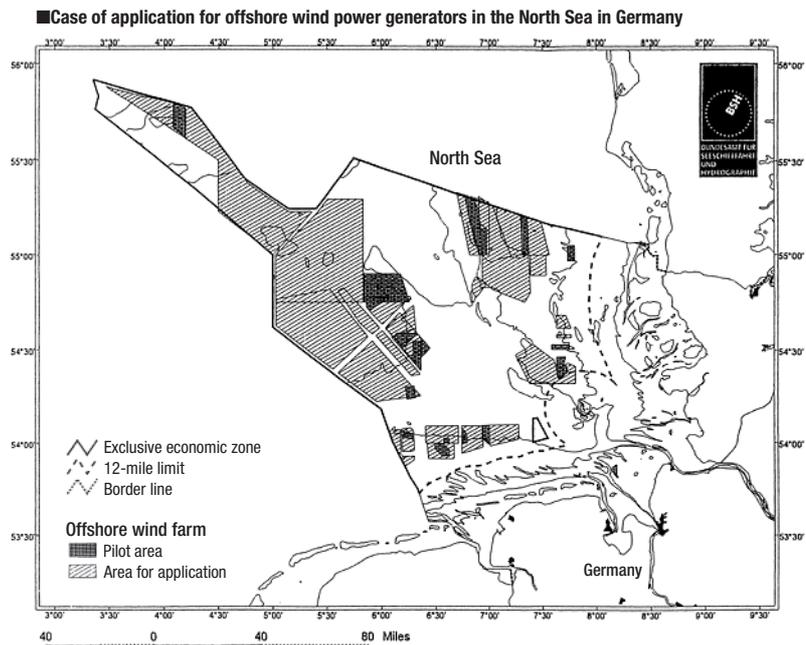
The German federal government and state governments do not have a special law that regulates the establishment of wind power generators in offshore areas within territorial waters. In general, the federal building code "Baugesetzbuch (BBauGB)," which also regulates general land use systematically in offshore areas within territorial waters in Germany, and which corresponds closely to Japan's City Planning Law, is applied. Under this law, it is understood in principle that coastal waters belong to the outer zone, "Aussenbereich," where all development is prohibited and

only exceptional developments are allowed. However, as wind power generators are listed as an exceptional development (Article 35-1-6 of the law), procedures must be taken according to the Baugesetzbuch.

In concrete terms, "a retention zone," "a priority zone," or "a zone suitable for the use of renewal energy" for wind power generation is designated based on provincial plans, and a federal land improvement plan that precedes provincial plans. Based on this, it is necessary to designate "a wind park zone" or another zone according to land use plans (Bauleitplan) on the municipal level, and specify a fixed site. However, in contrast to wind farms on land, municipal functions cannot be applied to coastal waters, so subordinate provincial government agencies must establish plans. Specific licenses are also granted by provincial government agencies. However, regulations are not enforced centrally or comprehensively, and regulations are actually extremely complicated because coastal areas require approval, licenses, and special procedures according to the federal and provincial nature conservation laws, the federal water management law, the federal canal law, the environmental suitability assessment law, and other laws. Because of this, there is a need for the standardization and expedition of regulations in order to promote offshore wind power generation in coastal waters.

#### 4. Regulations on offshore wind power generation in the exclusive economic zone

After the UN Convention on the Law of the Sea came into effect, the marine facilities ordinance called the "Seeanlagenverordnung" was issued in Germany as a domestic legal measure in 1997, based on the delegation of the federal maritime law (1994), and a license system was established for siting and operation of facilities (including structures and manmade objects) for producing energy by seawater, sea currents and wind power by the ordinance. The license is granted by the Federal Maritime and Hydrographic Agency (BSH). It stipulates that the license must be granted unless (1) wind power generators obstruct the operation and efficiency of facilities and aids for ship navigation, (2) wind power generators obstruct canals, airspaces, and the use of the sea for ship navigation, (3) wind power generators are likely to contaminate marine environ-



Jichi Kenkyu Vol. 79, No. 7 (2003), "German Legal System for Offshore Wind Power Generation and the Use of the Sea"

ments, or (4) wind power generators harm migrating birds. Other public and private benefits are considered under terms and conditions attached to the license. However, a measure has been taken to designate "special sea areas suitable for wind power generation" in the exclusive economic zone, to consolidate wind power generators in these sea areas in order to prevent their indiscriminate siting. In addition, other regulations in response to Article 60-3 to Article 60-5 of the UN Convention on the Law of the Sea are also included in the ordinance, such as the provision and publication of safe sea areas, information transmission, the removal of wind power generators after the expiration of the license, the duties of the operators of wind power generators, and administrative control.

The first license based on the marine facilities ordinance was granted (to a pilot project for 12 wind power generators 30 meters in water depth, located 45 kilometers from the shore line) in November 2000 after 26 months of deliberations. It is said that 40 projects are pending as of the end of the year.

German regulations on offshore wind power generation are extremely complicated due to the fact that regulations for coastal waters and the exclusive economic zone differ. However, there are a number of regulations that are instructive for Japan, including the systematic license system free from public tangible entity laws, consideration for the environment, and domestic legal regulations in the exclusive economic zone. ■

# Minamidaito Island - Frontiers of Forecasting of Typhoons

## Fumimasa Kinjo

Forecaster, Minamidaitojima Local Meteorological Observatory  
(Ship & Ocean Newsletter No.74 September 5, 2003)

The Minamidaitojima Local Meteorological Observatory plays an important role as the first to monitor the conditions of typhoons, which cause great damage to various parts of Japan every year, and it carries out surface meteorological observation and forecasting/alerting services round-the-clock. It is ironical that Minamidaito Island gets nationwide publicity in the typhoon season, but its history, culture and natural environment are actually not well known. I would like to introduce the island, which marks the 103rd anniversary of its settlement.

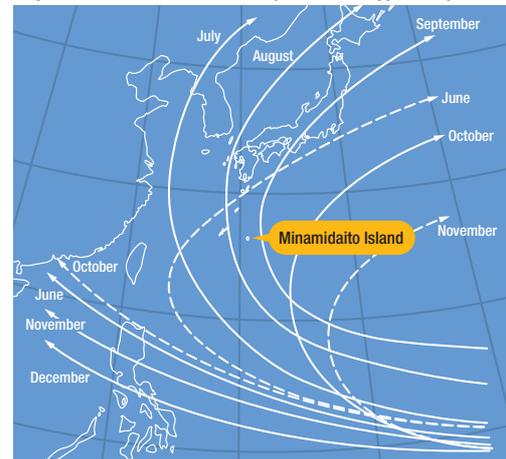
We often hear phrases such as, "Typhoon Long Wong (Dragon King) is currently over the sea to the southeast of Minamidaito Island ..." on TV and radio during their reports on typhoons.

The Minamidaitojima Local Meteorological Observatory (Figure 1), where I work, is located in the Pacific Ocean about 360 kilometers to the east of the Okinawa Main Island, and more than 1,000 kilometers to the southwest of Tokyo. The observatory is an important observation point on the sea, where such points are few in number, and plays an important role as the first to monitor particularly the conditions of typhoons, which cause great damage to various parts of Japan every year. It is ironical that Minamidaito Island, which gets nationwide publicity in the typhoon season, can be referred to as "the very front line of the observation of typhoons," but its history, culture and natural environment are not so well known. I would like to briefly introduce the island, which marks its 103rd anniversary of settlement.

## A Fusion of the Okinawan and Hachijojima Cultures

To begin with, the Daito Islands, which consist of Minamidaito Island, Kitadaito Island and Okidaito Island (Rasa Island), used to be uninhabited. The islands were called "Ufuagarijima (far east islands)" by the people in Ryukyu (another name for Okinawa). In 1885, the Okinawa prefectural government explored the islands and erected a national marker. Since then, the islands have belonged to Okinawa Prefecture. After that, several attempts were made to develop the islands. However, all attempts failed

■Figure 1:  
Map of Minamidaito Island and major routes of typhoon by month



Solid lines indicate major routes, and broken lines indicate minor routes (Japan Meteorological Agency).

because the coasts of the Daito Islands are lined with precipitous rock walls of 10 to 20 meters, without shoals or coves, making it extremely difficult to disembark due to the high waves that roll in from the outer sea and beat the shore. Then, in 1900, a settlement team that was organized by Han-emon Tamaki, a wealthy merchant from Hachijo Island, that is located about 300 kilometers to the south of Tokyo and belongs to Tokyo, landed on Minamidaito Island, marking an important chapter in the history of settlement in Japan. After that, settlers were recruited from Hachijojima, and the island was developed as cane (a material for sugar) land, as it remains.



### ■Minamidaito Island

- Address: Minamidaito-son, Shimajiri-gun, Okinawa Prefecture
  - Location: 25° 50' N., 131° 14' E. (at the center of the island)
  - Perimeter: 20.8 km (5.78 km east and west, and 6.54 km north and south)
  - Area: 30.57 km<sup>2</sup>
  - Population: 1,417
  - No. of households: 647
  - URL: Minamidaito Village Office: <http://www.vill.minamidaito.okinawa.jp/index.html>
- (Source: Website of Minamidaito Village)

A large number of remote islands belong to Okinawa Prefecture and Tokyo. I had been working for the Hachijojima Weather Station in Tokyo until March 2003 before I was transferred to Minamidaito Island of Okinawa Prefecture in April. I felt nostalgic for Hachijo Island when I spotted some familiar family names in the telephone book, such as "Okuyama" and "Kikuchi," from Hachijojima, and also when I heard the sounds of Hachijojima drums and Okinawan folk songs at night from the Comprehensive Remote Islands Development Center, located next to the weather station. In addition, there are shrines, mikoshi (portable shrines), and edo sumo wrestling matches, which one rarely sees in Okinawa, so it could be said that the cultures of Okinawa and Hachijo Island have truly been fused on Minamidaito Island.

### Passengers are also lifted in by crane.

Minamidaito Island is a round uplifted coral island, and the highest elevation is only 75.8 m. A hilly terrain lies in the form of a ring around the perimeter of the island with a basin at the center. There are many freshwater ponds at the center, and their water levels are affected by sea tides like sea water levels. The island is in the oceanic subtropical zone, and also has meteorological characteristics unique to basin areas. The daily range of temperature is the greatest among the meteorological observatories under the jurisdiction of the Okinawa Meteorological Observatory and radiation fog also forms here.

Sugarcane is a key crop, with fields spreading all over the island, which is enclosed by windbreak forests around the perimeter. Each farm household has a relatively large field of more than 8.2 hectares, and large-scale management with the use of heavy machinery and assembly lines is established.

Even if a typhoon remains far from Minamidaito Island, swells make high waves. In such a case, ferries that carry daily commodities for islanders are cancelled. Because there is no pier where ships can touch down directly, commodities are hoisted from a ship by crane, as shown in Photo 2. Of course, passengers are also hoisted in order to get on shore. At present, a man-made fishing port is being built on the north side of the island by cutting deep into the limestone, with a section of the port opening provisionally in 2000. There is a splendid view of the manmade pier with its steep cliff of excavated limestone of about 20 meters in height (Photo 3).

### Typhoons bring both blessings and curses.

During the Kan-non Festival, which is a traditional event held on July 17th, people pray for the sound health of livestock, prosperity, and also rain. The production of sugar in Minamidaito Island fluctuates from year to year, and the



Photo 1  
High surging waves (by courtesy of the Minamidaitojima Local Meteorological Observatory's staff member)



Photo 2  
Loading and unloading at the port. Both passengers and cargo are hoisted with a crane. (by courtesy of Minamidaito Marugoto-kan)



Photo 3  
Minamidaito Fishing port (under construction) where 15 to 20 meter high limestone is excavated (by courtesy of Minamidaito Marugoto-kan)



Photo 4  
Building of the Minamidaitojima Local Meteorological Observatory (by courtesy of a staff member of the Minamidaitojima Local Meteorological Observatory)

lowest annual production of sugar is sometimes shy of one half of the highest annual production, due to damage caused by typhoons or droughts. The people, therefore, are most earnest in carrying out the ritual rites.

As there was little rain for a while after the end of the rainy season in 2003, the Minamidaitojima Local Meteorological Observatory announced on July 15th that this would continue and raised a caution about dry conditions. Sugarcane fields visible from the observatory turned yellow. The phenomenon of sugarcane leaves rolling inward (in order to control the amount of evaporation) worsened, and sugarcanes withered. We then started receiving many phone calls from farmers. They complained and asked us, "Make it rain!" However even forecasters could not meet these requests.

Under these circumstances, we can only hope typhoons will bring good rain to the island. Typhoons cause great damage because of wild winds, but they also bring us blessed rain. Typhoons bring both blessings and curses to Minamidaito Island.

### **The observatory is charged with a mission to protect the island against disasters.**

Meteorological observations in Minamidaito Island started in a meteorological station that was privately established by a sugar manufacturer in 1917. The meteorological station was placed under the authority of the then Central Meteorological Observatory (currently Japan Meteorological Agency) as an important national meteorological point in the Pacific Ocean, and started its service as the Minamidaito Meteorological Station of the Central

Meteorological Observatory on February 1, 1942. The operation of the meteorological station was suspended temporarily due to World War II, but was restarted because of its importance as a meteorological observation point. After the era under the Ryukyu Government, Okinawa was returned to Japanese administration and the meteorological station has been serving as the Minamidaitojima Local Meteorological Observatory ever since (Photo 4).

The Minamidaitojima Local Meteorological Observatory carries out surface meteorological observation, aerological observation and forecasting/alerting services round-the-clock as a governmental office for disaster prevention. In addition, in March 2003, the observatory started observation with the use of a wind profiler, which observes wind directions and velocity automatically in the air up to about five kilometers, and it is expected that typhoons and other meteorological phenomena will be analyzed three-dimensionally with the use of the wind profiler.

### **The Minamidaitojima Local Meteorological Observatory has its own song.**

The Minamidaitojima Local Meteorological Observatory has its own song, something rare for national meteorological observatories. Yoshinobu Nishihama, a researcher who specialized in the history of the island, wrote and composed this song in 1962, and he contributed it to the observatory. The song has long been enjoyed by the staff of the observatory. Though observation equipment and forecasting technology have improved drastically through the years, we will keep working to reduce meteorological disasters in "the spirit of observation," which is woven into the song. ■

#### **Minamidaitojima Local Meteorological Observatory Song,**

written and composed by Yoshinobu Nishihama

- 1. We are sending information on the meteorological conditions of the solitary island in the southern sea every second.  
Information through electronic waves contributes to a good harvest that all people hope.  
The Minamidaito Local Meteorological Observatory has the valuable mission.*
- 2. Although visited by many storms, we always stand firmly against storms.  
With all our efforts, our meteorological observation is free from misjudgment.  
We are proud of the Minamidaito Local Meteorological Observatory.*
- 3. After 30 years, we now have a white shrine of meteorological observation.  
Today also our radar keeps following sondes in the air above the island.  
The Minamidaito Local Meteorological Observatory forever.*

# Hakodate International Fisheries & Marine City Concept

## Yataro Numazaki

Vice Chairman, Promotion Committee for Hakodate International Fisheries & Marine City Concept and former Chairman, Committee of Hakodate Marine Science Innovation (Ship & Ocean Newsletter No.75 September 20, 2003)

**Hakodate, which developed as a town known for its northern-sea fisheries, shipbuilding, and the Aomori-Hakodate ferryboat, now aims at becoming an academic and cultural city as well as a world leader in marine science, making best use of its regional advantages with regard to fisheries and ocean affairs. "Our goal is to be known as an international marine city like Naples in Italy or Woods Hole in the U.S."**

### Regional advantages of Hakodate

Hakodate City is a regional hub city in the southern part of Hokkaido, surrounded by three different seas (the Pacific Ocean, the Tsugaru Straits and the Sea of Japan). Because the warm Tsushima Current and the cold Liman and Oyashio Currents flow into the surrounding sea areas, they form good fishing zones for squid, salmon, kelp, sea urchins and abalone, making the city famous in Japan for its large catches. As the city is surrounded by water on three sides, in comparison with other regions the ocean plays an important role in people's daily lives.

There are also a number of academic organizations related to fisheries and ocean affairs: the Graduate School of Fisheries Sciences & Faculty of Fisheries, Hokkaido University, which is a leading research and educational organization in fisheries and marine matters; the Future University-Hakodate, which gained national attention as a unique information-oriented university; Hakodate National College of Technology, which has been actively working on collaborative research with local private companies; the Prefectural Industrial Technology Center, which has been researching and promoting advanced technology in the biotechnology and aquatic food processing fields; and Hokkaido Hakodate Fisheries Experimental Station.

In addition, industries related to fisheries and ocean affairs are concentrated in Hakodate, such as the aquatic food manufacturing industry, which utilizes local marine products; the shipbuilding industry, which has the largest shipyard in the Tohoku and Hokkaido regions; and the related maritime machinery manufacturing industry. In particular, various squid processed products are produced in the southern part of Hokkaido in quantities larger than most other parts of the nation (shares of the domestic market: 23.7% of squid products, 37.5% of fermented squid products, 63.6% of dried squid, and 80.0% of smoked squid). Research and development regarding means for utilizing squid entrails and other items and for transporting live squids have been actively pursued through collaboration with industry, educational institutions and the government, making significant contributions to local industry.

In these and other ways, Hakodate City is advantageously located for conducting research, technological development, and projects related to fisheries and the



Sources of the concept: Hakodate's characteristics and advantages

oceans. Being blessed with tourist resources that include Mt. Hakodate, which is said to provide the world's best night view, historical buildings, exotic streetscapes, a wide variety of fresh marine products, and hot springs, Hakodate is also a city of national and international tourism, visited by five million tourists a year.

### Background of concept - creating a city with character

Though Hakodate City is a regional hub city in the southern part of Hokkaido, its population started to decrease from about the mid-1980s and the city faced a difficult economic situation due to lingering business stagnation after the collapse of the bubble economy.

As we are said to be entering a new age for regional centers in Japan, it is important to review the characteristics and advantages of Hakodate and cultivate them as part of its unique character, to differentiate it from other cities, and make it a place its citizens can take pride in.

With these goals in mind, the Committee of Hakodate Marine Science Innovation, which consists of 22 members from industry, educational institutions and government, was established in June of 2002, and the Hakodate International Fisheries & Marine City Concept was formulated in March of 2003 as a concept to enable Hakodate to make the best use of its unique characteristics and advantages. Scholars and specialists who are active in the front lines in

Tokyo, Nagoya, Shizuoka and other places have also attended its meetings.

**Hakodate: aiming to become a world leader in marine science**

The Hakodate International Fisheries & Marine City Concept is still in its infancy and long-term efforts are required. However, as the business world and local public have particularly large expectations for the concept, the Committee for Promotion of the Hakodate International Fisheries & Marine City Concept was established immediately after formulation of the concept.

In June of 2002, The Algatech Kyowa Seaweed Technology Institute of Seaweeds opened in the city as the first private organization to support the concept. The laboratory started joint research with the Graduate School of Fisheries Sciences, Hokkaido University. The Hakodate area was also selected for the implementation of the Ministry of Education, Culture, Sports, Science and Technology's project to promote government-industry-academia collaboration in a city area; and large-scale research and development for the utilization of local major marine products, kelp and squid, are now underway.

At the end of August, the city was designated as a "Marine Frontier technology research zone" by the national government. Until recently, regulations were stringent regarding the private sector's use of national research insti-

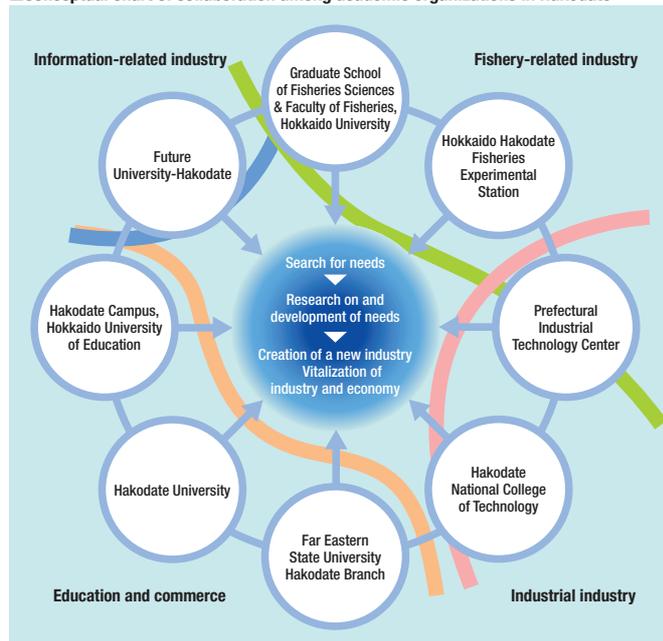
tutes and foreign researchers' stays, which obstructed research and development. However, due to the special zone designation, it has become easier for private companies to conduct joint research with the use of facilities in the Graduate School of Fisheries Sciences, Hokkaido University, and conditions for foreign researchers' stays have improved. For example, the period of foreign researchers' stays at the Graduate School of Fisheries Sciences, Hokkaido University, and Future University-Hakodate were extended, and foreign researchers are now allowed to engage in business activities.

The concept aims at creating an "international academic and cultural city with regard to fisheries and ocean affairs," utilizing the above-said unique characteristics and advantages of Hakodate. We want to make Hakodate an international ocean city that leads the world in marine science, like Naples in Italy, or Woods Hole in the U.S., by working on advanced, highly creative research, and by the development of innovative technology in cooperation with the local sector and academic organizations.

Through our efforts toward realization of this concept, we firmly believe that we will be able to contribute to the realization of "a nation based on the creativity of science and technology," at which Japan aims, to promote the creation of new industry, as well as to revitalize existing industry and the economy of the city.

For details of the concept, please visit our website. ■

■ Conceptual chart of collaboration among academic organizations in Hakodate



● Website of the Hakodate International Fisheries & Marine City Concept  
<http://www.marine-hakodate.jp/>

# The Present Status and Operating Structure of Central Japan International Airport "Centrair"

—Centrair is the aerial gateway for the "2005 World Exposition, Aichi, Japan"—

## Kunikatsu Yamashita

Senior Executive Vice President, Central Japan International Airport Co., Ltd.  
(Ship & Ocean Newsletter No.78 November 5, 2003)

The population and the shipment value of products manufactured in the Chubu area (consisting of nine prefectures) accounts for approximately one sixth of the population of Japan and one quarter of the shipment value of products manufactured in the country, respectively. The Chubu area has the strongest potential after the Tokyo and Osaka areas and its economic scale surpasses that of either Canada or Spain. The Central Japan International Airport (also known as Centrair) is now under construction as a 24-hour a day international airport in the Chubu area off the coast of Tokoname City, Aichi Prefecture, with an anticipated opening date of February 2005. The airport is conveniently located approximately 30 to 40 minutes from the heart of Nagoya City and preparations for its opening as a gateway connecting the Chubu area with the rest of the world are presently being made.

### 1. Mechanism of the Central Japan International Airport Project

Central Japan International Airport Co., Ltd. was designated as the entity to establish and manage the Chubu International Airport in July 1998, based on Article 4 of the Law Concerning the Provision and Management of the Chubu International Airport. Central Japan International Airport Co., Ltd. is a business corporation under the commercial law and it aims at (1) the establishment and management of the Central Japan International Airport, aeronautical navigation aids and functional facilities handling passengers and cargo, (2) the construction and management of stores and other facilities for the convenience of patrons, and (3) the carrying out of incidental projects. The total cost of the project is ¥768 billion and an investment and interest-free loan was provided by the national government, local autonomous bodies and the private sector for 40% of the total cost, while an interest-bearing loan accounts for the remaining 60%. The capital fund is ¥102.4 billion and the contribution rates of the national government, local autonomous bodies and the private sector are 40%, 10% and 50%, respectively. Private sector funds and management expertise are being actively utilized (Figure 1).

### 2. Progress of construction work

Shore protection work was delayed for about six months from the original schedule and commenced in August 2000, due to a delay in compensation for fisheries around the construction site. However, efforts are being made to

shorten the period of construction work by dividing the construction site into several sections for land reclamation work, and starting reclamation work first for the passenger terminal area - which requires more time for construction work - instead of starting on the construction of the passenger terminal building and others after land reclamation has been completed for the entire airport island. As a result, construction work for the passenger terminal building started in January 2002 and is scheduled to be completed in September 2004. The entire 470-hectare land reclamation for the airport was completed in February 2003, so construction work on the runway and taxiways commenced in the same month and is scheduled to be completed in the spring of 2004.

■Table 1: Airports used for overseas business trips in the Chubu area

Destination	Departure airports	Narita	Kansai	Nagoya
U.S.		59%	8%	33%
Europe		59%	8%	33%
Asia		15%	7%	78%
China		13%	13%	74%
Oceania		27%	8%	65%
Total		34%	8%	57%

### 3. Consideration of the environment

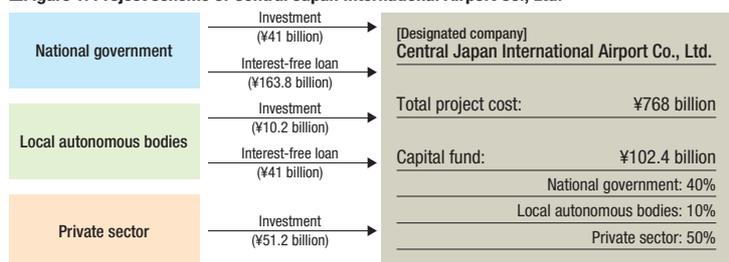
Among airport providers in Japan, Central Japan International Airport Co., Ltd. was the first to obtain ISO 14001 certification, the international standard for environmental management systems, in December 2000. In order to reduce environmental loads, the company is also working on the following:

Consideration of the sea environment: Taking the sea



The Chubu International Airport is presently under construction, and is scheduled to open in February 2005. (Photo taken on September 22, 2003)

■Figure 1: Project scheme of Central Japan International Airport Co., Ltd.



■Location of Central Japan International Airport



## The Present Status and Operating Structure of Central Japan International Airport "Centrair"

— Centrair is the aerial gateway for the "2005 World Exposition, Aichi, Japan" —

moted and construction methods that reduce construction costs without sacrificing reliability and the quality of construction work are being proposed and implemented by businesses.

For the total cost of the project, we now expect that a total of approximately ¥100 billion will be saved - ¥60 billion for land formation, ¥34 billion for lowered interest rates and ¥6 billion for the postponed provision of facilities. As for future construction work, we will make every possible effort to continuously reduce costs.

environment into account, curved lines were introduced into the configuration of the airport island, the width of the sea area between the airport island and the opposite bank was widened and round corners were introduced so that they would not impede currents.

Consideration of ecosystems: In striving for harmony with nature, sloped banks were employed as a base with the use of natural stones on the airport island. In addition, a rocky underwater forest of a 10-meter width was created for the west and south sides of the banks (approximately 6.5 kilometers) in consideration of marine life habitats. Furthermore, in order to take all possible measures to ensure environmental conservation, environmental monitoring is being conducted and the results publicized.

Consideration of aircraft noise: To reduce aircraft noise over land, the runway and flight paths were carefully laid out. It is estimated that any aircraft noise exceeding environmental standards will not reach beyond the sea area.

### 4. Introduction of universal design

We are aiming for a passenger terminal building based not only on barrier-free design, but also on the concept of universal design so that the facilities will be convenient for all users, regardless of age or disability. Toward this end, we organized a workshop on universal design and received various proposals from scholars and movement-limited groups in the community with which consulting contracts were concluded. In practical terms, routes for departing and arriving passengers will be provided on the one floor so the trouble of moving to other floors will be eliminated. Elevators will also be easily accessible to disabled persons and moving walkways will be provided.

### 5. Cost reduction efforts

Various efforts are also being made to reduce the cost of providing various facilities at the airport based on a policy of open and fair competition. Namely, consulting is to be provided by businesses that are familiar with building construction, the introduction of market prices is being pro-

### 6. Future issues

We have much to do after the opening of Centrair in order to improve air routes and increase demand for air travel. Table 1 indicates the results of a questionnaire that was conducted in the summer of 2002 by the "Council on the Promotion of the Use of the Central Japan International Airport," which consists of members from local autonomous bodies and economic circles, regarding "Airports used for overseas business trips in the Chubu area." The questionnaire was sent to about 60,000 business travelers from 300 companies in Aichi, Gifu, Mie, Shizuoka and Nagano in order to survey departure airports by destination. Nearly 60% of business travelers destined for the U.S. and Europe used Narita Airport, partly because there were few direct services from Nagoya Airport.

This year's (2003) actual performance of the current Nagoya Airport will greatly affect whether airlines introduce new routes or increase flights at the time of the opening of Centrair. Therefore, the Council on the Promotion of the Use of the Central Japan International Airport has launched a "fly Nagoya campaign" in order to increase demand for Nagoya Airport.

Each airline is most interested in how frequently local residents and companies use the airport, so we will continue to work positively toward increasing demand for air travel through these and other such activities in the future.

### 7. Conclusion

In the 21st century, the Chubu area is expected to play a pivotal, global role in advanced industrial technology and to become an area where diverse exchanges from all over the world will be actively encouraged.

We are aiming at the construction of a competitive international airport that is superior in convenience and in economic terms as a gateway connecting the Chubu area and the world, and hope to contribute to the development of a domestic and global air route network in the 21st century through the provision of attractive customer-focused services. ■

# FAO and "Ethical Issues in Fisheries"

**Hiomoto Watanabe**

*FAO Fisheries Department*

(Ship & Ocean Newsletter No.84 February 5, 2004)

**In the 21st century, it is necessary for us to go beyond the sole pursuit of economic and technological development and live in harmony with the global environment. The restructuring of ethics regarding the world's food problems is being demanded. The Food and Agriculture Organization of the United Nations (FAO), which has been addressing the world's food and agricultural problems as one of the United Nations' specialized agencies, is now grappling with "ethics in food and agriculture" in order to secure food security for humankind in the future, and the Fisheries Department has also started addressing "ethical issues in fisheries."**

## Food and Agriculture Organization of the United Nations (FAO)

The Food and Agriculture Organization of the United Nations (FAO), one of the United Nations' specialized agencies, is headquartered in Rome and was established in 1945 to tackle issues in food and agriculture. According to the FAO Constitution, the term "agriculture" includes fisheries and forestry, and the Fisheries Department is in charge of fisheries.

In the Fisheries Department, there are three divisions (Fishery Policy and Planning Division, Fishery Resources Division and Fishery Industries Division) and two units (Fishery Information, Data and Statistics Unit and Program Coordination Unit) under the Office of the Assistant Director-General, and their activities cover all fields of fisheries in the world. The Yearbook of Fishery Statistics, which is published yearly by FAO, is a valuable source of information on fisheries in the world<sup>1)</sup>. The State of World Fisheries and Aquaculture (SOFIA), which is similar to the Japan's annual report on fisheries, is also published biannually<sup>2)</sup>. Representatives concerned with fisheries from member countries attend the Committee on Fisheries (COFI), which is held biannually, in order to exchange various opinions and to make decisions on fisheries issues in the world. The committee has recently been working on prevention and elimination of illegal, unreported and unregu-

lated (IUU) fishing as an especially important problem. The Code of Conduct for Responsible Fisheries (hereinafter referred as "the Code")<sup>3)</sup>, which was adopted in 1995, is not legally binding, but is accepted by countries throughout the world as a "voluntary" code for all fisheries. The International Plans of Action (IPOAs) were developed within the framework of the Code in order to serve as instruments for each State and regional fishery body to tackle concerned issues in compliance with the Code such as the IUU fishing issue.

## Japan's Contribution to FAO

Japan is the second-largest donor after the U.S. and its contribution accounts almost for 20% of the total financial contributions to FAO. More than 35 Japanese nationals work at the FAO headquarters, including five who work in the Fisheries Department. Japan also provides financial resources for the Fisheries Department in the form of trust funds for special purposes, which are kept separate from the regular contributions. Trust funds are essential for the Fisheries Department's major activities that include the sustainable contributions of fisheries to food security, support for responsible fisheries, and fisheries management in consideration of ecosystems.

I work as a Fishery Liaison Officer in the Fishery Policy and Planning Division. While I am mainly in charge of the Secretariat for COFI, liaison with regional fishery bodies and NGOs, and the collection and provision of relevant information, I am recently assigned a new duty as a coordinator for "ethical issues in fisheries."

## FAO's Approach to Ethical Issues

"Ethics in food and agriculture" is one of the priority areas for interdisciplinary action, for which inter-departmental efforts are required among the Agriculture, Fisheries and Forestry Departments in FAO. The outcomes of their activities have already been published in three volumes of publications called "FAO Ethics Series", which are available through the FAO's website<sup>4)</sup>.

What are ethical issues in food and agriculture? In the FAO Ethics Series 1, "Ethical Issues in Food and Agricul-



FAO headquarters in Rome (Photo taken by the author)

ture,"<sup>5)</sup> the values of food, enhanced well-being, human health, natural resources and nature are listed as five ethical values to be considered by FAO. These ethical values now face several profound changes, such as drastic population growth, overexploitation of natural resources, frequent occurrence of human-induced "natural" disasters, industrialization and globalization of agriculture, economic imbalances and emergence of the new technologies such as biotechnologies and advanced information technologies. Heretofore, it has been possible for people to manage to feed themselves, even if they were poor, as long as there was land for cultivation. However, there is a concern that recent drastic changes may erode such traditional "safety nets." It has also been pointed out that the management of common resources traditionally shared by communities may be jeopardized. For instance, fisheries resources may be depleted due to the development of fisheries technology and consequent overcapacity, so that the existence of communities traditionally dependent on those resources may be threatened. There is also concern over the changing climate and the loss of biodiversity. The loss of biodiversity may lead the loss of cultural diversity and undermine people's rights to food security and the rights to determine their future. Therefore, the ethical issues in food and agriculture mean the challenges, in order to secure the ethical values, to fill the gap between needy countries and some wealthy countries, to create a world where everybody can equally share the benefits of food and agriculture in full consideration of cultural differences and the degree of globalization, and to seek the true food security by securing production, distribution, quality and safety of food.

### Ethical Issues in Fisheries

The Fisheries Department decided to elaborate the ethical issues particularly in fisheries. It is understood that the Code is the codes of "conduct" as well as "ethics" (the moral code) and therefore it is considered that the Code should be the starting point for further elaboration in the ethical dimension. "Responsible fisheries" mean, in a word, fisheries that realize sustainable development in consideration of, inter alia, the environment and future generations. "Responsible fisheries" imply various principles, such as the "sustainable development" and the "precautionary approach," which were highlighted in the United Nations Conference on Environment and Development

(UNCED) held in 1992.

I think that Japanese fisheries are highly "responsible fisheries" in general. In particular, traditional coastal fisheries, which have utilized limited fishery resources over generations, can be considered as typical cases of responsible fisheries. The traditional coastal fisheries management in Japan has been conducted mainly by fisheries cooperatives within fishing communities in a voluntary manner. Such voluntary fisheries management by fishers themselves would be, indeed, the responsible fisheries practice, which the voluntary "Code" calls for, and could be a model of an idealistic shape of fisheries, toward which the ethical pursuit should be directed<sup>6)</sup>.

In the 20th century, economic principles were given more priority than any other principles. As a result we, human beings, may have overstepped a certain limit, which we should not. In the 21st century, we should control ourselves more appropriately and live in harmony with the global environment rather than simply pursuing the development of economy and technology. Ethics can provide the wisdom to meet that end. I have a certain presentiment that the 21st century will become "the century of ethics", where the reestablishment of ethics being demanded not only in fisheries, but also in all aspects of the human activities. ■

●The opinions expressed in this article reflect those of the author and not of the organization to which the author belongs.

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# Comprehensive Reappraisal of the U.S. Ocean Policy is Underway

**Donald F. Boesch**

*President, Center for Environmental Science, University of Maryland  
(Ship & Ocean Newsletter No.84 February 5, 2004)*

**Two national commissions are making recommendations for redirecting United States ocean policy. The privately-supported Pew Oceans Commission has already released its report and the Presidentially-appointed U.S. Commission on Ocean Policy will issue a report in early 2004. While the scope and political perspectives of these commissions differ, their key recommendations will nonetheless stress stewardship and sustainable resource use. The commissions identify the need for improved ocean governance through coordination across federal agencies and vertically through national, state and local government. They endorse ecosystem-based management of fisheries and other human activities and watershed-based approaches for managing land-based activities that affect the coasts and oceans. The commissions recommend doubling of the U.S. investment in ocean science and technology and particularly in an Integrated Ocean Observing System. Finally, the commissions also stress the importance of education of the public about the ocean, including how humans affect the ocean and how the ocean affects our lives. Although the degree to which the commission recommendations will be implemented is uncertain because of the dominance of economic, social and national security issues in this election year, the two commission reports present an unprecedented impetus for significant changes in U.S. ocean policy.**

Early in 2004, the United States Commission on Ocean Policy (<http://www.oceancommission.gov>) will issue its long awaited report to the President and Congress as mandated by the Oceans Act of 2000. The Commission undertook the first comprehensive reconsideration of U.S. policies related to the ocean since the Stratton Commission released its landmark report "Our Nation and the Sea" in 1969. Chaired by retired Admiral James D. Watkins, former Chief of Naval Operations and Secretary of Energy, the Commission consists of 16 distinguished individuals appointed by President Bush and held fact-finding meetings throughout the U.S. during 2001-2002.

In May, 2003, the Pew Oceans Commission (<http://www.pewoceans.org/>) released its own report making recommendations for a new U.S. ocean policy. The Pew Commission had a somewhat narrower focus than the U.S. Commission, concentrating on living resources, including the fisheries and natural biodiversity of American seas. This non-governmental commission was sponsored by a private foundation prior to the passage of the Oceans Act of 2000 and was chaired by former Congressman and White House Chief of Staff Leon Panetta.

Although the Pew Commission is perceived to have a more activist agenda particularly with regard to fisheries management and marine reserves, presentations made by Admiral Watkins and other members of the U.S. Commission suggest that there will be many similarities in the key recommendations of the two commissions that will undoubtedly influence future U.S. ocean policies. While the earlier Stratton Commission saw the ocean as a vast frontier to explore and exploit, the present commissions

very much emphasize the limits of the oceans and the urgent need to protect and sustain their finite resources.

The U.S. Commission will recommend a new model for ocean governance that will seek to align and coordinate the many disparate, confusing and single-issue governance tools. It will recommend an integrated structure that: (1) treats ocean resources as parts of ecosystems and uses proactive, adaptive management methods; (2) is based on principles of stewardship incorporated through private-public partnerships; (3) integrates government structure both horizontally (across agencies) and vertically (federal to state to local); and (4) enables more consistent participation by stakeholders and experts. The U.S. Commission will recommend a high level National Ocean Council to better organize and coordinate national efforts. The Pew Commission also called for a permanent interagency Ocean Council, but goes further to recommend an independent oceans agency.

Both Councils will strongly endorse adoption of ecosystem-based strategies to improve management of fisheries and other human uses of the coasts and ocean. The U.S. Commission recognizes that application of ecosystem-based management will require defining geographic management areas based on ecosystem, rather than political, boundaries. The Pew Commission goes further in calling for Regional Ocean Ecosystem Councils and a national system of marine reserves. It also recognizes that because of the limits of natural fishery resources there will be increased reliance on aquaculture, but argues that marine aquaculture must be environmentally compatible and sustainable.

Both commissions will note that while considerable progress has been made in controlling ocean pollution, major challenges remain, particularly with regard to non-point source pollution by nutrients and toxic contaminants. Both commissions will also stress the need to better manage the rapid population growth and development of U.S. coastal areas, including nonpoint source pollution and damage to critical habitats. More effective governance mechanisms and redirection of governmental programs and subsidies away from harmful coastal sprawl development and toward beneficial development and restoration will be required. Interestingly, both with regard to nonpoint source development and land development, the commissions both will emphasize the need to align national policies regarding agriculture, energy consumption, air quality, transportation, and other land-based activities with national ocean policy. Management of coastal zones and seas must include a watershed perspective. "The Gulf of Mexico begins in Minnesota," Admiral Watkins is fond of saying.

The U.S. Ocean Commission will make a strong case for a significant increase in the national investment in science and technology. It notes that the federal investment of approximately \$650 million annually on basic and applied ocean research has remained stagnant for the past 20 years when adjusted for inflation. Federal ocean R&D has decreased from 7 percent of the total R&D budget in 1982 to about 3.5 percent today. Both commissions, in fact, will call for a doubling of U.S. ocean science and technology funding. While both commissions stress the need for environmental monitoring and ocean observations, the U.S. Commission is expected to advance a very strong endorsement of a sustained, Integrated Ocean Observing System (IOOS). The U.S. IOOS would integrate a network of regional coastal observing systems that serve local ecosystem-based management needs and diverse users with the global observations made by U.S. agencies for weather forecasting and climate assessment. The U.S. IOOS would also serve as the link with the many contributing international partners in the Global Ocean Observing System (GOOS).

Both the U.S. and the Pew commissions will also stress the importance of ocean education at all levels in order to improve the understanding and appreciation of the ocean by American citizens and to train the next generation of scientists and managers needed for effective ecosystem-based stewardship of ocean resources. Both commissions see the need for greater ocean literacy as a requirement for the broad public support required for restoring and sustaining the oceans. The U.S. Commission, for example, is



crafting recommendations for training school teachers in ocean science, incorporating ocean science into national education standards, fostering better communication between educators and scientists, capitalizing on ocean exploration as an inspirational tool, and enhancing informal education through marine aquaria, zoos and museums.

The two commission reports are the most thorough and comprehensive reassessments of ocean policy ever undertaken, certainly in the United States and perhaps in the world. Although 2004 is an election year in the United States and citizens and political leaders are focused on other important economic, social and national security issues, the reports will certainly have major influence on national ocean policy. Congressional actions on many important elements of the policy, including reauthorization of federal fishery management statutes, are on hold pending the release of the report of the U.S. Commission on Ocean Policy. Furthermore, the reports will undoubtedly provide many recommendations that will be implemented during the next Presidential term of office. ■

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# The Challenge of Hachinohe, an Ocean City

## —Toward creation of a resource recycling-based community—

**Toshifumi Nakamura**

*Mayor of Hachinohe City*

(Ship & Ocean Newsletter No.85 February 20, 2004)

Hachinohe City formulated its "Ocean City Plan" in 2003, in order to make not only the port area, but also the whole city more attractive and vibrant by fully utilizing the appeal of the ocean. "Aomori Eco-Town Plan" and "Hachinohe Recycling Port," which have been promoted as core projects for creating a recycling-based community, as well as efforts for new energy projects, etc., are as follows.

### **Borne of the sea, Hachinohe looks to sea for development**

The sea near Hachinohe abounds with treasures. The scenic Tanesashi Coast where natural turf and precious coastal plants grow was selected as one of 100 notable coasts in Japan with white sand and green trees. Kabushima Island is a national monument and designated as a breeding ground for black-tailed gulls. The Port of Hachinohe is blessed with fresh and delicious seafood such as sea urchins and abalone. Its fish haul is greater than many other ports in Japan and its catch of squid is the largest in Japan. A number of companies with advanced recycling technology are located mostly in waterfront industrial areas and form the largest industrial concentration in the northern Tohoku area. The Port of Hachinohe plays an important role in economic activities as the largest base for international container trade in the northern Tohoku area. All of these are Hachinohe's treasures and come from the sea, making the city famous throughout the country.

Taking as its philosophy, "Borne of the sea, growing with the sea," Hachinohe City formulated its "Ocean City Plan" in March 2003 to make the port area and the entire city more attractive and energized by fully utilizing the appeal of the ocean.

In December 2002, Hachinohe Station on the Tohoku Shinkansen Line opened and since then Hachinohe Yatai Village - which is well known as a "slow food" mecca - and other tourist centers have combined local cuisine with the use of fresh, abundant food from the ocean and mountains to attract local and national attention in tourism circles.

### **Hachinohe's challenge of zero emissions**

After Hachinohe City was designated as a new industrial city in 1964, its industrial infrastructure was reinforced, and basic material-related and life-related industries involving paper, pulp, steel, nonferrous metals, smelting, and food concentrated mostly in waterfront areas. The shipment value of manufactured products was approximately ¥430 billion in 2000, roughly one third of the prefectural shipment value of manufactured products, and the city has become the largest industrial area in the northern Tohoku area.

Against this background, the "Aomori Eco-Town Plan,"

which was approved by the Ministry of Economy, Trade and Industry, and the Ministry of the Environment in December 2002, has been promoted as a core project for creating a recycling-based community. The plan aims at the complete elimination of emissions through technology that has been built up over many years in the smelting and other basic material-related industries for the complete separation of metals from other materials, along with technology to remove dioxins and other toxic substances from waste.

An example of this recycling project is the scheme for complete recycling that has been initiated by the following three companies. Facilities for recycling incinerated ash and scallop shells were established in the Hachinohe plant of Pacific Metals Co., Ltd., where waste scallop shells collected in Aomori Prefecture and ash incinerated in Hachinohe City are mixed and melted in order to produce fish banks and manmade gravel. The resulting fly ash discharged from the plant and also from Tohoku Tokyo Steel K.K. is then received by Hachinohe Smelting Co., Ltd., which collects lead, zinc, cadmium and other metals from the fly ash and produces slugs, which are used as cement material. Through this process, the project is intended to establish a system that does not discharge any industrial waste in the region.

In addition to the Aomori Eco-Town Plan, the Port of Hachinohe was designated as a Recycling Port by the Ministry of Land, Infrastructure and Transport in April of 2003. We can therefore expect that infrastructure will be improved for the creation of new industries in the environmental and recycling-related fields.

### **Project for making water flow into electricity: Special district project for new energy**

In addition to the promotion of the Aomori Eco-Town Plan, the city has also been working hard on new energy systems. In particular, "an experimental study on local new energy sources" was entrusted to the New Energy and Industrial Technology Development Organization (NEDO) and approved in May 2003 as a special project in the special zone for the creation of environmental and energy industries in Aomori Prefecture. The study has been drawing considerable national attention.

The project is designed to generate electricity and heat

with the use of methane gas generated from wastewater and sludge at the sewage treatment plant in the eastern part of Hachinohe City, to supply electricity by private cables to nearby elementary schools, junior high schools, the city government office, and the water supply authority, and to utilize the generated heat to promote fermentation of wastewater and sludge. As discharged sewage sludge is used to supply electricity to the water supply authority, which supplies clean water, the project is called "a project for making water flow into electricity." This is a leading-edge project with photovoltaic power generators and windpower generators established at the sewage treatment plant, the elementary schools, the junior high schools and the city government office, with a number of natural energy systems being combined. This is also the world's first microgrid project (self-supplied power system) and takes advantage of the partial deregulation of the Electricity Utilities Industry Law. The system will begin operating in 2005, and various experimental studies on system control, the assessment of the quality of electricity, and other facets of the actual performance of microgrids are planned to be conducted in the five years to 2007.

### Efforts for offshore windpower generation

Hachinohe City has been actively working on the creation of new industries and communities in harmony with the environment through the introduction of new energy, such as the implementation of NEDO's project for establishing a "new energy vision" at the local level in 2003. The city has been focusing particularly on windpower generation.

In order to explore the possibilities of offshore windpower generation in the region as a project in 2003, the city entrusted the Research Institute for Ocean Economics to conduct a feasibility survey on offshore windpower genera-

tion in Hachinohe. At present, the city is preparing a proposal for a schedule for (1) the understanding of the conditions of coastal waters in the use and characteristics of wind, (2) a study on infrastructure, including the size and layout of facilities and the connection between electrical lines and systems, (3) a questionnaire survey among the private sector and others, (4) identification of legal, technical, and environmental issues, and (5) a study on an implementation system and commercialization.

In addition, in order to commercialize offshore windpower generation, a society consisting of industry, educational institutions, the government, and the private sector in the region was established in August 2003 for the study of offshore windpower generation in Hachinohe. To date, the society has held two meetings and has been conducting a feasibility study on the selection of a suitable site, a study on the awareness of businesses and a study of an allocation system.

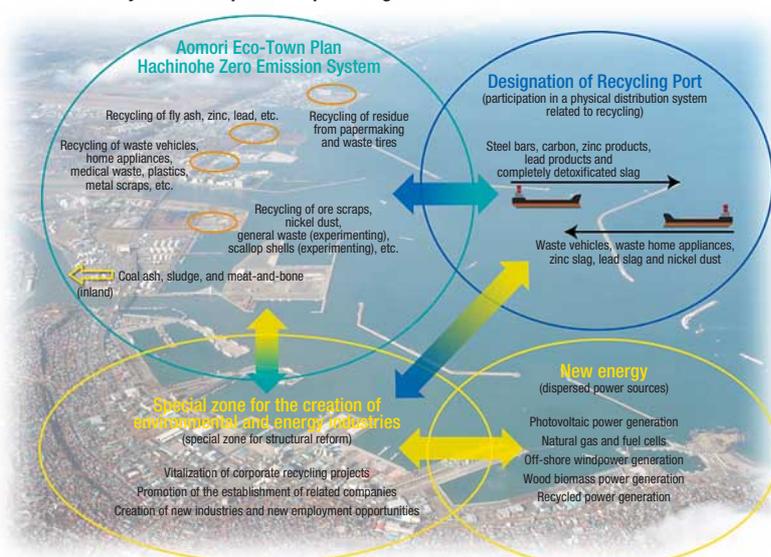
With initiatives such as these, the city is promoting "the concept of natural energy generation at the Port of Hachinohe" with an emphasis on offshore windpower generation as the symbol of a city blessed by the ocean. With regard to the use of newly-generated electricity, the city plans to conduct investigations and research on the use of electricity for port facilities, such as lighting in open spaces and waterfront areas, the lighting up of bridges, the supply of electricity for plants and refrigerating chambers for seafood processing in waterfront areas, and the generation of hydrogen for fuel cells.

### Toward the creation of a resource recycling-based community

Owing to the wisdom and efforts of our ancestors, Hachinohe City has developed into the hub city of the northern Tohoku area, as the foremost industrial center, as a major

base for land, sea, and air transportation with the introduction of the newly opened Tohoku Shinkansen Line, and as a provider of various urban functions for a wide area. I believe that it is the responsibility of the current generation to further improve such industrial concentration and urban functions, and to hand down to the next generation a rich natural environment of seas, mountains, and rivers, as well as a tradition and culture that have been carefully protected and nurtured. With "a city blessed by the ocean" as one of its slogans, Hachinohe City would like to continue to make every possible effort to promote environment and energy-oriented projects in the future.

■Hachinohe City's industrial promotion plan using the sea



# Pearl Culture and the Biological Environment

**Shigeru Akamatsu**

*Counselor, Japan Pearl Promotion Society*

(Ship & Ocean Newsletter No.86 March 5, 2004)

Japan dominated the world's cultured pearl industry for many years, but in recent times that state of affairs is changing rapidly. Though the rapid globalization of the pearl industry can be considered as one of the reasons, the primary cause is the deterioration of pearl farms caused by the occurrence of harmful red tides and the massive mortality of Akoya pearl oysters due to an infectious disease. Such phenomena relate not only to pearl culture, but also to BSE, carp herpes, avian influenza, etc., and may be the price paid for not treating animals as living creatures, in the pursuit of economic efficiency, as well as for incessantly changing the natural environment for the expansion of production.

Japan has long dominated the world's cultured pearl industry since pearl farming technology was developed some 110 years ago. However, this dominance is being undermined as the quantity and quality of cultured pearls produced in China, Indonesia, the Philippines, Australia, and Tahiti increases along with the globalization of pearl culture. There is also another reason that should not be overlooked: the drastic decline of Japan's own pearl industry. This relates to man-made disasters caused by the deterioration of pearl farms and the massive mortality of Akoya pearl oysters due to infectious disease. These phenomena may be the price paid for not treating animals as living creatures, in the pursuit of economic efficiency, as well as for incessantly changing the natural environment for the expansion of production. On this occasion therefore, I would like mainly to discuss pearl culture and the biological environment.

## 1. The present status and problems of cultured pearls

As mentioned above, pearl culturing technology developed approximately 110 years ago and eventually grew into

an industry. In particular, after World War II, cultured pearls played an important role as export products that earned precious foreign currency. Before long, pearl culture spread to China, Australia and Tahiti, and due to its globalization intense competition began. As a result, Japan's freshwater pearls and black pearls were forced to withdraw from the market as they were exposed to intense global competition with China and Tahiti. Even Akoya pearls, which once dominated the world market, are now being threatened by the Chinese industry. To make matters worse, production dropped to one third of previous levels due to the massive mortality of Akoya pearl oysters in Japan, which continues due to the occurrence of harmful red tides and infectious disease. We now find ourselves as the world's greatest importer of pearls.

It somehow seems that Japan's pearl industry has entered a period of decline, though more detailed analysis reveals common patterns in pearl history irrelevant to the types of Akoya pearl oysters or pearl farming areas. Whatever the circumstances, pearl culture undergoes technological invention, increased production due to technological innovation, quality degradation caused by deteriorated pearl farms and the massive mortality of Akoya pearl oysters, intensified global competition, and decline. At first, technology is invented and technological invention brings about an industry. When technological innovation occurs, production increases drastically and surpasses the production capabilities of pearl farms. Production continues to increase until reproduction becomes impossible. Akoya pearl oysters cultivated in pearl farms under such conditions will naturally become unsustainable because they are living creatures. As a result, harmful red tides that were never seen before suddenly occur, or a new disease that cannot be overcome breaks out. They result in abnormalities or the wiping out of Akoya pearl oysters and a situation where pearl farming cannot be performed on a continuous basis.

Infected Akoya pearl oysters develop a disease when water temperatures are high in summer, farming is con-



Akoya pearl oysters are put into a nylon net for cultivation. Pearl farming in the sea must respond promptly and precisely to ever-changing sea conditions that include typhoons, red tides and low temperatures in winter. (Photo: Japan Pearl Exporters' Association)

gested, or other stresses are added. They probably developed a disease on the last occasion when the resistance that had protected them in the past collapsed under the pressure of stresses being continuously added on a daily basis. This phenomenon has also occurred among other animals, like carp herpes that broke out in Kasumigaura. The case of Akoya pearl oysters being infected in Ehime strangely overlaps with that of carp contracting herpes in Kasumigaura. With respect to BSE, carp herpes, avian influenza and other present-day ubiquitous global problems, I can't help feeling that living creatures that have been forced to produce by humans have started to exact revenge on us. What do you think?

## 2. The future of pearl culture

There are several issues regarding the future of pearl culture. I would next like to outline three of them. The first issue is that the value of cultured pearls as jewels should be maintained. Unfortunately, due to the recent popularization of cultured pearls, there is a school of thought that "as long as they sell, anything will do". Once low-quality, low-priced cultured pearls start selling, they will be mass-produced in the extreme without consideration for the natural environment or living creatures. The time has passed when pearl farms and Akoya pearl oysters were innumerable. It is necessary to use limited resources efficiently, and to switch to a system that produces cultures pearls of a high quality in small amounts.

The second issue is that the pearl industry should break away from "a labor-intensive industry" to "a technology-intensive industry." The industry's previous measures were utterly ineffective against the new infectious disease, so the delay in its initial response resulted in extensive damage. In the case of cows, carp, chickens, ducks, masked palm civets and any other animals, they are instantly disposed of when infected. Unfortunately, such a measure was not taken for pearl culture in the initial stage, so the infectious disease spread quickly across the country. In addition, many pearl cultivators imported a large amount of Akoya pearl oysters from China and cultivated hybrid Akoya pearl oysters crossed with Japanese Akoya pearl oysters because they heard a rumor that some Akoya pearl oysters from China had a strong resistance to infectious disease. Therefore, it is now feared that even pure Japanese Akoya pearl oysters may become extinct. It was discovered that our previous experience and instincts are totally useless for harmful red tides and infectious disease. Unless there is a shift to pearl culture backed by scientific methods, we will



A healthy Akoya pearl oyster (above) and an infected Akoya pearl oyster (below): The ligament of the infected Akoya pearl oyster (below) changed its color into reddish brown. Soon the whole muscle will be damaged and the oyster will die. There were no effective countermeasures against this infectious disease, which occurred eight years ago, and so Japan's cultured pearl industry was decimated.

not be able to respond to unexpected incidents in the future.

The third issue, "harmony between the pearl industry and ecosystems" is the most important. From now on, the industry should not simply be prioritized, but thought as to how consideration should be given to the environment becomes crucial. In practical terms, it is necessary to thoroughly manage pearl farms by accurately understanding their production capacity in order to avoid congestion, and by preventing the deterioration of pearl farms caused by the shortage of food and oxygen, as well as the generation of hydrogen sulfide. It is also necessary to scientifically understand changes in sea conditions and to establish a system for predicting red tides so as to prevent damage. As for Akoya pearl oysters, healthy Akoya pearl oysters should be produced. In order to do so, it is necessary to analyze superior Akoya pearl oysters at the genetic level, to store superior species with the use of frozen sperm and to establish technology for producing Akoya pearl oysters through hatchery system. It is also necessary to respond to infectious diseases promptly by prohibiting the import or by burning infected Akoya pearl oysters. Crossing with foreign species must be avoided, and as each pearl cultivator cannot respond to all of these issues independently, the local sector and unions should cooperate in addressing these issues.

Japan's pearl culture is now at a turning point. It may completely break away into a technology-intensive industry and make another leap forward, or it may keep its conventional methods, lose to global competition, and fall into decline. ■

# New Evolution in Oceanic Research through Bio-logging

—Mysteries of the ocean solved by its inhabitants—

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(Ship & Ocean Newsletter No.89 April 20, 2004)

Oceanic research has progressed with the research and development of tools for making observations and understanding phenomena in the deep sea. Dynamic oceanographic observation has become possible by research and survey vessels and various types of observation equipment. In addition, it has become possible to keep abreast of environmental changes that may occur during the tracking of the movements and migration of creatures living in the sea by applying newly developed bio-logging technology.

## Marine research: out of ignorance

The ocean is a cradle and treasure house of living creatures. Two thirds of the earth's surface is ocean, which is mostly several thousand meters in depth. The gigantic water mass of the ocean has greatly affected the global environment and human life. People have also been making use of the ocean since ancient times for transportation and fisheries and humankind has long been accumulating knowledge about ocean currents, meteorological conditions and living creatures. Recently, our knowledge has increased through scientific research, but asked if this knowledge extends equally across all fields of marine science, the answer must be no. The ocean is a gigantic three-dimensional space where many marine-related phenomena undergo momentary changes and there remains a big issue as to how changes and fluctuations in this space should be understood.

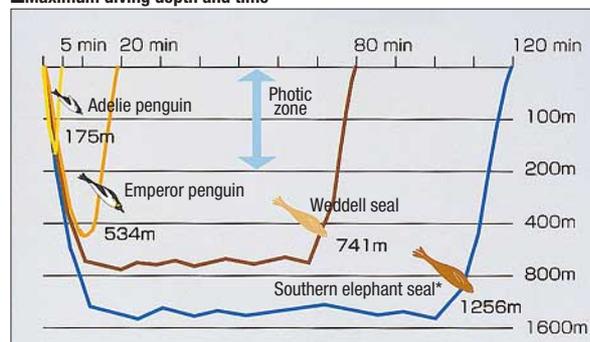
In marine research, how the ocean should be viewed as a world of its own is a significant issue. The interior of the water mass cannot be seen through, but stars in the universe can be clearly seen, like when we say, "It's like stardust." This difference between outer space and the ocean greatly affects our way of thinking. The starlit sky can be seen by everyone, and the universe provides us with many dreams and inspires an adventurous spirit. The deep ocean does not give us any dreams or inspire such a spirit. Living creatures in the ocean are described as devils or monsters. Those dreams and an adventurous spirit will create inquisitive minds for the future. However, the black abyss of the ocean

hardly inspires an inquisitive, futuristic mind with dreams or an adventurous spirit. In this way, one may say that marine research did not begin in search of an unknown world, but rather started out of ignorance. Of course, a quest for the unknown was steadily pursued in marine research, with fragmentary documents introduced from time to time about living creatures guiding us into the world of the unknown.

## Technology of seeing through the ocean

Just as development research on telescopes and other subsequent tools has been important for space research, the development of tools has been important for marine research as well. In particular, tools for collecting were indispensable during the early stages of marine research. However, new tools were needed in order to look into the deep ocean or to catch dynamic phenomena, and in recent marine research various ultrasonic tools have played a major role. At the same time, people dreamed of diving by themselves in order to see through the ocean directly. As for modern tools, there is scuba diving equipment as well as manned and unmanned submarines and great progress has been made in the world of the ocean through equipment. Of course, there is also innovative observation equipment for various research and investigation vessels. Later, offshore exploration and research entered the era of fully-fledged dynamic observation with the use of various unmanned buoys, followed by the era of monitoring observation for the monitoring of the global environment.

■ Maximum diving depth and time



\*The latest record indicates that the maximum diving depth of southern elephant seals is 2,000 meters.

## Bio-logging technology

However, all of this was insufficient in seeing through the water mass of the ocean. In particular, when creatures travel (unfortunately, most of the creatures in the sea do travel), it is difficult to track them. It is almost impossible to keep track of creatures and environmental changes and things that may occur during the tracking of their movements and the migration of creatures in the sea. Because of this, new tools were necessary, and for this purpose bio-logging technology was invented. Bio-logging is a method of obtaining data by mounting a small recorder on the body of an animal, monitoring the animal's behaviors and the

environment around it, and collecting the device or wiring information. The method was originally developed in order to conduct research on the diving behaviors of seals, penguins and sea turtles, and the device was called a time depth recorder (TDR). For this method, recorders need to be collected, so the method was developed for penguins and seals who invariably return to their habitats. Research with the use of the time depth recorder revealed that seals and penguins dive much deeper than imagined and discovered the strange behaviors of animals that were found to dive deep. For instance, southern elephant seals dived to depths of 2,000 meters for two hours, emperor penguins dived to depths of 530 meters for 20 minutes, Weddell seals dived to depths of 740 meters for 80 minutes, and Adelie penguins dived to depths of 175 meters for five minutes. Even leatherback sea turtles, which are ectothermic reptiles, dived to depths of 1,000 meters or more for one hour. This obviously raised various questions such as, "Why do they need to dive that deep?" and "Why can these animals, which use lungs to breathe in air, dive that deep for long periods of time by only holding their breath?"

In the 1990s, equipment was further digitized and downsized, and its capacity was increased and multichannels were provided. Miniaturization is the most important technological issue for this research in order to reduce the load of equipment and the impact of the equipment on animals. It became possible to detect minor movements, postures and three-dimensional locations of animals, and to know about animals feeding underwater, as well as the migration and movements of the animals while they feed with the use of accelerated velocity and geomagnetic sensors, meaning that many things were revealed. These animals dived all the way to cold and dark intermediate and deep water in order to feed, past marine surface layers where it was believed that there was abundant food for them because there were various phytoplanktons there. Because of that, their ways of diving are unique. It also revealed that animals do all kinds of things to save their kinetic energy. For instance,

one seal sank itself down without making a movement when it dived, and penguins accelerated and surfaced without flapping their wings. There are a great many high-level predatory animals that rely on marine production, however, and strangely enough, 30% to 40% of high-level predatory animals have feeding grounds in deep water like this. Our next questions are, what do they eat and how is their food distributed?

Our next tool is an image logger. Images show exactly what underwater animals and animals moving through the environment see. They expose us to the world of the black abyss of the sea for the first time. Through these tools, the diving habits of a seal that lives in the Antarctic icy seas and its feeding environment were revealed for the first time. This seal dived quietly toward the bottom of the sea in a straight line, swam slowly near the bottom and picked off *Pleuragramma antarcticum* and other small fish one by one. Seals do not have to hunt big fish in the deep, dark sea, so they dive many times and move their feeding places little by little each time they dive.

### From ignorance to the unknown, and a new marine world

Greatly benefitting from digital technology, bio-logging technology is about to enter an age of new development. Animals that move deep vertically, or migrate horizontally in a wide area provide oceanographic platforms. At the same time, animals themselves can act as marine sensors. Animals make a selection for their existence by obtaining information on minor changes in the sea and marine environment. Different from conventional ways of exploring the ocean, it is greatly anticipated that bio-logging will reveal new aspects of the ocean to us in the future. With information provided by animals as a guide, we must further explore the unknown - a journey we began out of ignorance - to discover a new ocean, as well as ways to protect the marine environment where people and animals can co-exist. ■



King penguin with a data logger mounted



A camera caught a Weddell seal at a moment when it was feeding at a depth of 315 meters.

# Sakhalin Oil Development and Countermeasures for the Prevention and Combating of Oil Spill in Japan

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(Ship & Ocean Newsletter No.90 May 5, 2004)

**Worst-case scenarios for accidents involving the Sakhalin oil development have been examined and necessary countermeasures adopted at the national level for possible impacts on the environment and disaster prevention. However, it is still considered necessary to collect useful information, establish necessary institutional systems and organizations, implement studies and training and to actively work on reviews regarding each of these, while not being complacent that these countermeasures are sufficient and with a basic conviction that "large-scale oil spill accidents will inevitably occur."**

## 1. Japan's oil spill countermeasures

In the recent history of disasters caused by oil spill accidents in Japan, the Nakhodka oil spill accident of January 1997 is worthy of special mention. The accident received considerable attention from the public at the time and had a great impact on the way subsequent oil spill accidents were responded to. It was an important issue for the then national government to identify problems in responding to this accident and to make efforts toward the prevention of a similar occurrence. As countermeasures thought necessary, the following were identified and those that could be adopted were:

### Major countermeasures taken after the Nakhodka accident

- \* Promotion of port state control (PSC) and the provision of double hull tankers as countermeasures to prevent reoccurrences

- \* Establishment of a government system for quick responses, the provision of materials and equipment for the prevention and combating of oil spill and large oil recovery vessels for use on open seas

- \* Establishment of a system for efficient responses in cooperation with related countries and the implementation of joint training with the North-West Pacific Action Plan (NOWPAP) for the establishment of an international cooperative system for the prevention of marine pollution

## 2. Current status of countermeasures for the prevention and combating of oil spill from the oil development off the Sakhalin coast

With regard to the development of oil resources on the continental shelf off the Sakhalin coast of Russia, approximately nine projects are underway. Of these, the Sakhalin II Project began commercial production of crude oil in July 1999. Because no crude oil has ever been produced on a large scale near Japan, those related to fisheries and other industries in Hokkaido near the site of production are deeply concerned about domestic damage that might be caused if an oil spill accident occurs.

On the other hand, the operating body of the project, Sakhalin Energy Investment Company Ltd.(SEIC), formu-

lated "an Oil Spill Contingency Plan" to respond to oil spill accidents that may occur near its facilities. Though the plan does not take into account oil spill accidents that may affect Japan, the Japanese government has been making efforts to deepen the relationship between related organizations and the project operator, to collect information and to take the following measures in preparation for accidents like the Nakhodka oil spill, in which stormy weather made response difficult.

### Japan Coast Guard's major countermeasures for the prevention and combating of oil spill with regard to the Sakhalin II Project

- \* "A liaison conference with related ministries and agencies with regard to preparation for, and response to oil pollution incidents" that comprises related government organizations ("the liaison conference" hereafter) is to be held as the need arises.

- \* In the liaison conference held in February 2000, mutual agreement ("the agreement" hereafter) was obtained with regard to "related government organizations' concrete preparation for, and response to oil spill accidents in the production facilities of the Sakhalin II Oil Development Project." The agreement was subsequently revised.

- \* In May 2000, "countermeasures for oil spill accidents in the oil fields off the coast of Sakhalin" were added to "Regional Contingency Plan for oil spill in coastal waters near Hokkaido" in accordance with the law.

- \* Large equipment for collecting spilled oil was placed mainly in the First Regional Maritime Safety Headquarters by the end of 2000.

- \* In July 1996, a liaison was set up among the First Regional Maritime Safety Headquarters of the Japan Coast Guard, other Japanese government organizations, and State Marine Rescue Co-ordination Centre, Moscow.

- \* In 2001, joint training in preparation for a major accident of oil spill from facilities related to the Sakhalin oil fields was implemented, and cooperation for training will be continuously made in the future.

At present, a system is being established to provide information from SEIC to relevant government organizations and others on a step-by-step basis when oil is spilled from

related facilities into the sea - even if only a single cup of oil is spilled.

### 3. Further development of the Sakhalin Project

As mentioned above, only the Sakhalin II project currently produces oil on a commercial basis. In the future, it is expected that both the Sakhalin I and II Projects will be developed further.

Of the activities related to crude oil development which are cause for concern, production is planned to start from the end of 2005 under the Sakhalin I Project, in which crude oil produced in the oil fields will be transported through pipelines across the northeastern part of Sakhalin to Dekastoly on the mainland, and then shipped by tanker from an oil export base. As for the Sakhalin II Project, which has so far only been producing crude oil during summer (phase 1), it is planned to start transporting crude oil produced in the oil fields through pipelines across Sakhalin Island, and ship it by tanker from an oil export base in Prigorodonoe in the southern part of the island in 2006 (phase 2).

### 4. Future countermeasures

The members of the liaison conference, including the relevant departments and agencies of the Japan Coast Guard, Cabinet Secretariat and the Agency for Natural Resources and Energy, have been endeavoring on a daily basis to obtain new information that is necessary to evaluate the impact on Japan in light of the developing conditions of the Sakhalin Project as mentioned in section 3. Because damage estimated by the project operator has not been finalized at the present time, and for other reasons, no agreement on how to respond to a situation caused by the new development of the projects in an emergency or in normal circumstances has been reached among related government organizations. However, in order to make the most reliable possible system for the prevention and combating of oil spill from facilities related to the Sakhalin Project, relevant organizations have been continuously collecting pertinent information in cooperation with each other, and an agreement on necessary countermeasures has been made among the relevant parties so that they can be promptly implemented.

### 5. Conclusion

Once a natural disaster or an accidental disaster occurs, its great impact on communities, the economy, and the environment draws attention, and countermeasures are immediately demanded. As the saying goes, "Great natural disasters occur when we have forgotten the last one," and



we should never forget to prepare for disasters because "disasters will inevitably happen."

Fortunately, with regard to oil spill accidents, no major accident has occurred near Japan since the Nakhodka oil spill accident. However, we should again realize that oil spill accidents are an important issue in terms of risk management for Japan. Therefore, I believe that efforts should be made to collect necessary information, to establish necessary systems and organizations, to implement necessary training and to provide necessary equipment, and that each of these items should be actively reviewed without ever being satisfied that preparations are sufficient, as "large-scale oil spill accidents will inevitably occur."

I also believe that the feelings of hopelessness experienced when shocking news is frequently reported in various parts of the world, such as people using a ladle to scoop up spilled oil or birds that have been caught up in spilled oil and are not able to move, are shared by all of humankind and that none of us want to witness such scenes ever again. ■