

Ship & Ocean Newsletter

Selected Papers

No. **2**

Institute for Ocean Policy, SOF

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 Ship & Ocean Foundation has launched an "Institute for Ocean Policy", with the mission statement "Living in Harmony with the Oceans".

The Institute for Ocean Policy 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 Institute 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.2" is an English-language version of papers from the Japanese Newsletter edition, published from No.17(2001.4.20) to No.28(2001.10.5).

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

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Learning about Coastal Regions from Geographic Features and Seabed Sediments

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Shallow coastal areas have very delicate and complex natural ecosystems that are exemplified no more clearly than in the Ariake Sea, where nori (Japanese seaweed) production has been damaged by outbreaks of red tide. Furthermore, a variety of phenomenon exist linking coastal areas closely to the geography and geology of landforms. Progression is being made in the research of coastal erosion, deep-sea areas, oil spills and other coastal issues, but we must learn more about the ocean to further advance environmental conservation and development.

The Spice of Variety in Coastal Seas

Somewhat different to deep-sea regions, there are some people who believe that almost everything is known about the coastal areas that adjoin our land. However, the actual feelings of someone who has been involved in ocean research for far more than ten years, is that there are still many unknown and non-clarified pieces in the coastal region puzzle. Take for example the very well publicized damage to the nori (Japanese seaweed) industry in the Ariake Sea. The outbreak of such a crippling red tide portrays just how complicated, yet subtle, the ocean's natural functions can be.

Hokkaido has a shoreline of 2,950km in length, which accounts for about 9% of the total length of Japan's coastline, and in comparison to the entirety of Japan its total area of 73,000m² is strikingly similar in proportion, with its coastal regions being no deeper than 200 meters. In the surrounding area there is the Japan Sea through which the warm Tsushima Current moves north, the Okhotsk Sea where sea ice drifts south during winter and the Pacific Ocean down through which the nutrient filled Oyashio Current flows. In other words, three seas with totally different characteristics surround Hokkaido. In this relation and subject to the composition of rock on the seabed, the different sea currents and other varying factors, a large variety of terrain, sand, soil and other seabed sediment extend across the coastal zone of Hokkaido.



Sediment sampling by gravity corers

In the coastal seas that were traditionally used for mainly fishing purposes, recently there has been a continual increase in a number of different facilities, through the expansion of ports, the construction of bridges, landfill projects and other activities. At the

same time, the extension of breakwaters into offshore areas has changed the flow of currents offshore, the amount of sand carried into such regions and the wave actions in the area, resulting in parts of beaches being eroded away and other complex phenomenon unique to the ocean also being witnessed.

What We Should Be Aiming For

The research institute where I work is an agency of the Hokkaido Prefectural Government, but is an organization that can't be found in other prefectural governments. Our main research areas are hot springs and underground water, volcano disasters, active faults, landslides, etc. In order to extend the knowledge built about land into coastal areas, in 1989 an "Ocean Affairs Department" was established and has been running through to this day.

During this time we have been able to confirm a variety of geographic and geological phenomenon. Targeting the ocean surrounding Hokkaido while the seas are calm from June through October and through the cooperation of fishing trawlers (around 5 tons in size) requested at the site of each survey, we have been measuring geographic changes in terrain, carrying out sonic profiling surveys on the thickness and expanse of sand and sludge and stowing survey apparatus such as mud sampling equipment on board the vessels to take actual samples of the sand and sludge in the Hokkaido surrounds. In addition, we have also managed to survey deep-sea volcanoes that erupted some 40,000 years ago, the remains of volcanic craters and small-scale volcanic gas emissions, active faults on the seabed that extend from land and the developments of submarine valleys.

Some tens or hundreds of thousand years ago, the rise and fall of the sea level occurred a number of times as a result of changes in climate and there were periods when much of the earth was covered in seawater and also times when many sea floors were part of land. We classify land and ocean on earth by whether it is covered by air or water, but the geological formation of stratum, rocks, etc. in coastal areas between land and sea extends continuously

and no geological boundary exists. If you take this approach, land and sea are completely equivalent targets of research and survey. On land there are traces of the ocean and on the seafloor there exist traces of land, both of which provide us with many challenging research topics. I believe that research on the ocean should be approached by regarding the impacts and happenings on land as being unified with the ocean.

Making the Most of Outcomes for the Future

I would now like to present three remarks based on from the research of the Department of Marine Geoscience of our research institute.

The first is that of coastal erosion. In recent years, it has been extremely regrettable to see erosion thinning our beaches, manmade coastlines fixed in concrete spreading throughout our country and the expanse of our natural resources gradually declining, even in Hokkaido, which boasts of its plentiful natural features. By nature, beaches are formed through a delicate balance between the supply and loss of sand into coastal areas. If there is insufficient supply of sand or excess loss of it, then naturally beaches are going to retreat or disappear. There may well be some negative aspects to securing the supply of sediment, such as productive land being run down and oceans being contaminated by the washing out of river deposits. However, is it not more important that a suitable amount of sand is supplied to preserve our coastline? Whatever be the answer, observing these changes from a long-term perspective, and making efforts to clarify the complex mechanisms involved, will surely help in the prevention of erosion phenomena.

The second of my comments is on the utilization of deep-sea water reserves that are currently at the center of attention. In Hokkaido, the towns of Kumaishi, Iwanai and Rausu have put together action plans and are presently actively involved in the exploitation of such water resources. Amongst these activities, in the offshore region between Kumaishi and Iwanai there is a natural valley configuration that is very advantageous for pumping up deep-sea mineral water, because the seabed falls away very sharply just off the coastline and only a short pipeline is required. By making sonic profiling surveys, we were able to investigate the detailed formation and geographic features of the underwater valley, which was very important for deciding on the site for extraction and constructing the pipeline itself. We are also trying to maintain an accurate understanding of the change in nutrients, as a consequence

of changes in season and depth, that is an important requirement for the sustained utilization of these resources into the future.

The last remark I would like to make is concerned with our research into the coastlines affected by oil spills. In January of 1997,

an unforgettable happening was recorded when the Russian registered flagship "Nakhodka" was grounded off the coast of Fukui. Alongside those involved in the oil production activities in Sakhalin, the coastal region of Hokkaido didn't just regard this accident as the affairs of another nation, but in fact has requested more sufficient preparedness towards such potential disasters. In the United States and Canada that experienced the 1989 oil spill off the coast of Alaska, research into how the oil that was cast ashore by the accident has been permeated or remained in beach sand and gravel is being actively undertaken. The infiltration and retention of the oil differs between fine grains of sand and coarse gravel found in the coastal area, and clarifying the characteristics of such coastal sediment is a very beneficial reference for planning clean up operations on polluted beaches. Furthermore, by portraying the remaining amount of oil on coastline maps, based on the geographic features and sediment composition of the area, further attempts are being made to help in addressing future disasters.

Various interesting phenomenon also exist in the narrow coastal regions of Hokkaido, and for Japan as a whole, which has such limited land resources, we can rightfully expect further developments in the utilization of its coastal zone to continue into the future, through the use of advanced technology. However, in order to accomplish this and effectively utilize the coastal zone for aqua-cultural activities, the construction of seaside facilities and other similar activities, we need to know more about the oceans. Moreover, we must also improve our understanding of the hazardous nature of both ocean and sediment pollution and move to treat the oceans with the respect that they deserve. I believe that, through the continuation of scientific research and the wide dissemination of its outcomes, further understanding of the oceans needs to be gained from both the environmental preservation and development perspectives. Understanding the ocean is the first step towards treating it with respect.

(Ship & Ocean Newsletter No.17 April 20, 2001)



Sand beach cut up by wave actions
(Otaru City, November, 1995)

Measures to Suppress Piracy and Armed Robbery against Ships in the Southeast Asian Seas

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Increasing incidence of piracy and armed robbery against ships are being reported in the Southeast Asian Seas. In addition to the measures taken up to now, more effective measures need to be taken through local legislation in the relevant countries and ASEAN regional cooperation.

The Present State of Piracy and Armed Robbery against Ships

According to the 73rd session report of the International Maritime Organization's (IMO) Maritime Safety Committee (MSC), there have been 2,017 reported cases of piracy or armed robbery at sea between 1984 and October of 2000, and in recent times the frequent occurrence of such crime in Southeast Asian waters is apparent. According to the International Maritime Bureau (IMB), of the 467 cases reported in 2000 (including attempted piracy or armed robbery), the 119 cases in surrounding Indonesia and 75 cases in the Malacca Straits, make up nearly half of the reports for the entire world. Aside from the number of attacks, while the robbery of money, goods, equipment and crew's belongings were the most dominant forms of pirating, there were also 8 reports of vessels being seajacked in their entirety and even one case of the intruders changing into the uniforms of officials in order to complete their act. The occurrence of such incidents is not only on the increase, but presently there is also little promise that the situation can be controlled.

The analysis of pirating data shows that a large part of the criminal conduct occurs in straits that are used for international navigation, or within harbor limits and territorial seas. From the point of view of the people committing these crimes and those unfortunate to be on the receiving end of their acts, it doesn't really make any difference where the acts of criminal conduct occur. However, when it comes to catching the criminals, obtaining sufficient evidence for prosecution and administering the correct sentences in court, suddenly the location of the crime and the position of the vessel attacked become very important. Under international law, any state can seize a ship and commit the offenders to punishment in that country, if the act is deemed to be piracy in high seas (Articles 101 and 105 of the United Nations Convention of the Law of the Sea). However, criminal acts within the harbor limits and territorial waters aren't officially recognized as acts of piracy, but are classified differently as acts of "Armed Robbery against Ships". Therefore, as long as acts of criminal conduct occur within internal or territorial waters of a littoral country, unless there are special grounds for provision under international law, the entire responsibility for the enforcement and prosecution of such acts fall on the particular littoral

country in which the crime occurred, and no other countries are allowed to enter the picture.

Previous Measures against Piracy and Armed Robbery

It is often pointed out that the background to piracy and armed robbery in the Southeast Asian Seas lies in the social and economic situation of the region, but as far as direct measures towards piracy are concerned, efforts are currently concentrated around the self-defense measures of the vessels that pass through the region and the strengthening of sea patrols by the relevant countries. Up until the present, the Piracy Reporting Center (PRC) of the International Chamber of Commerce (ICC)/IMB has carried out the important role of fielding reports of piracy and off their own backs ships operating in the region have increased surveillance activities in an attempt to prevent attacks. Singaporean authorities and the Malaysian Marine Police Force have also increased their patrols, but the area that requires surveillance has obviously proved to be too large, and subsequent improvement in the situation has yet to be seen.

In May of 1995 IMO established the "Recommendations to Governments for Preventing and Compressing Acts of Piracy and Armed Robbery against Ships" (MSC/Circ. 622, revised in May, 1999), which stipulates the necessity for the formation of action plans by littoral countries, shipping countries and flag states, the need to carry out investigations on acts of criminal conduct and to prosecute those involved in accordance with domestic law, and the requirement for the formulation of agreements between countries in the regions of high incidence. Likewise, the formulation of the "Guidance for Ship Owners and Ship Operators, Shipmasters and Crews on Preventing and Suppressing Acts of Piracy and Armed Robbery against Ships" (MSC/Circ. 623) in May 1999 also designated measures for the self-defense of vessels that pass through the region. Additionally, since 1998, regional seminars held in regions of high incidence have also facilitated the promotion of measures to cope with piracy issues. Furthermore, in December 2000, the "Code of Practice for the Investigation of the Crimes of Piracy and Armed Robbery against Ships" was put together at the 73rd MSC meeting, which not only formed an MSC Circular that was passed onto each rele-

vant country (MSC/Circ. 984), but was also submitted to the 22nd United Nations General Assembly. However, in regard to the official nature of this code of conduct for law enforcement officials of IMO member states, and indeed the "Government Recommendations" and "Guidance for Ship Owners (and so forth)" also mentioned above, at the present time they are not legally binding documents.

Measures for the Future

1. Japan's Counter Measures

After the Alondra Rainbow incident in October 1999 (a Panama registered vessel carrying two Japanese crewmen), a "Regional Conference on Combatting Piracy and Armed Robbery against Ships" was held in Tokyo in April 2000, where the "Asia Anti-Piracy Challenges 2000" for the related coast guard agencies in the Asian region and the "Model Action Plan" for maritime policy authorities were adopted, thus signaling the beginning of cooperation strengthening activities of the coast guard authorities in Southeast Asia. However, in addition to this, what is now required is the revision of domestic legislation. Criminal law in Japan is applied on the principles of territoriality and flag state, and therefore in the case that criminal conduct such as robbery and captivity does occur within Japan's territorial waters, unless the incident involves a Japanese vessel, current law is structured so that it can't be applied. Under this legal system, even if the culprits of the Alondra Rainbow incident were to be captured in Japan, this means they would be unable to be prosecuted. Surely the time has come to reconsider this passive approach to criminal conduct, of everything except incidents involving Japanese interests, if not at least to apply Japanese domestic legislation under the principle of universalism.

2. Counter Measures for the Southeast Asia Region

The issues surrounding piracy and armed robbery against ships in the Southeast Asian Seas are not just limited to the

country where the criminal acts take place, but are issues that ride across many countries, including the nationality of the criminals and victims, the flag states of the offending and aggrieved vessels and the ports of destination of the ships involved. To combat this misconduct in the Southeast Asian waters, it is absolutely vital that the related countries maintain a close-knit communication and reporting framework, and engage in the fast transmission and sharing of all relevant information, as soon as it becomes available.

Furthermore, if the guilty parties or their vessels manage to escape enforcement in one particular country, they must be able to be apprehended at the next port of call in the region, arrested and prosecuted as is due fit under the domestic law of that country. In other words, the jurisdiction over both enforcement and administration of justice urgently needs to be addressed. Whether this can be achieved is totally reliant upon the close-knit cooperation of the many countries involved. For example, some desirable measures would be; the joint operation of sea patrols, or the creation of a framework that allows the coast guard authorities of the country where an incident originally occurred to continue tracing the particular offending vessel, even when it absconds into the territorial waters of another country, or corresponding to the revision of domestic legislation, to enable the country where the offending party or offending ship is/are located to detain those involved, constrain the movements of the vessel in question and secure prosecution of the criminal act. In this relation, the formulation of joint investigation frameworks and laws for the collection and submission of evidence and/or the transfer of criminals between countries is also required, to ensure that the prosecution is successfully processed. For this purpose, I strongly urge the related countries to step up their collaborations, in view of forming a Southeast Asian based cooperative network to address this increasing incidence of piracy and armed robbery against ships in the region.

(Ship & Ocean Newsletter No.18 May 5, 2001)

The Management of Highly Migratory Fish Stocks in the Pacific

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Last September, amongst many outstanding points of conflict, the MHLIC Convention on the conservation and management of highly migratory fish stocks in the Western and Central Pacific Ocean was adopted. For such resource management to be effective, littoral and shipping countries must persistently search for acceptable common ground. Furthermore, Japan needs to follow developments closely and further discussions domestically on the approach to be taken towards any issues.

MHLIC's Purpose and the Background to its Adoption

The "MHLIC Convention", or the "Multilateral High Level Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific" when expressed in full, is at a glimpse slightly difficult to comprehend. However, put in simple terms, its purpose is to form international rules on the means and volume of catch for the Tuna and Bonito that migrate in the Pacific Ocean.

Different to land, the sea, and in particular the high-seas, were regarded for a long time to be universally owned by all on earth and their resources viewed as open game on a first-come-first-served basis. Countries with large fishing industries would send their fishing fleets out far beyond the horizon, and without any restrictions they would fish and trawl under the noses of other nationalities and islands. However, amongst growing nationalism that began in the early 1970's in regard to marine resources, the 200 nautical-mile international ruling on exclusive economic zones (EEZ) became firmly established, recognizing the rights of littoral countries for at least the fishing resources that surround their islands. Consequently, in order to fulfill their required catch, major fishing countries negotiated with the littoral countries concerned and began paying for the fishing rights to their waters. Through this process, not only were littoral countries presented with economic benefits, but it also provided a means for controlling the fishing takes in their nearby waters, and preventing the depletion of fishing resources.

On the other hand, however, the establishment of EEZ's didn't resolve the issues that previously existed in terms of how and by whom fish stocks that migrated inside or outside the 200 nautical-mile zones should be managed. Due to the rapid increase in deep-sea fishing by Asian countries during this period, concern for resource depletion grew amongst littoral countries, and in order to establish a sustainable level of utilization, the formation of international arrangements between the related countries became an urgent necessity for coastal nations. To this effect, "The

International Commission for the Conservation of Atlantic Tuna" (ICCAT) and "The Indian Ocean Tuna Commission" (IOTC), to both of which Japan is also a member, were established to formulate such resource management frameworks. In the meantime, however, talks on a framework for the Pacific Ocean fell behind, leaving Japan in constantly deep concern over uncontrolled fishing in the Pacific.

Finally, in 1994 discussions began on the formulation of international regulations for the Pacific. In an effort to generate agreement on a multilateral treaty for the region, a number of talks were undertaken between littoral countries and territories from the Central and Western Pacific and states with fishing operations in the region, with representation at the meetings from 28 countries and territories in total. The result of these deliberations was the "MHLIC Convention", which was adopted in Hawaii on September 4th, 2000 at the seventh meeting between the parties.

However, Japan, which initially advocated the importance of resource management and participated proactively in the treaty discussions, in conjunction with Korea, opposed the adoption of the convention in its final form (20 countries for, 2 against, 3 abstentions), and refused to become a signatory party. This was to say that the talks developed in such a way that Japan's points of view weren't incorporated and so it was unable to accommodate the convention.

The Reasons behind Japan's Opposition

Asahi Newspaper reported Japan's disapproval in the following manner. "Based on regulatory controls such as the tighter setting of fishing quotas and the increased authority of inspectors who board ships, the nature of the convention is very demanding". However, Japan holds strong desires for the suitable management of fishing quotas. The biggest issue for Japan that invites its opposition, is the decision making format of the convention, in conjunction with the waters targeted, the means of dealing with disputes and the tightening of regulatory controls as mentioned above.

Amongst the participating countries of the convention, it is clearly obvious that littoral countries hold an overwhelm-

ing majority in terms of numbers, which means that when it comes to majority decisions, the notions of the littoral countries are more than strongly reflected. However, it is stipulated in the convention that maintaining consistency between management measures for within the EEZ and those outside in open waters is an important priority, so the possibility arises that coastal fishermen, in addition to deep-sea fishermen, will also be affected by regulations that are based on the notions of foreign countries. So as not to follow in the footsteps of the whaling issues, where the "Power of Numbers" is nullifying Japan's "Power of Logic", Japan requires the right of objection to be withheld when a majority decision is made on measures that are unreasonable for fishing countries. However, this was not accepted, and despite many conflicts being left unresolved, the chairman's draft that leans in the favor of littoral countries has ended up being adopted. This process raises many concerns in relation to the continual and complete rejection of fishing country's notions on the presence of the "Power of Numbers", especially during the discussions on measures for storage management, which are closely related to the fishing quota's that will supposedly be decided after the convention has been put into effect.

From another point of view, there is also a strong sense of uncertainty surrounding some littoral countries that regard their immediate fishing rights as being more impor-

tant than any resource management. Therefore, if adverse claims are accommodated, there are concerns that regulatory measures for the conservation of resources will effectively be watered down by the objections of fishing countries. In either case, the fact that the adoption of this convention was forced through without enough careful deliberation of the member countries, or the thorough search for acceptable common ground, will no doubt create problems for the future.

In order to dispel the concerns of the fishing countries involved, since the adoption of the MHLC Convention Japan has approached each member country about these issues. However, with many of the littoral countries holding a firm stance on their agreement to the convention, regrettably these activities have gone in vain. Furthermore, Japan also chose to overlook participating in a meeting held in April this year to deliberate on the convention's operational regulations. In the event that Japan and other fishing countries were to oppose participation in the convention, the resource management objectives of the agreement would lose all their effectiveness. Surely this emphasizes the need for littoral countries to reconsider the real objectives of the convention and to sit down with the member fishing countries for further talks on the unresolved matters at hand.

For Japan, the Central and Western Pacific Ocean targeted by the convention contains nearly 80% of Japan's take of Tuna and Bonito. Therefore, in terms of the potential effect on the dining tables of the Japanese people, here hides an issue that by far exceeds any disputes involving international whaling. Sadly, the Japanese media has failed to pick up on the importance of the "MHLC Convention" and so it has no doubt gone unnoticed by most citizens of Japan.

Judging by the required conditions for validation and the attitudes of each country, the "MHLC Convention" will probably be brought into force sometime between 2003 and 2004. Before this, Japan must maintain persistent pressure on the other member countries to acknowledge its stance and move towards the amendment of the present agreement. Regardless of the result of any such efforts, in 3 years time Japan will be faced with the difficult choice of accepting or rejecting the convention. While airing all related issues to the general public, during this time Japan needs to follow developments closely and further discussions domestically on the approach to be taken.

(Ship & Ocean Newsletter No.19 May 20, 2001)

■The Fishing Catches of the Countries / Regions in the Territory Targeted by the MHLC Convention (Unit : Tons)

Country / Region	1993	1994	1995	1996	1997
Japan	523,963	458,313	445,067	396,221	367,142
Indonesia	196,324	215,951	229,431	256,975	285,300
Taiwan	216,315	219,555	233,089	234,278	216,568
Philippine	106,148	147,739	171,068	171,284	177,439
South Korea	130,496	199,506	177,896	149,831	161,217
U.S.A.	177,376	194,823	156,010	146,403	140,391
Guam	110	123	46	32	41
Solomon Islands	29,813	35,299	55,228	40,804	41,385
Papua New Guinea	8	1,781	15,230	11,077	20,810
Fiji	8,209	8,787	12,467	13,121	12,663
New Zealand	4,593	9,610	8,046	11,033	8,245
Federated States of Micronesia	16,003	22,150	7,692	8,227	8,078
Australia	5,189	4,356	4,300	4,762	7,408
China	5,614	11,143	9,261	5,281	2,953
Kiribati	293	192	482	482	482
Marshall Islands	136	53	35	35	35
New Caledonia	1,237	1,301	1,175	1,117	903
Northern Mariana Islands	40	45	69	92	75
Palau	75	80	80	93	93
Tuvalu	584	272	272	275	275
Vanuatu	490	186	186	665	161
Singapore	0	5	5	5	47
Total	1,423,016	1,531,713	1,527,131	1,452,093	1,451,711

Source : "Annual Fishing Catch Statistics, 1997", Food and Agriculture Organization of the United Nations (FAO)
 Note : The figures in this table are obtained by totaling the catches of the main fish species in the territory (statistics from area fisheries 61,71,91 of the FAO)

The 'Ehime-Maru' Incident from a Different Perspective

Masanobu TERADA

Secretary, Marine Traffic System Forum

The "Ehime-Maru" accident was a tragic incident in which a mistake by the US Navy took the lives of nine people, including several young high school students. For a period after the incident, the Japanese media, in conjunction with many websites, gathered much sympathy for the lost crew and reported extensively on the emotional aspects of the tragedy. However, there were few references made to the different values of Japanese and American people in terms of the political system in America that caused the collision, the rescue effort after the accident and the raising of the sunken "Ehime-Maru".

The US Coast Guard's Prompt Search and Rescue

We can only assume that the nine people tragically lost in the incident were trapped below deck, therefore making it impossible for them to be rescued. If nothing else, at least all the Ehime-Maru crewmembers thrown into the sea by the impact of the collision were saved by the US Coast Guard's prompt rescue effort, and on-going reports on the state of rescue activities were posted on the US Coast Guard's website immediately following the tragedy.

The prompt and efficient rescue services of the US Coast Guard and the US Navy are highly regarded in their own right. I distinctly remember Satoru Matsuki, yachtsman and Honorary Professor of Kobe University of Mercantile Marine, telling me about the US Coast Guard's immediate reply to his distress call along the coast of America. On expressing his gratitude they replied by saying "It's our obligation to provide such a service to the tax paying public of this country".

However, there were two hot topics of discussion in relation to the rescue effort of the Ehime-Maru.

The first was the issue of the crew of the submarine assuming the role of bystanders and not participating in the rescue activities after the accident. It appears that they judged that, rather than making a poor attempt from a submarine without any rescue equipment, that a more efficient and effective effort could be made by waiting for the trusty US Coast Guard, who are specialists in rescue activities. Furthermore, this may also explain why they choose not to interfere in the rescue, and watched as fellow US Navy personnel completed the rescue on their behalf. Maybe it's unavoidable that Japanese people felt that such spectatorship was disgraceful, but it must be accepted that in the heat of the moment such a judgment is likely to have been made. Sure, if the coast guard rescue team were late to respond, naturally you would have expected that the crew of the submarine would have attempted to make the rescue, but in this case it's hard to say that such emotional criticism was

advisable.

The other issue is that of the U.S. Coast Guard wanting to call off the search and rescue activities. One can imagine that after 10 days of rescue activities and no sign of the missing nine people, this was nothing but a rational decision made in relation to the remote possibility of finding anyone by continuing the search. However, the strong pleas of the victims' families and Ehime Marine High School were accepted and the search was continued for some time after. Surely the US Coast Guard and the US Navy must be acknowledged for attempting to understand the feelings of the grieving Japanese and acting in an appropriately respectful manner.

Consequently, I think it can be said that America's response at the scene of the accident was more than reasonable considering the circumstances. On the other hand, however, I think it was very regrettable that the US media translated the Ehime-Maru not as a "Training Ship" but as a "Fishing Boat", which portrayed an image to the American public that a Japanese ship using youth labor was undertaking trawling operations near Pearl Harbor, of course, when its motives were very much different.

An Accident Invited by a Obligatory Service to the Civilian Public (Taxpayers)

The way in which administration provides obligatory services to the taxpaying public of America is no doubt an outstanding achievement of the American democratic system. However, taken from another view, it was also the incorrect implementation of this obligation to civil society that led to this tragic accident.

Allowing the passage of civilians aboard a leading nuclear powered submarine that is less than 5 years old, and furthermore to put the passengers through an emergency surfacing experience is something that could only be heard of in America. Even if this was considered to be a way of disclosing information to the civilian public, you would at least think that the most important issue during the

experience would be to educate the public about the safety assurance functions of the submarine. This too is the kind of experience that civilians aboard should have demanded, instead of the thrill of the rapid resurfacing maneuver being the "main event" of the journey. Is it not that the US Navy's manual on "Civilian Submarine Tours" is concentrated on displaying performance limits to its audience? I only hope that US Navy officials and the general public understand that, not only is there absolutely no meaning in an experience that caters for desires that are different from the safe everyday navigation of submarines and also the aims of an excellent democratic system, but rather that this process has created a detrimental service that causes accidents. One would imagine that former Commander Scott Waddle, the other crewmembers of the submarine, and indeed the civilians (taxpayers) aboard the submarine, themselves, now ever regret the day that high-ranking navy officials first ordered the guiding of unfamiliar civilians through a cramped submarine. Of course Commander Waddle is no doubt even more remorseful that, amongst the disorder, the all important safety check was verified by just one quick account of the activities on the surface. No excuse now will ever exempt him from the responsibility for the collision.

In his apology to the bereaved families, Commander Waddles commented that he would have to burden a large weight on his mind for the rest of his life. This signals that he is certainly aware of this responsibility.

Even if the requests of civilians (taxpayers) for information disclosure and demonstrations are considered to be worthy, America must reflect on this incident as highlighting the top priority that must be exercised towards safety.

The Ehime-Maru accident can be viewed overall as a sad

incident in which the American system failed miserably.

The Raising of the Ehime-Maru

The issues surrounding the raising of the Ehime-Maru throw much light on the differences in Japanese and American culture.

For the families, relatives and friends involved in the Ehime-Maru tragedy, confirming the deaths and obtaining the remains of the nine people, presumed to be trapped in the hold of the sunken ship, are the only motives behind their requests. The actual reclamation of the ship itself is of no particular concern. In contrast, in western culture people often receive special dignity for meeting with misfortune at sea, and more often than not their bodies and spirits are left to rest in peace where their lives were taken. Without working through the misconceptions that occur from such cultural differences in thinking, America's views on the feasibility of raising the Ehime-Maru initially focused entirely on the physical aspects of the issue. However, even with the cultural misconceptions, must we not give the United States credit for the positive way they agreed to undertake the salvage of the sunken vessel?

As I mentioned earlier in this article, this collision was caused by a mistake by the US Navy, and there is no room for explanation or debate in regards to their responsibility in the incident. However, for the prevention of further accidents, the coexistence of both parties in maritime affairs and the mutual respect of different cultural values, I think that examining the background to this tragic accident, in terms of the American political system, the state of search and rescue activities and the large gap created by cultural differences is very important.

(Ship & Ocean Newsletter No.20 June 5, 2001)

The Raising of the 'Ehime-Maru' and the Current State of Salvage Operations from the Deep-Sea

Nobuo SHIMIZU

Manager, Deep Sea Development Group, Fukada Salvage & Marine Works Co., Ltd.

The present situation in deep-sea salvage operations, which involve extraordinary costs, is that no commercial market yet exists. This raises many questions concerning both the equipment and technological aspects of such heavy-duty deep-sea activities. Consequently, in raising the Ehime-Maru 610m from the sea floor, many difficulties can be anticipated. At the same time, however, hopefully it will also trigger many significant breakthroughs in the development of deep-sea salvage technology.

Background to the Decision to Salvage the Ehime-Maru

At about 1:45pm on the 10th of February 2001, the "USS Greenville", a US Navy nuclear powered submarine, plowed into the Ehime-Maru, a 499-ton marine training vessel, owned by the Ehime Marine High School of Uwajima City in Ehime. The "Greenville" was in the middle of a rapid resurfacing maneuver, 10.2 miles (18.5 km) off the coast of Diamond Head in Oahu Island, Hawaii. The vessel sank without even a moment's notice and now sits on the sea floor, 610 meters from the surface. Almost immediately after the impact, the crew of the Ehime-Maru attempted their own rescue operation, but tragically the accident ended in the lives of nine people being lost. Forty-five minutes after the collision, the US Coast Guard's rescue ship arrived on the scene to pick up the survivors and search for the missing crewmembers. In the following days, the search was continued by air and sea, right around the clock. The US Navy also requested the use of other apparatus such as "Remotely Operated Vehicles" (ROVs) and "Side Scan Sonars", enabling a stereoscopic search to be made of the area from air to sea floor. Alas, no sign of the nine victims was ever found, and after almost a month of activities, the search was called off.

Judging by the way the Ehime-Maru disappeared below the surface less than fifteen minutes after the impact, it became obvious to the grieving parties that the missing nine people were more than likely trapped below deck, leading to increasing pleas for the sunken vessel to be recovered, in addition to the cries to extend the search and rescue effort. In reply to Japan's requests, the United States government indicated they would do everything in their power to recover the bodies of the missing, and consequently operations began moving towards the raising of the sunken vessel. A two-month environmental assessment of the area was completed as the first stage of the operations, and following this, it was estimated that a start could be made on the recovery this coming summer.

Under the US Navy framework, all salvage operations of US Navy or related aircraft and ships are consigned by contract to private enterprises. The Ehime-Maru salvage was

accordingly consigned to the Dutch salvaging company "Smit International" who were signed up with US Navy at the time. I was also involved in the early salvaging developments. I served as a salvage advisor from February 12th to 27th following the collision, at the "Ehime-Maru Rescue Response Center", which was set up by the Japanese Consulate in Hawaii, and also investigated the possibility of making a salvage through the observation of the under water operations of the ROVs "Scorpio" and "Deep Drone".

The Current State of Deep-Sea Salvaging Operations

Japan's record in deep-sea salvaging is the raising of a 50-ton private marine research vessel "Heriosu" from a depth of 240 meters, after it sank off the coast of Iwashi in Fukushima Prefecture in July 1988. Successful salvage operations on large vessels of up to 6,000-ton have been made in shallower waters too, similar to most other smaller recovery attempts that are ordered by insurance companies for vessels sunk in waters that are no deeper than 50 meters. However, salvages are only made when the insurance policy held on the ship (Main Body Insurance) is more than the quote made by the salvage company. In the case that the insurance doesn't cover the salvage costs, the entire insurance payout goes to the ship owner and no salvage attempt is made. The rough cut off point for an economic salvage is therefore around 50 meters, the same depth that is about the limit for general scuba divers. For this reason, there is no commercial market for salvage operations on vessels lying at great depths.

However, due to recent developments in environmental and humanitarian issues, there is a growing need for a deep-sea salvage industry. The "Heriosu" salvage mentioned above and the recovery of the Ehime-Maru are just two examples of this. The salvage of the Russian tanker "Nakhodka" that caused one of the world's worst oil spills (the main hull of the ship has been identified at a depth of 2,500 meters) and the child evacuation ship "Tsushima-Maru" (which has been identified at a depth of 840m) have also been discussed by the Japanese government.

Additionally, the nuclear powered Russian submarine

"Kursk" that sank last year to a depth of 105 meters, with an underwater weight 18,000 tons (scheduled to be raised during summer this year) and the Russian Komsomolets that sank in April 1989 and has been traced to a depth of 1,682 meters, with a underwater weight of 4,500 tons, are further examples of potential targets for deep-sea operations internationally. This is not forgetting the more recent gas explosion on oil production plant "P36" off the coast of Rio de Janeiro in Brazil, which resulted in the structure sinking nearly 2,000 meters to the sea floor.

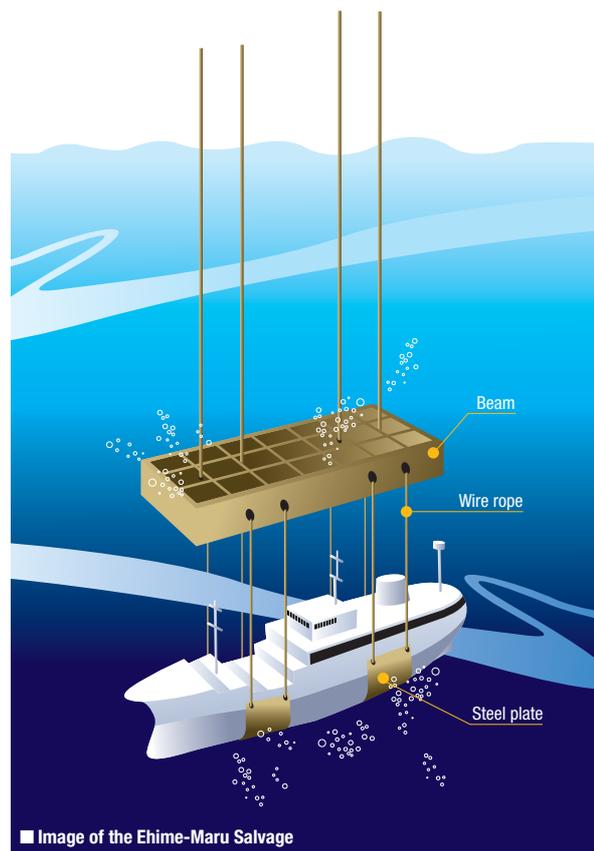
In regards to the mere surveying of structures to be uplifted from the sea floor, with the exception of interior surveys, in this day and age there aren't many depths where technology can't go. Furthermore, even in deep-sea regions, the recovery of several ton pieces of crashed aircraft, rockets and other debris is also a very feasible extension of surveying activities.

The Ehime-Maru salvage, however, is a heavy-duty operation that has to be undertaken in a deep subterranean environment, and that will require a culmination of all the available technology.

The Technological Aspects of the Ehime-Maru Salvage

As I have stated in the above text, the deep-sea isn't targeted by commercial salvage operations, and so the fact is when it comes to taking on such an operation, mainly due to a lack of specialized machinery and equipment, a quick response is virtually impossible. Especially for underwater equipment, emergency manufacturing often isn't possible and there is a limit to what can be done with the operational technology available commercially.

In terms of specific issues related to the raising of the Ehime-Maru, one of the biggest issues is the method of attaching the necessary cables to the hull of the ship. The limit for commercial divers who make such operations is about 300 meters, so for anything deeper operations are reliant upon unmanned ROVs. In the case whereby a sunken ship lies on flat on the sea floor, it is normal procedure to lift the stern of the ship and then pass cables under the hull through the space created between the ship and the sea floor. However, for the Ehime-Maru a robot must be used, so it is a case of how much can be dug out from under the hull of the ship, so that cables or metal plates can be passed underneath. Furthermore, I have heard that the lifting cables are to be attached to a lifting beam (diagram above). Therefore, another big issue will be how this attachment is going to be made. The thickness of the lifting cables necessary will be in the vicinity of 110mm, and they will probably weigh more than 50 kilograms per meter, so



Graphic Illustration by Shuichi Furuoka

it will be interesting to see how a ROV will be able to handle such heavy material.

These kinds of issues will no doubt be the biggest points of attention in the Ehime-Maru salvage later this summer. However, not only will the operation be of great reference to deep-sea salvage activities of the future, but it is also likely to set the global standard for deep-sea salvage technology.

As I mentioned earlier in this text, the heavy-duty operations that are required as a consequence of accidents in the deep-seas involve many technological and equipment-manufacturing issues, and there are many cases of emergency responses not being able to be made at the commercial level. For this purpose and from a different point of view, I also hope the Ehime-Maru tragedy will provide the turning point for developing deep-sea accident prevention measures.

Finally, I would like to express my deepest sympathy to the family and friends of the missing 5 crewmembers and the 4 students. I hope that they will be reunited with the remains of their loved ones in the very near future and that they recover from their tragic loss as soon as possible.

(Ship & Ocean Newsletter No.20 June 5, 2001)

National Boundaries of the Future

Yoshihide OHTA

Senior Scientist of Norsk Polarinstitutt

Japan's claims on the Kuril Islands and other territories situated north of Hokkaido present it with problems in terms of national boundary designation. Norway and Russia are also faced with similar issues. Unresolved land disputes and territorial water issues are unlikely to be resolved under the conventional concept of national boundary designation. Therefore, isn't it time for the idealistic shift towards the joint management of territory, irrespective of boundaries, and the creation of a new cultural sphere?

I am just a mere geologist, ignorant of many of the world's politics. However, on reading about the joint resolution of Japanese and Russian scientists on environmental research for the Kuril Islands in the 17th edition of this newsletter, I would like to share with you my thoughts after having worked together with Russian researchers for nearly 30 years.

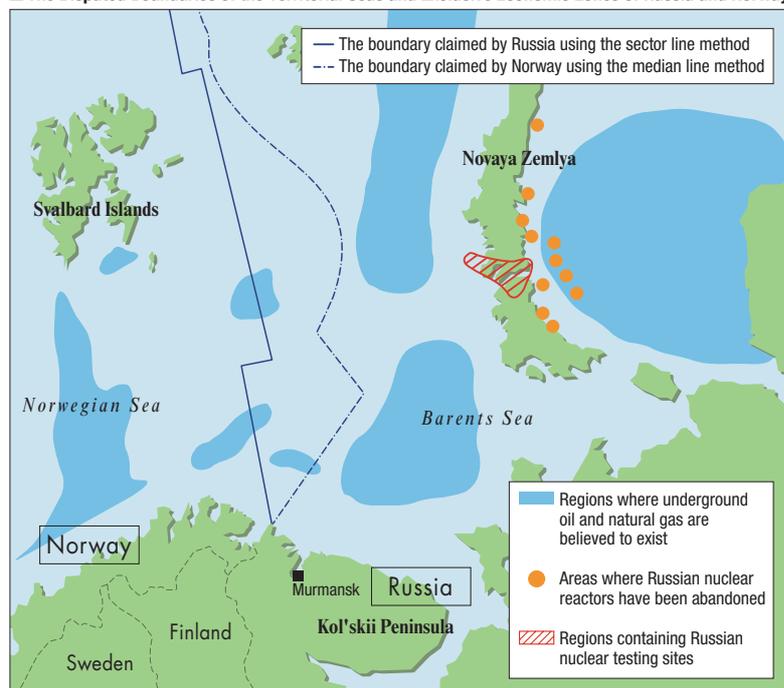
While environmental pollution sweeps over man-made boundaries and spreads through out the world without any problems, researchers are always hindered by nationalities and borders, and have a rough time obtaining visas and work permits. Where I live in Norway, the issues surrounding the boundary lines of territorial waters and exclusive economic zones in the Arctic Circle, and in particular the Barents Sea, are the cause of continuing unresolved disputes with Russia, which are indeed very similar to Japan's problems in the Kuril Islands. However, despite the obstacles posed by national boundaries, joint scientific investigations by Norway and Russia into the development of

deep-sea oil and natural gas reserves and fishing resources, the chemical pollution from Kol'skii Peninsula, the potential radioactive pollution created by the nuclear testing site on Novaya Zemlya and the several nuclear powered engines dumped around the islands, are making progress at a significant rate.

I am fully aware that Japan's claims on the Kuril Islands are based on the fervent wishes of the Japanese people, but I dream of a different future for countries and their borders. Present national borders signify the boundaries of a state's political, economic and military power. However, I think the people of the new millennium will rise above the present system, dissolving these kinds of states in exchange for cultural spheres, which will be nations built on the history and natural features of particular areas (Nf: S. P. Huntington, "The Clash of Civilizations and the Remaking of World Order", 1996). This kind of political change will no doubt take several hundred years, but I am convinced that we are unconsciously proceeding towards it even now. For

example, under the "Svalbard Treaty" that came into effect in 1925, while Norway was legally granted absolute and unlimited sovereignty over the Svalbard Archipelago, a new territorial concept was implemented when the other signatory countries of the treaty were provided with equal rights to share in the economic activities of the islands. Further-

■ The Disputed Boundaries of the Territorial Seas and Exclusive Economic Zones of Russia and Norway



In the Barents Sea region the median line method applied by Norway and the sector line method applied by Russia have lead to conflict in the boundaries of the countries territorial seas and exclusive economic zones. Agreement has yet to be reached. The Barents Sea is not only blessed with many deep-sea resources, but also is a gold mine for cod, prawns and other seafood delicacies. Source: Based on Ostistiy & Cheredeev, 1993 and Dore, 1995.

more, at the opposite pole in Antarctica, all territorial rights are frozen and activities such as scientific environmental research and tourism can only be undertaken with the joint agreement of all countries.

If we think of the unresolved territorial issues of Russia and Japan or Norway in light of this possibility for the future, we could forget trying to resolve the issues by conventional border designation, and take advantage of the unresolved issues by turning the areas into a joint management spheres, run by the countries involved. Through such revolutionary management, such areas could be used to study and learn new methods of joint utilization, leading eventually to the joint operation of many countries borders, the mixing of civilization and the furthered expansion of joint management spheres until the shape of historical countries are formed. Consequently, conventional "states" would cease to exist and new "nations" based on the ethnic

culture of the regions would evolve. I believe this is perhaps one positive approach that can be taken towards such unresolved issues.

I believe that if human society doesn't have the intellect and wisdom to end its disunion in the new millennium that we have just entered, then it will certainly signal the future extinction of mankind. This may well be an article far fetched from reality, but for yours truly, someone who studies earth history and the change in living beings over a span of 3 billion years, the existing conflicts between human beings are nothing more than a collection of pathetic and pitiful short term squabbles. In one particular collection of Japanese Haiku poems there exists a prose by Nobuko Inoue that reads (in translation) "Flowers that bloom on borders spread their seeds in ignorance of man-made boundaries". We too need to accumulate wisdom from the small blooming examples that lay before us.

(Ship & Ocean Newsletter No.21 June 20, 2001)

Information

Joint Resolution by Japanese and Russian Scientists — A New Approach to the Issue of the Four Northern Islands

This paper describes the joint resolution adopted in the UNESCO/MAB-IUCN Workshop titled "Nature Conservation Cooperation on the Kunashir, Iturup, Shikotan and the Habomai Islands," which was held in the National Olympics Memorial Youth Center on January 21, 2001. This resolution states that Japan and Russia can contribute to world peace through environmental conservation activities. It is thought to be a new approach to improving the relations between Japan and Russia regarding the issue of the four northern islands.

WE, THE PARTICIPANTS OF THIS SCIENTIFIC WORKSHOP, RECOGNIZE AS FOLLOWS: the Kunashir, Iturup, Shikotan and Habomai Islands are home for some of the finest pristine wilderness left on earth. These islands support many species endangered in Hokkaido, serve as part of a major feeding area and migratory route of marine mammals and birds, and represent an invaluable scientific "control" site, rich in the marine resources which have been ravaged in more developed areas of the region.

Conserving the islands is in the best interests of the peoples of Russia, Japan and the rest of the world, in light of the global problems of dwindling forests, oceanic pollution, loss of biodiversity, and ozone depletion. The nature reserves of Kunashir, Shikotan and Habomai should serve as a starting point for, and play a key role in, Russian-Japanese nature cooperation.

WE BELIEVE AS FOLLOWS: the existing bilateral conservation effort, a few brief and highly restricted trips each year by Japanese

scientists, however well-intentioned, is of largely symbolic value, and does not even begin to adequately address the urgent conservation needs of the islands.

WE THEREFORE URGE OUR COUNTRIES AS FOLLOWS: To move energetically ahead on joint research, field expeditions and conservation. To regular and comprehensive joint Russian-Japanese biological surveys, including censuses of migrating species, should be conducted, so that the islands' vast biodiversity can be properly assessed and maintained. These actions would be enhanced through the publication of joint scientific articles and monographs, joint workshops and conferences, and cooperative programs in the fields of ecotourism and eco-education.

Equally important, our countries should take effective measures to combat poaching, which has reached epidemic levels and threatens to destroy not only the islands' sanctuary but also commercially vital fisheries in the Sea of Okhotsk. We recognize that this action will not only save wilderness but also protect the marine resources that provide food and jobs for Russians and Japanese.

FINALLY, WE RECOGNIZE AS FOLLOWS: by working together to protect the wilderness of these islands, our countries would make a huge contribution to environmental conservation as well as to world peace, setting a model for all mankind.

We urge our countries to act fearlessly, boldly, and with all urgency.

(Ship & Ocean Newsletter No.17 April 20, 2001)

A Regional Framework for Cooperation: Partnerships in Environmental Management for the Seas of East Asia (PEMSEA)

Chua THIA-ENG

Manager, PEMSEA

East Asian countries, many of which depend on marine related activities for a large part of their gross domestic product, are faced with many acute coastal environmental problems. These environmental issues are not the problem of just one or two of these countries, but must be approached by the East Asian region as a whole. For this purpose, the PEMSEA initiative facilitates a joint vision to resolve environmental issues as a region, while assisting countries to build strategies and action plans to achieve that vision.

The Link between Coastal Management and Economic Development in East Asia

Eleven governments in East Asia formed the Regional Program on Building Partnerships in Environmental Management for the Seas of South East Asia (PEMSEA), in collaboration with the Global Environment Facility (GEF), the United Nations Development Program (UNDP) and the International Maritime Organization (IMO), and are now collectively addressing the marine environmental problems of the Seas of East Asia, by focusing on areas of common concern and building capacities to tackle environmental issues of the region.

These countries are Brunei Darussalam, Cambodia, China, the Democratic Peoples Republic of Korea, Malaysia, Indonesia, the Philippines, the Republic of Korea, Singapore, Thailand and Vietnam, all of which border the Seas of East Asia, and have always relied on the vast resources of the ocean for food supply, livelihood, medicine, energy minerals, transport and recreation. Geographically, these countries semi-enclose five large marine ecosystems; the Yellow Sea, the East China Sea, the South China Sea, Sulu-Celebes Sea and the Indonesian Seas.

The Seas of East Asia play a significant role in the economy of the region. The estimated total values of the seas

and oceans in the region come close to \$US13 trillion in terms of goods and services, and the coral reefs in the South Asian Seas generate an estimated value of \$US112.5 billion per year in tourist dollars. Maritime trade has increased from 15% of the regional GDP in 1970, to over 50% in 1995, as exports have grown by 10% per annum (World Bank, 1998). Half of the world's merchant fleets sail through the Malacca and Lombok Straits, and nine out of twenty of the world's largest maritime ports are currently located in the region, particularly within the shipping corridor between Singapore and Japan.

However, it is well recognized that coastal and marine environmental conditions in most parts of the region are in a severe state of degradation. Environmental stresses have begun to impact on human health and reduce the capacity of the resource systems, which is subsequently impeding economic growth. Many cases are reported in this region where less than 10% of sewage is treated, and already there are more than 250 million reported cases of gastroenteritis and

■ Integrated Coastal Management Initiatives in APEC Countries



upper respiratory tract infections as a consequence of people who are in contact with seawater. Widespread red tide outbreaks are the cause of several million dollar losses in the fishing and aquaculture industries each year, and in the Philippines and Thailand, for example, not only have more than half of their mangrove forests have been lost, but much of their sea-grass beds have been wiped out by bottom trawling and pollution. While the actual cost of recovery is not yet fully understood, the World Bank has reported that remedial measures require slightly less than 1% of the gross domestic product (GDP) for the region, which is expected to rise to an annual cost of 1-1.5% of the regional GDP in 2020.

Above all, the situation is particularly worrisome with respect to environmental and natural resource use across national or administrative boundaries. While specific and localized environmental issues have been addressed in some countries, trans-boundary issues are often nobody's business. Consequently, the net impacts of trans-boundary environmental degradation have started to take their toll on the functional integrity of not only the shared resource systems, but also the resource systems within national boundaries.

At the Singapore Summit held in November 2000, the ASEAN and North East Asian leaders favorably considered a new economic realignment for the nations of the region, a collective effort that recognizes the regions economy and environment as being two sides of the same coin. Protection of the environment is an indispensable part of social and sustainable economic development. Environmental management should therefore form an inseparable part of a regional program of action for the new East Asian Economy.

The Aims and Activities of PEMSEA

A number of international environmental conventions and agreements have been enacted over the past years. Of specific relevance to the protection and management of the coastal and marine areas are the United Nations (UN) Conference on the Law of the Sea, Chapter 17 of the UN Conference on Environment and Development, the UN Framework Convention on Climate Change, the Convention on Biodiversity, and other specific international conventions and protocols of IMO and the United Nations Environment Program. The implementation of these conventions, however, is an even greater challenge than their ratification, and in many countries of the region effective implementation of these global instruments is lacking.

In response to this situation, PEMSEA has confirmed its niche among the countries of the East Asian Economy (ASEAN+3) and has established its aims to build a multi-country, multi-shared vision for the Seas of East Asia, along with supporting strategies and environmental action programs for attaining that vision. A functional regional framework is the ultimate target of PEMSEA, which among other mechanisms will incorporate integrated implementation of international environment instruments such as the Global Program of Action, Climate Change Convention and the Biodiversity Convention.

PEMSEA activities focus on;

- a. Enabling local governments to effectively manage coastal and marine resources and their environment through strengthening local capacity in the integrated planning and management of their coastal areas, in collaboration with civil society and other stakeholders.
- b. Promoting multi-country and multi-agency cooperation in managing sub-regional sea areas and marine pollution hotspots through shared visions, strategies and common action programs.
- c. Developing management related methodologies, techniques, working models and standards to strengthen practical efforts in the field.
- d. Providing policy support and scientific advice to decision-makers.
- e. Identifying and demonstrating the synergies and linkages between related international instruments and facilitating their integrated implementation.
- f. Creating environmental investment opportunities, sustainable financing mechanisms and institutional arrangements for implementing marine environment related international conventions.

In implementing its long-term development objectives and activities, PEMSEA intends to establish a "Regional Ocean Think-Tank" for the Seas of East Asia to brainstorm specific policy issues of common concern. It will create a "Multidisciplinary Expert Group" comprising of senior regional and international experts to provide sound scientific advice to the region, and invite regional experts to serve as senior advisors to the Regional Program. Furthermore, in order to build a critical mass of regional experts, PEMSEA will also institute a "Regional Task Force" to provide interdisciplinary technical and scientific services to the region through PEMSEA activities.

(Ship & Ocean Newsletter No.22 July 5, 2001)

What Is the Ideal Existence for Our Rivers and Oceans?

—The Role of Rivers as a Passage Linking Land and Sea—

Yoshio MATSUDA

Chairman, Foundation for Riverfront Improvement and Restoration

An amazing 38 trillion cubic meters ($38 \times 10^{12} \text{m}^3$) of river water flows into our oceans each year, almost all of which is rainwater, created through the evaporation of our seas. Through the continual circulation of this huge amount of water from land to sea, the many problems carried by rivers are swept straight out to sea without resolve, seriously affecting our oceans and their resources. To restore our oceans to the former pleasure is going to require a serious reconsideration of the relationship between them and our rivers.

1. Rivers Fostered by the Ocean

Generally speaking, where there is land there are rivers, and the water in them flows in one direction from land out to sea. It is no secret that water runs from high places to lowlands and therefore painfully obvious that river water runs out to sea. However, as Table 1 points out, it must be remembered that more rain falls on land than water is evaporated from it, or in other words via the earth's atmosphere the oceans supply land with much of its water.

As Table 1 shows, a very large part of the water that exists on earth is seawater, and of the small amount of fresh water that does exist, most of it is in the form of ice and groundwater. Of the resources of fresh water that mankind can get close to, lakes and wetlands are only a tiny 0.007% of the total, and rivers and streams make up an even smaller proportion of just 0.00014% or a minute existence of only 2 trillion cubic meters ($2 \times 10^{12} \text{m}^3$). However, when you view the situation from the perspective of the "water cycle" or the way water evaporates to form steam or clouds, is transformed back into rain, and then returns to land or the ocean's surface, the picture dramatically changes. As you can see in Diagram 1, the total amount of water evaporated from earth per year is 496 trillion m^3 , 425 trillion m^3 from the ocean and 71 trillion m^3 from land, but this is 38 times

the value of the existing water in the atmosphere, listed in Table 1 as 13 trillion m^3 . This therefore means that the water in the atmosphere is completely renewed every 10 days.

Similarly, in contrast to the 2 trillion m^3 of water that exists in rivers and streams, 19 times that amount of water, or 38 trillion m^3 as shown in Diagram 1, flow out to sea per year, meaning that the water in rivers and streams is on average totally renewed approximately every 20 days.

Although the amount of water in the atmosphere or in rivers and streams is only a very small portion of the total in existence, the most important thing to remember about fresh water resources is the way they are always being replaced. Furthermore, if you retrace the origin of the water that ensures the flow of river water from land out to sea, you will find that it is mostly supplied from the oceans by evaporation.

2. Rivers as a Passage Linking Land and Sea

Ultimately aiming to exit out into the sea, river water flows from places of high altitude down to those of lower ones under the force of gravity. However, through this process deposits that have fallen away from the terrain in the river basin or chemical substances and waste material created by organic matter or human activity are up taken by

Table 1: Amount of Water in Existence on Earth

Kind of Water	Existing Amount ($\times 10^6 \text{km}^3$)	% of the Total
Seawater	1338	96.5
Saline Water (Tidal Water, Groundwater)	13	0.9
Fresh Water	35	2.5
Glaciers, Ice Sheets	(24)	(1.7)
Groundwater, Soil Water	(11)	(0.8)
Lakes, Wetlands	(0.1)	(0.007)
Rivers and Streams	(0.002)	(0.00014)
Water in the Atmosphere (Steam, Clouds)	0.013	0.001
Total	1386	100

Source : "Japan's Water Resources" (National Land Agency), 1999

Diagram 1

(Unit: Trillion m^3 per year)

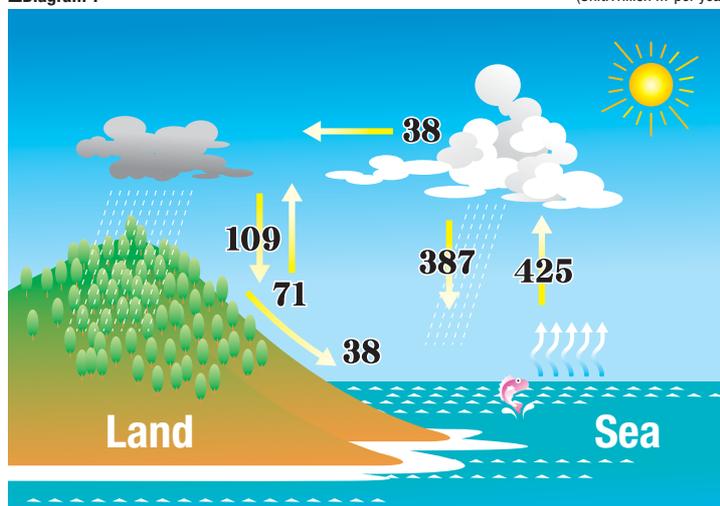


Illustration by Shuichi Furuoka

the flow and either dissolved into the water or taken out to sea. With the help of gravity, rivers play the role of a passageway that carries not only water from land, but also sediment and many other substances.

In the workings of rivers that are recently under so much attention, there is also the role of a natural passage for living matter. Of course, since historic times it has been well known that fish come and go between rivers and sea, but we now also know that many plants, birds, insects, frogs and many other larger scale mammals also depend on the rivers as a passageway that links mountain and ocean. In other words for living matter, rivers are the roads that connect the sea with inland regions.

Humans too, use rivers as passageways. Recently, rising expectation for the revival of the river shipping industry, which was degenerated by the road and rail transport industries in the last century, is becoming eminent as the world's attention turns towards efficient energy consumption. Such transportation was very popular during the Meiji Era only 100 years ago, but for reasons such as the current of rivers being too strong, the depth being too shallow or the possible transportation distance being too short, the existence of river shipping fell by the wayside. Today, although there maybe a question mark surrounding the future of commercial river transportation, the revival of river shipping for excursion and tourist purposes is definitely something that should be considered, especially as there are advantages in low energy consumption.

3. River Mouths and Tidal Land

Japan has complex topographic features and very intricate coastlines. The total length of Japan's coastline extends to more than 35,000 kilometers, which far exceeds the 20,000-kilometer length of that of the United States. Furthermore, because Japan has many open and enclosed bays, inland seas and islands that shut out the external forces of tidal currents and ocean waves, many of its waters are very gentle, and moreover, due to the constant outflow of sediment from its rivers, are also relatively shallow.

There are many semi-land regions in Japan that take on the form of tidal lands during low tide, providing the perfect habitat for living matter such as crabs and shellfish, and also excellent breeding grounds in the surrounding shallow waters for the production of seaweed, oysters, scallops and the like. Again, the estuarine waters created by the inflow of freshwater into that of saltwater at river mouths, also provide the environment for other unique living matter such as Japanese Shijimi (a variety of small shellfish).

In recent years, the importance of such tidal lands and river mouths has been strongly advocated from the environmental protection prospective and development projects

such as the Isahaya reclamation on the coast of the Ariake Sea, the waste treatment plant planned for the Fujimae Tidal Flats in Nagoya Port and the land filling of the Sanbanze Tidal Lands in Ichikawa City of Tokyo Bay have been aborted and strong public debate on such issues continues.

4. Coastal Erosion and the Retreat of Japan's Coastline

Our coastlines, the line of tangency between land and sea, contain a variety of forms such as reefs, sea cliffs, the muddy shores of enclosed bays and the manmade coastlines of harbors and fishing ports. However, most people associate coastlines with flowing white sand and green palm trees. Different from the slimy character of tidal lands, many of Japan's coastlines used to be a precious place where clean and beautiful swimming areas existed and you could always lie down and get the feel of that beach that everyone associates in their minds.

Unfortunately, these beaches are being abruptly lost through a reduction in sand supply, which has resulted from the construction of sediment controls and dams, and ironically also because of the negative effects of seawalls, that were actually constructed to prevent erosion. There is even data that suggests that 10,000 kilometers of Japanese beach coastline has on average retreated 8 meters in the last 100 years since the Meiji Era. In response to this, the flushing out of sediment accumulated in storage reservoirs with the discharge from dams, the construction of slit structures in sediment controls that allow the accumulation of rocks but don't disturb the flow of downstream gravel or sand, which therefore doesn't allow deposits to accumulate, and other similar efforts are presently being made.

5. Restoring the Relationship between River and Sea to What It Should Be

In the new millennium, a huge effort is required to restore the distorted relationship between river and ocean to its closest natural form. In other words the following attempts are needed: 1. To secure the supply of sand into coastal regions, plan the restoration of beaches with white sand and green trees and increase the opportunities for humans to interact with the ocean in beach areas. 2. To preserve our natural tidal lands and river mouths as much as possible and create some way of making our manmade zones more natural. 3. To make further efforts to improve the water quality of rivers and prevent the dumping and drifting of waste flowing out to sea, in order to clean up the pollution along the coastline and in the coastal zones of Japan.

(Ship & Ocean Newsletter No.23 July 20, 2001)

Precautionary Principles that Protect the Ocean's Ecosystems and Their Biodiversity

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Boyce THORNE-MILLER

Sea Web Scientific Advisor

Biodiversity is the key to the health of the ocean. Finally, we on earth have started to realize this important fact. In order to protect the ecosystems of the ocean, we need to build an integrated framework that transects all relevant organizations and implement a "precautionary principle" approach to policy decision-making.

Why aren't the problems in marine ecosystems being addressed?

Around the world, fisheries catches are being pushed to the limit. In most regions of the world ocean, once-rich fishing grounds are collapsing, as typified by Georges Bank in the western Atlantic Ocean. At the same time, human impacts such as development on land and pollution are degrading coastal marine ecosystems that serve as crucial breeding grounds for marine organisms including many commercially valuable species. Among such habitats are coral reefs, mangrove swamps, seaweed meadows and underwater kelp beds. The decline of populations of larger fish due to overfishing and destruction of spawning/breeding grounds is a critical factor in the deterioration of marine ecosystems and the reduction of biodiversity.

Unfortunately, policy-makers and the media evidence little concern for the biological impoverishment of marine ecosystems. There are several reasons for this. Perhaps the simplest explanation is that people don't witness the decline of living communities beneath the opaque surface of the sea, and therefore they aren't very interested. To those who might exhibit some curiosity, the problems may not elicit sympathy, or they may be difficult to understand. For instance, many of the changes in marine productivity are related to the large amounts of fish caught, and people want those fish. Also, even major upheavals in fish production and habitats tend to go unnoticed if total catch is relatively unchanged. It must be borne in mind that catch and production are not the same thing. These can differ greatly based on the scale and intensity of fishing efforts and the effectiveness of the equipment used, so catch statistics cannot be taken as reliable indicators of the true state of affairs in the oceans. Furthermore, mar-

ket information relative to the varieties of fish commercially available is a poor guide to the status of other species. Finally, catch reporting is often inaccurate, sometimes intentionally so. Exaggerated reporting, particularly by China, has been responsible for inflated estimates of the amount of fish in the sea.

Given the misinformation and the gaps in information, it is not surprising that governments have not developed effective ocean environmental policies and the public has not noticed the need for them. One major problem in ocean governance is that the responsibility for ocean policy is fragmented among many organizations and institutions, making comprehensive policymaking difficult. In the United States for example, fishing in the three-mile coastal zone is controlled by each state, while fishing in the 200-mile exclusive economic zone (EEZ) is under the jurisdiction of the National Marine Fisheries Service, a federal agency. Moreover, offshore oil fields are the preserve of the Department of the Interior; the US Navy governs areas of submarine activity and establishes environmental criteria for its own vessels; and responsibility for marine pollution is shared between the Environmental Protection Agency (EPA) and the Coast Guard. The situation in Japan is similar: the management of the fisheries is a complicated affair



Coral reefs are a treasure-trove of biodiversity. Already 30% of the world's coral reefs have been severely damaged, and a further 60% may be lost by 2030. (Photo: Akajima Marine Science Laboratory)

between the Fisheries Agency, fishing co-operatives and local governments, whereas issues of marine shipping and pollution are variously handled by the Japan Coast Guard and the Ministry of the Environment. The problem here is that the ecosystems and biodiversity do not correspond to the niceties of bureaucratic jurisdiction, and in any case none of these agencies is primarily concerned with the preservation of the biological integrity of marine ecosystems. It is rare indeed that these various institutions meet to coordinate solutions to environmental problems.

Another problem is that the general public does not understand that biodiversity includes, not only species, but also ecosystems, habitats, and genetics. Yet, because diversity of species is the easiest concept for the public to grasp, it is widely thought that everything is fine as long as the number of species is conserved, even in populations so small as to make the species ecologically insignificant. Public attention focuses on endangered species, especially larger and more familiar fauna, while ignoring the loss of habitats essential for the propagation and growth of a great many species, including less familiar creatures. The public rarely hears or cares about declines in numbers of organisms that play key roles in food chains (the relationship between predators and prey) and disruptions and imbalances among species critical to each other's survival. It is little understood that these and other complex biological phenomena are equally important factors in the loss of biodiversity.

The precautionary principle

The regulation of fishing, pollution and other activities that affect marine biological environments has long been based on risk assessment. Obviously the outcome of any assessment depends heavily on the criteria by which risk is judged. Bioassays (measurements of biological reaction to a stimulus), which are often used to assess risk, offer an instructive example. In a bioassay, a test species is selected and exposed to measured amounts of pollutant or other environmental stress. If that stress causes the death of some of the target organisms, percent death is recorded as the result of the bioassay; but more subtle processes that may have been occurring before the organism died, such as abnormal behavior or reproductive loss, are ignored. Moreover, bioassay results for one or two species are hardly adequate to assess the impact of a stress on an entire natural ecosystem, with its complex interactions among multitudes of organisms. Research bias, which reports only those results that are in line with expectations, is another source of error. Errors and gaps in scientific knowledge, along with surprise responses of natural systems to environmental

stress, all introduce uncertainty into the assessment of risk. Policy-makers must take full account of this problem in their risk-assessment approaches. Regrettably, this is rarely the case. While some modern risk assessment methodologies allow for the consideration of some types of uncertainty, there is a need for additional approaches that take full account of the potential for environmental harm and consider the full array of alternative actions to avoid the harm.

Policy decisions regarding human health and the preservation of the environment must be based solidly on a scientific approach. Yet, since even science is prone to uncertainty and errors, final decisions on such questions should be grounded in sound ethical principles as well. The precautionary principle or precautionary approach offers an alternative that is both grounded in science and responsive to ethical considerations. This approach has come to be recognized in numerous international agreements governing the environment, including the Rio Declaration, drawn up at the Earth Summit in Rio de Janeiro in 1992. Although agreements that explicitly recognize this principle include among others, the UN Convention of Biological Diversity, the London Convention (governing the disposal of waste at sea), the FAO Code of Conduct for Responsible Fisheries, and a variety of regional environmental declarations, the principle has been rarely invoked in law to protect biodiversity.

The precautionary approach emerged as a topic of discussion among policy-makers and industry leaders in the United States in 1998, when the Science and Environmental Health Network, a non-governmental organization (NGO), convened a meeting in Wingspread, Wisconsin and issued a consensus statement calling for and defining the Precautionary Principle. It states: "When an activity raises threat of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically." In this context the proponent of an activity, rather than the public bears the burden of proof. The proponent must also involve an examination of the full range of alternatives, including no action. This is not a call for "no action" in most cases, a criticism often leveled at the precautionary approach. Instead it challenges decision makers to identify and assess alternative methods of accomplishing the goals of human activities in the natural world with less likelihood of damaging environment or human health. "No action" is the last resort when such innovative alternatives cannot be found.

Many NGOs in the United States promote the precautionary principle as an overarching policy. Opponents of

this approach, including many government officials, criticize the principle as an anti-scientific notion that impedes technological progress and blocks important international trade (the conflict over genetically modified crops is a good example). Others maintain that the precautionary principle assumes that environmental effects of new technologies are negative, such as pollution and doubt its applicability to innovations such as fishing treaties that set out blueprints for sustainable management of resources. Unquestionably, the precautionary principle may seem to leave countries at a disadvantage if expenses are incurred making production processes or resource exploitation less threatening to the environment and human health. However, that is only a perception, since the cost of harm done in the absence of precaution is ultimately born by the public when natural resources must be restored and health problems abound among the population. In the case of the ocean, the fact remains that human activities are clearly depleting marine ecosystems and reducing biodiversity. Existing fisheries treaties and regulations do little to address the declining fish and fisheries, nor have pollution agreements and regulations ended the degradation of marine habitats. In light of these circumstances, the introduction of a legal framework based on the precautionary approach seems reasonable and justified.

Forming policy based on the precautionary principle

Biodiversity is the key to the health of the natural environment, and today the world is finally waking up to this crucial reality. Nonetheless, policy is still being formulated without regard to preserving the biodiversity of the seas. To protect marine ecosystems, we need to reflect carefully on the mistakes of the past and form a comprehensive framework for full and open communication among all related organizations, institutions, and concerned citizens. Where commercial activity poses a threat to marine environments, policy must be

Under the precautionary principle, the approach to fishing targets is shifted from "How much can we catch?" to "What is the right amount to catch, so that human needs can be supplied without harming ecosystems?"

determined with due consideration for the functioning of ecosystems and the preservation of habitats, species, and genetic diversity (differences within and between populations). The precautionary principle is a vital tool in this strategy.

While risk assessment by itself seeks to measure the greatest degree of damage that people or nature can tolerate, the precautionary approach asks how much damage can be prevented, drawing on the best available scientific information and personal and collective experience and using the utmost caution and foresight within the limits of incomplete scientific data. Far from posing an obstacle to the progress of science and technology, the precautionary principle serves as a shock absorber to prevent environmental damage and becomes an impetus to commercial interests to exercise greater safety and find new innovative methods and benign materials in their development of operations and products. We believe that new policies and binding criteria and laws governed by the precautionary principle should be enacted to protect the ecosystems and biodiversity of the world's oceans before they succumb. Hopefully it is not too late to implement a meaningful policy framework to protect marine ecosystems and marine biodiversity. The developed nations can use their technological and economic power to protect themselves from the threat of environmental degradation (at least for awhile), but those who depend most directly on nature for sustenance are the first to suffer and the last to recover from the loss of ecosystems and biodiversity.

(Ship & Ocean Newsletter No.24 August 5, 2001)



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Disaster Prevention from the Ocean Perspective

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When it comes to earthquakes, facilities positioned on the ocean surface are in a far superior location from the disaster prevention point of view. However, in order to make the most of these superior facilities at the time of an earthquake, consideration of systems that provide unspoiled links with facilities on land are very much required. For this purpose, we must review what happened when previous earthquakes struck, and carry out scenario investigations based on the information obtained.

On the day the Hanshin-Awaji Earthquake struck, Japanese and American disaster-prevention researchers were gathering in Osaka.

On the morning of January 17, 1995, when the Hanshin-Awaji Earthquake struck Kansai area, I felt the shock in my hotel room in Osaka. I had arrived the previous day to attend a conference of Japanese and American researchers on urban disaster prevention in Kansai. Our American counterparts had strongly urged us to change the timing of the conference, as the Northridge Earthquake had occurred on this date exactly one year earlier.

When we selected the date for the conference I reasoned, as chairman of the Regional Safety Council, that January 17 would be a good date, as it was the day after Japan's university professors finished their center tests. Needless to say I could not possibly have foreseen the calamity that would occur on that date, any more than I could have had advance knowledge of the Northridge Earthquake. When I negotiated with the Americans on the date, I was aware that it was more convenient for us than for them, and the number of participants might be reduced by as much as half. Nonetheless some 37 participants arrived from the United States, no doubt because the Northridge Earthquake of a year earlier had provided numerous findings they wanted to announce.

The earthquake struck at 5:46 AM. It was hard to discern from the morning news what was going on, so I went downstairs for an early breakfast in the restaurant, where the other attendees had already gathered. The room was abuzz with conversation about the disaster unfolding just a few dozen miles away. Some of the younger researchers and people not involved in running the conference, deciding to go immediately to the scene of the quake, hired taxis and headed for the Kobe/Awaji area. If I had not been responsible for running the conference, I would have joined them. As it happened, it was impossible to proceed, as soon as the conference began, TV and newspaper journalists were calling constantly. I was asked to appear on the 11

o'clock news at NHK. While I waited and watched the news feed from Kobe and Awaji, I realized that as many of us as possible should depart for the affected region the next day, so I asked NHK to transport 25 of us to the scene. NHK obliged with three minibuses carrying nine people each, and soon the other media joined in, so we were all able to make the journey. We finally managed to hold a general conference on the third day. As a result of this experience, the bonds of friendship and cooperation among disaster-prevention researchers on both sides of the ocean were strengthened considerably, and many fruitful Japan-US conferences on urban disaster prevention followed.

When disasters arise, support from the sea is important. To ensure this support is available, the necessary systems must be set up in advance.

I visited more sites struck by the Hanshin-Awaji Earthquake than I can count, but I only went there by car on January 17 and 18. At all other times, until the shinkansen was running again, I ventured out from Kansai International Airport by boat.

When major earthquakes occur, access from the sea is of paramount importance. In 1923, when the Great Kanto Earthquake struck the Tokyo area, relief supplies were shipped in from around the world and unloaded on the wharf at Shibaura. Organization is important, however, as the following tale illustrates. According to Mr. Miyoshi who was present at the time, there were not enough dockworkers to handle the workload, so the people of the stricken city moved in to take the supplies themselves. Unsure how to handle the situation, local policemen asked for the opinion of the Superintendent General of the Tokyo Metropolitan Police. The Superintendent General suggested that the people be allowed to carry on, with the police allocating tasks so that the work could proceed in an orderly fashion.

Later a survey was conducted of the port facilities used

during the quake disaster. The equipment used at the time of the Great Kanto Earthquake was small, suited to offloading of cargo imported from China. Officials recognized that more modern ports used much larger facilities, and highly detailed plans would have to be considered to ensure the port's usefulness in the event of another earthquake.

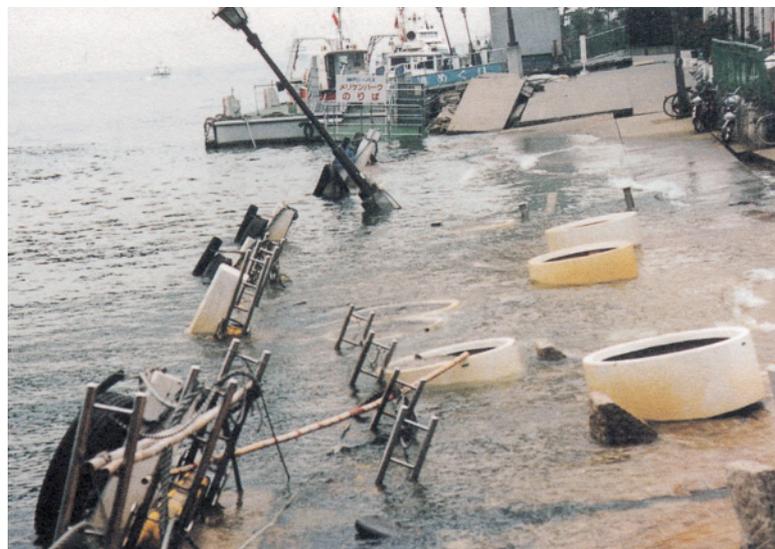
In the case of the Hanshin-Awaji Earthquake, Kobe's port had three berths specially designed to be earthquake-resistant, but none of them could be used because they were all in the same place and the bridge leading to them had collapsed. When the berths were built, it was deemed that putting them all in one location was most cost-effective; in fact, they were made useless. If each berth had been erected in a separate place, it would have been far more likely that at least one berth would be serviceable.

More trouble arose when the Japan Maritime Self-Defence Force brought in drinking water by ship, but not enough water trucks were available to distribute it. As these incidents reveal, facilities cannot be considered in isolation—planners must take into account the interplay of many different factors.

Passenger ships were pressed into service as refuges and accommodations for relief teams. The dilemma in this case is that, if the ships are not docked, it may be difficult to get on and off the ships after the port is damaged, yet if the ships are docked when the earthquake strikes, they may be damaged along with the port. When an earthquake struck Italy in 1980, ships were used as refuges, but a lack of similar refuge facilities meant that the ships had to be used in this way far longer than intended, disrupting passenger services. For those taking refuge on the ships, however, there was no need to worry about aftershocks, nor was food supply an issue. On the morning of April 18, 1906, my grandfather was on a ship moored at the San Francisco harbor. When the earthquake struck that city, the ship was rocked by a powerful tremor but was left undamaged, in contrast to the devastation in the city center. He told me that he simply disembarked from the ship and walked around San Francisco to survey the wreckage.

Maritime facilities have an outstanding role to play in disaster prevention, but to make proper use of them in the event of an earthquake systematic planning is needed to ensure that sea and land facilities are well coordinated. The lessons from past earthquake disasters must be carefully studied and scenarios developed on that basis. Clearly, the role of the sea in earthquake relief has not yet been adequately examined.

(Ship & Ocean Newsletter No.26 September 5, 2001)



The port of Kobe, 25 days after the earthquake (February 11, 1995). The pier in the background was available for use the next day; the one in the foreground was unserviceable. Even if relief supplies could reach the port, sea-based support systems could not function because vessels were unable to dock.

A Disaster Prevention Support System Using Rivers and the Ocean

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The maintenance of an extensive transport network system that organically ties up land, sea and air is a major point in the discussions involving earthquake counter measures. An infinite amount of small and large rivers flow through the plains on which large cities sit. These river routes need to be characterized as an extension to ocean routes and used more effectively to promote the improvement of the transportation network.

Disaster response operations integrating land, sea and air

One of the greatest regrets about the 1995 Hanshin-Awaji Earthquake was that the region's abundant seas, port facilities, open spaces and airspace were not effectively utilized, in an integrated approach linking land, sea and air, to tackle the disaster. Though great efforts were made to incorporate land, sea and air routes into disaster-prevention planning, in each case the best routes were selected on an individual basis, not as cohesive parts of a comprehensive, three-route plan. In a truly integrated approach, earthquake barriers, for example, could be used not merely as barriers but as takeoff and landing facilities for helicopters and as transportation links for the delivery of goods and access to the open spaces where residents could take refuge. Admirably, Kobe's earthquake barriers withstood the quake, but it satisfied none of the other conditions listed above.

Immediately after the earthquake, the development of a wide-area transportation network was proposed, linking land, sea and air and built in partnership between the public and private sector. In 1995 and 1996 the National Land Agency, Ministry of Transport and Ministry of Construction (now amalgamated in the Ministry of Land, Infrastructure and Transport (MLIT)) joined with the Fire Defense Agency (now Fire and Disaster Management Agency) to assess the cost of a comprehensive land development project for this purpose, in a study called the "survey to determine measures to promote the formation of an integrated land, sea and air network in the Tokyo area." The survey dealt with four themes: the construction of disaster prevention bases for the Tokyo area as a center for wide-area support and other disaster prevention efforts extending across prefectural borders; formation of a river-based emergency transportation network; use of ports as centers for disaster prevention activities; and securing and distributing supplies of household water.

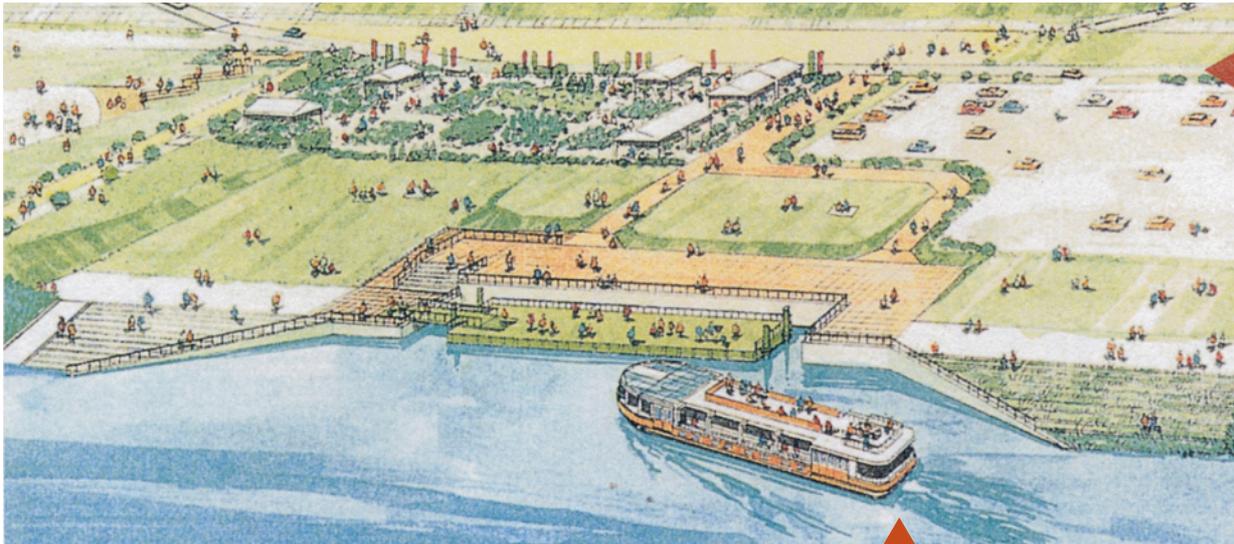
Proceeding in parallel with these efforts is the Megafloat project, a plan to devise a large-scale floating structure for disaster prevention purposes. While the idea of creating an artificial, floating island in place of land has been around

for over 20 years, it was only in the 1990s that the Transportation Technology Commission published findings that prompted real progress in research and development on the topic. The Commission was particularly interested in the fact that, while land-based structures sustained massive damage in the Hanshin-Awaji Earthquake, floating docks in shipyards emerged unscathed. That year a technical research consortium was formed, consisting of 17 shipbuilding and steelmaking companies. Megafloat was conceived as a mobile port facility and an "offshore wide-area disaster prevention base" for the Tokyo area, capable of supporting a river-based emergency transport network. Proving tests were conducted in Yokosuka Bay to float a prototype measuring 300m in length, 60m in width and 2m thick. After these tests, six units were linked together in 1999 to create a Megafloat that was 1000m long, 60m wide (120m wide in some parts) and 3m thick (with a draft of 1m).

As part of the Megafloat research effort, proving tests were conducted to assess its function as a disaster prevention base and offshore airport. In autumn 2000, after the research and proving tests were completed, Megafloat was dismantled and put to other uses. In the ports of Osaka, Nagoya and Yokohama, these "minifloats" were docked with cargoes in the 1000t range and deployed as floating disaster-prevention bases with heliport capabilities.

In a separate effort, the Research Institute for Ocean Economics (RIOE) initiated research on a "system for disaster prevention support from seas and rivers" immediately after the Hanshin-Awaji Earthquake. This proposal clearly demonstrated considerable promise. RIOE's report envisaged a 16m ship for river transport, with a draft of 1.5-2m when fully loaded and a height of 3m above the surface when empty. Assuming that the ship would require bridge clearance of 3m or more, waters at least 2m deep in dry season or at low tide and an upstream limit point of 20m (to enable turnarounds), the distance the vessel would be able to travel upriver from Tokyo Bay would be 29km on the Arakawa River, 22km on the Edogawa, 10km on the Tamagawa and 9km on the Tsurumigawa. Of these four, the river with the greatest potential utility is the Arakawa. Today a

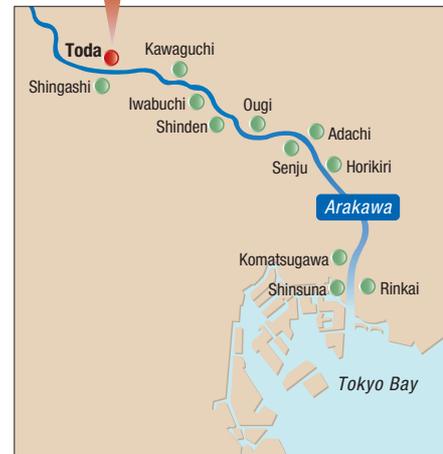
■The Arakawa River Station Plan



In MLIT's Arakawa River Station Plan, 12 "river stations" will be built along the Arakawa River, establishing an emergency transportation route to Tokyo Bay. Above is an artist's conception of the Toda river station with a 30m floating wharf.

river bus operates along a 34km stretch of the Arakawa, with a capacity of 206 passengers and draft of 1.25m.

Yet another plan, advanced by MLIT, calls for the construction of six river stations on each side of the Arakawa River, in a 30km stretch from the river's mouth. Dubbed the Arakawa River Station Plan, this scheme aims to facilitate river transportation during normal times and facilitate emergency response in the event of earthquakes or similar events. Although some safety issues remain to be solved regarding the use of rivers in disaster response, if these can be conquered a vast new transportation network can be opened up to serve the Tokyo area.



A new urban transportation network for Japan's aging society

If this river route is to be made available in times of crisis, measures must be taken to stimulate its use in normal times. Such a project amounts to nothing less than the creation of a new mode of river and marine transportation.

If I may finish on a somewhat unrelated note, another new transportation network is emerging in the form of the three- and four-wheel electric vehicles, with a top speed of 6km/h, favored by the elderly today. In my own hometown, my mother loved her electric cart, and my 91-year-old father, taking her lead, uses one constantly to go shopping, visit the hospital or meet friends. These little vehicles are everywhere now, from big cities like Tokyo to regional centers like Nagaoka. Even though electric carts are only permitted on footpaths, many people cheerfully drive them

on roads and highways. I believe the day is not far off when these little cars will throng city streets in huge numbers. Although it will start with brief journeys for daily tasks, I believe that elderly people living along Tokyo Bay, the banks of rivers and the Koto delta will soon use their beloved buggies to go shopping or sightseeing in Asakusa, Ginza, Tokyo Disneyland and Yokohama's Minato Mirai 21. The new water transportation systems should soon make such travel possible, in fact, it is hard to imagine such travel patterns without them.

I believe that within 10 years we will see crowds of elderly people on their electric buggies. They will up and down rivers and along the shores of Tokyo Bay in countless craft both large and small, side-by-side with children and young adults on their bicycles.

(Ship & Ocean Newsletter No.26 September 5, 2001)

Mutual Earthquake Support Agreements Linked by the Oceans

Yoshinori YAMANE

Mayor of Tamano City, Okayama Prefecture

Taking heed of the lessons taught by the "Great Kobe Earthquake", Tamano City of Okayama Prefecture, which faces the Seto Inland Sea, has begun to promote improved earthquake resistance of its harbor facilities, in order that the functions of its harbor aren't paralyzed by the occurrence of a major earthquake. Furthermore, a mutual support agreement has been formed by Tamano City with the harbor municipality of Chuo-ku, Tokyo. Through this agreement, a mutual cooperative arrangement, which includes the rescue of disaster victims, the provision of relief supplies and much other support, has been successfully set in place.

Applying the lessons of the Hanshin-Awaji Earthquake in harbor construction

The City of Tamano is located on the shores of Japan's Inland Sea, or Setonaikai, in the eastern part of the sea known as Higashibisaneto. Since the 19th century the city's port, Uno, has been linked to the port of Takamatsu, across the Inland Sea in Shikoku, by a ferry service. For much of its recent history, the city's growth has been powered by its proximity to the ferry landing and by a local shipbuilding industry. In 1988 the Seto Ohashi Bridge was completed, linking Honshu, the mainisland of Japan and Shikoku. At the same time the old ferry service was replaced by a frequent local service, departing every 20 minutes day and night and calling at nearby islands such as Shodoshima and Naoshima in addition to Uno and Takamatsu.

Before the bridge was constructed, the port of Uno was host to a constant stream of travelers passing over the straits. However, several levels of government are taking steps to boost seaborne traffic on the Inland Sea. In other regions, dedicated cargo berths are being built. To revive the movement of people by sea, the Ministry of Transportation (now MLIT) tabled a plan called Port Renaissance 21. Based on this plan, the area of the Uno ferry wharf was designated a "people port," meaning a port for the transportation of tourists, and efforts were stepped up to build a wharf for ocean-going cruise vessels and to modernize the ferry terminal. The development of the City of Tamano is now focused clearly on maritime traffic, as Tamano builds a new port cul-

ture that is open to the world.

In setting a plan for the development of people ports in 2003, Tamano took great pains to design ports to provide solid backup in the event of major disasters. This decision was prompted when, in the wake of the Hanshin-Awaji Earthquake, Tamano sent relief supplies, firefighters and work vehicles to the scene of the disaster, but their arrival was delayed due to chaos on the roads. The city switched to marine transportation from the port of Uno to Kobe, but Kobe's port was devastated by the quake and scarcely able to function. This terrible experience underscored the crucial importance of earthquake-resistant port facilities.

Mutual Earthquake Support Agreement between port cities

Recent moves in Japan to devolve powers to local governments are helping Japan's cities to develop greater autonomy and individuality. To develop stronger ties of commerce and promote the exchange of ideas, many cities are partnering with each other through sister-city agree-

■ City of Tamano and surrounding area



ments and inter-city exchanges. In Tamano, we quickly realized that Chuo-ku of Tokyo would be a good fit for such an agreement, for several reasons. First, many companies with places of business in Tamano have their head offices in Chuo-ku. Second, in the event of an earthquake or similar disaster, the chances of both locations being struck at the same time are slim, as the two cities are more than 700km apart. Finally, in the event that a disaster renders the roads impassable, the port of Harumi in Tokyo and the port of Uno in Tamano could be used to deliver relief supplies and dispatch relief workers by sea, provided that both ports made diligent preparations to implement earthquake-resistant infrastructure. Following discussions with Chuo-ku, in 1996 the City of Tamano and Chuo-ku concluded a Mutual Earthquake Support Agreement.

The agreement offers a number of specific assurances. Our two cities agree to assist each other in the evacuation of disaster victims, to provide facilities for temporary supply, and to provide equipment and materials for rapid recovery from disasters, including vehicles for emergency relief efforts, food, drinking water and medical supplies. Medical and technical personnel will also be dispatched as required. We believe that the strong bonds of cooperation this agreement builds will foster a spirit of full and mutually rewarding exchange between the two cities, not only at the government level but among individual citizens and residents as well.

As Mayor of Tamano, it is my basic responsibility to ensure the safety and security of residents. As the devolution of authority to local governments continues in Japan, I am confident that Chuo-ku, the heart of the nation's capital and the largest metropolis, and Tamano, a small city nestled in a beautiful natural environment, can complement each other to improve the quality of life for the people of both our constituencies.

(Ship & Ocean Newsletter No.26 September 5, 2001)



Signing ceremony for the Mutual Earthquake Support Agreement between Chuo-ku and Tamano City. Pictured are Mr. Yoshihide Yada, Mayor of Chuo-ku (right) and the author (left).