

NOWPAP MERRAC

Northwest Pacific Action Plan
Marine Environmental Emergency Preparedness and Response
Regional Activity Centre

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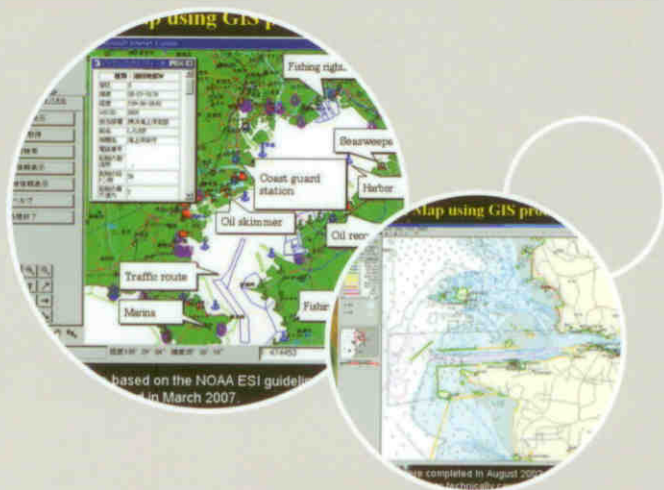
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Sensitivity Mapping



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First published in 2005
by Marine Environmental Emergency Preparedness and Response
Regional Activity Centre
the Northwest Pacific Action Plan (NOWPAP MERRAC)
Established at **KORDI/MOERI**
P.O.Box 23, Yuseong, Daejeon 305-600 Republic of Korea

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For bibliographical purposes this document may be cited as:
MERRAC Technical Report No. 1, Sensitivity Mapping, NOWPAP MERRAC,
2005.

Foreword

MERRAC, the Marine Environmental Emergency Preparedness and Response Regional Activity Centre, is one of four Regional Activity Centres of the Northwest Pacific Action Plan (NOWPAP) which was adopted in 1994 as a Regional Seas Programme of the United Nations Environment Programme (UNEP) by the People's Republic of China, Japan, Republic of Korea, and Russian Federation. MERRAC is responsible for regional co-operation on marine pollution preparedness and response in the region.

With technical support from the International Maritime Organization (IMO), MERRAC is currently functioning as secretariat for the NOWPAP MERRAC Focal Points Meeting, Expert Meeting, Competent National Authorities Meeting for NOWPAP Regional Oil Spill Contingency Plan (CNA meeting). The Centre also carries out other special activities including the management of a regional information system, organization of training and exercise, capacity building, co-ordination of research and development on the technical aspects of oil spills.

As one of main outcomes of MERRAC activities, the NOWPAP Regional Oil Spill Contingency Plan (the Plan) and its relevant Memorandum of Understanding (MoU) have been developed and officially come into effect as being signed by all NOWPAP Members. The purpose of the Plan is to provide an operational mechanism for mutual assistance through which the Member States will co-operate during major marine oil pollution incidents in the region.

In order to provide practical and technical guidelines to promptly and effectively respond to major oil spill accidents within the framework of the Plan, the 5th MERRAC Focal Points Meeting (MERRAC, Daejeon, 20-24 May 2002) especially agreed to carry out the series of MERRAC specific projects related to oil spill prediction model, sensitivity mapping, oil dispersant, shoreline cleanup, etc.

The documents have been prepared by the Experts Groups, whose members have been officially nominated by the NOWPAP Members and has a profound professionalism in the relevant fields. The 8th NOWPAP MERRAC Focal Points Meeting (MERRAC, Daejeon, 24-27 May 2005) finally reviewed the drafts and then approved to publish them as MERRAC Technical Report series. This technical reports are described the current situation of the relevant subjects and future actions of MERRAC related to relevant subjects. A series of the MERRAC Special Reports to be published in 2005 are as follows:

- . Sensitivity Mapping
- . Guideline for Shoreline Clean-up
- . Guideline for the Use of Dispersants

As Director of MERRAC, I would like to thank the MERRAC Focal Points and all experts of the Expert Groups for their support and contributions to finalizing the MERRAC Technical Reports.

Chang-Gu Kang
Director of MERRAC, November 2005

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Chapter 1

Background and Objectives

At the First NOWPAP Forum Meeting on Marine Pollution Preparedness and Response (July 1997, Toyama, Japan), Japan was designated as the lead country of the correspondence group to collect information on existing and planned Environmental Sensitivity Index (ESI) Maps and related information on coastal and marine resources.

At the Second NOWPAP Forum Meeting (July 1998, Daejeon, the Republic of Korea), each NOWPAP Member introduced its existing and planned ESI Maps.

At the Third NOWPAP Forum Meeting (July 1999, Yuzhno-Sakhalinsk, Russian Federation), it was agreed that the ESI Maps should be prepared using the IMO/IPIECA guidelines as much as possible. The meeting further agreed that, at the next Fourth Meeting, participants would bring actual maps and/or computer displays, so that the Forum members would be able to see the differences in the maps developed or being developed.

At the Fourth NOWPAP Forum Meeting (May 2001, Qingdao, People's Republic of China), updated information on ESI Maps development was introduced by each NOWPAP Member including computer display presentations.

At the fifth NOWPAP MERRAC Focal Points Meeting (Daejeon, 20-24 May 2002), it was agreed to establish an Expert Group for Environmental Sensitivity Index (ESI) Maps in order to carry out the specific task "Oil Spill Prediction Model associated with Sensitivity Mapping". The Expert Group for ESI Maps consists of National Experts of ESI Maps nominated by each NOWPAP Member. The purpose of the activities of the Expert Group is to review the current situation on the development of ESI Maps in the NOWPAP Members, and to compare each of them to determine the next term's activity and then find an appropriate direction in which the NOWPAP Members will proceed.

Chapter 2

Review of the Current Situation on the Development of Environmental Sensitivity Index Maps in the NOWPAP Members

In order to research and review the current situation on the development of ESI Maps, a questionnaire about the publication, specifications, shoreline/coastline classification, symbols and other relevant information of ESI Maps (see Annex B) was sent to the national experts of the Expert Group for ESI Maps in the NOWPAP Members from leading expert (see Annex A) in February 2003. Answers are summarized as below and arranged in Annex C and D in detail.

2.1 People's Republic of China

ESI Maps are developed by the Yantai Maritime Safety Administration (MSA) for the whole coastal areas of the northern China Sea in order to protect nature and the environment, according to the Maritime Environment Protection Law of the People's Republic of China.

ESI Maps are available for China MSA and are developed using ArcInfo system (ESRI, www.esri.com). Style of ESI Maps is A3 book with 10 colors and its scale is 1:250,000 for the northern China Sea and 1:350,000 for the Yantai offshore regions. Geographical information is based on navigational chart including ENC and raster land maps by satellite.

The model predicts the movement and spreading of an oil spill, defines the marine and shoreline resources at risk, and evaluates the likely losses and damages there of.

For the time being, China has no unified criteria for ESI maps, but according to the "China Environment Protection Law", "China Maritime Environment Protection Law" and other relevant regulations for marine administration, for example, maps with marine function plotting of the state have been worked out. On these maps, which were verified and published by the China State Maritime Administration, criteria and objectives for protection are defined based on nature attributes and utilization requirements. China MSA has established regional ESI maps in the contingency plan for oil spill from vessels at sea, such as the Oil Spill Contingency Plan for the northern China Sea and the Oil Spill Contingency Plan for the South China Sea. In the regional ESI Maps, classification of shoreline sensitivity was based on NOAA, and Chinese governmental institutions concerned shall make further amendments, create unified criteria and publish ESI maps at a certain time before finally opening to those institutions with an oil spill contingency plan.

2.2 Japan

Four organizations including the Ministry of the Environment, Japan Fisheries Agency, Japan Coast Guard (JCG) and Japan Association of Marine Safety have been collecting information, making databases and developing ESI Maps, independently. The ESI Maps of JCG is most suitable one for the NOWPAP/4 activity in consideration of those purposes. JCG's ESI Maps covers the whole coastal areas of Japan including Electronic Navigational Chart (ENC) and land maps as geographical information in scale of up to 1:50,000, and the ESI Maps are available on trial to governmental offices and related local governments through Internet Explorer using SIS (Cadcorp, www.cadcorp.com). The database system is operated by TNTmips (MicroImages, www.microimages.com), and the system will be changed to ArcGIS (ESRI, www.esri.com) from September 2003.

The project of ESI mapping based on shoreline/coastline classification in NOAA ESI guideline was initiated in April 2002 and it will be completed in March 2007. The results from April 2002 were arranged, estimated and ranked after April 2003. These results were converted to ArcView format and they will be accessible by the Web browser.

The natural, social and economic information in ESI Maps cannot take in any oil spill prediction at present. It is necessary to resolve some technical problems, i.e., different computer systems and data formats between the ESI Maps management and oil spill prediction model, in order to reflect the results of oil spill prediction model into ESI Maps in future.

2.3 Republic of Korea

The project on the development of ESI Maps was initiated in July 1999 by the Korea Coast Guard, which acts as a leading agency in the field of marine pollution preparedness and response in Korea. This project has been technically carried out by the Maritime and Ocean Engineering Research Institute/Korea Ocean Research and Development Institute (MOERI/ KORDI), which has operated the MERRAC.

The whole Korean coastal area was divided into twelve sub-regions, and then the ESI mapping project was carried out on each area by area, together with the development of Area Oil Spill Contingency Plan. In August 2002, all ESI Maps were completed, which cover the whole Korean coastal area.

The Korean ESI (KRESI) system is coded by Visual C++ and ESRI Map Objects utility and includes information on coastal and marine relevant resources more than 42 items in a form of the Geographical Information System (GIS). This system can display linking with other special reference data such as satellite images, results of oil spill trajectory predictions in scale of up to 1:25,000. Papers version of ESI Maps are also available.

2.4 Russian Federation

ESI Maps have been developed by the Sea Protection Institute of Marine State University under named admiral G.I. Nevelskoy for the coastal area between 33-55°N and 121-145°E, as one of the main elements of the central reference information database (together with the oil spill response recourse database, hydro-meteorological information and so on) used for designing structures to contain hazardous materials responding to oil spills. These maps should be a part of the legal system. So they are to be formed and maintained by the agency having special authorities from the Natural Recourses Protection Department of Russia (or Regional Administration). ESI Maps of appropriate regions must be compatible with the Oil Spill Response Plans of all levels. ESI Maps are available to agencies creating oil spill response plans, local authorities and natural resources departments, and social and public departments.

ESI Maps are available by CD-ROM in scale from 1:10,000 to 1:1,000,000, or A4 paper with full color or monochrome, both based on ENC and raster data of maritime and land maps.

Now Sea Protection Institute (SPI) of Marine State University (Vladivostok) has the technical and software resources required to solve the following tasks:

- giving registered users the ESI maps made as Shapefiles by the Internet;
- giving the possibility to simulate the oil spill prediction on ESI Maps made as Shapefiles for regions, which is likely to be accessible by the Internet;
- storing and disseminating the data about the resources of the whole NOWPAP region by the Internet.

2.5 Summary

Development of ESI Maps has been initiated by each NOWPAP Member. In the Republic of Korea, ESI Maps were completed in August 2002 and can be displayed on the original system using a form of the GIS. In Japan, ESI Maps are operated on a trial basis through the Internet and ESI shoreline/coastline classification based on NOAA ESI guidelines and will be completed by March 2007. In the Russian Federation, ESI Maps can be displayed using original GIS-like software, which are able to integrate Shapefiles of ESI Maps and Oil Spill Model. Shoreline/coastline classification and symbols are the same as in NOAA ESI guidelines. Data about the ESI Maps, oil spill models and oil spill response resources may be accessed by the Internet. In the People's Republic of China, ESI Maps are available in the form of A3 papers and specifications are different in each region.

ESI shoreline/coastline classification in the NOWPAP Members is based on NOAA ESI guideline, but some rankings are different between NOAA and NOWPAP Members except the Russian Federation. Symbols and styles, such as line type and color regarding sensitive biological resources and human-use features on ESI Maps of the NOWPAP Members, are also different from NOAA

standard symbolization except for the Russian Federation.

Detailed specification and symbolization on ESI Maps are shown in Annex C and D in English for comparison and interpretation of the current status of ESI Maps of each NOWPAP Member. Some examples of ESI Maps are also shown in Annex D.

Chapter 3

Proposed Plan for the Next Term's Activity

As seen in Annex C and D, ESI shoreline/coastline classification is basically the same as the NOAA ESI guidelines, but there are some differences of styles, symbols and specification such as media, software/systems and language on ESI Maps among NOWPAP Members. In the current state, it is quite difficult to standardize them and share ESI Maps for the NOWPAP region, because the development of own ESI Maps has already been initiated and maintained under the national policy of each NOWPAP Member. Therefore thousands of man-hours as well as large sums of money would be required to convert into a single form of ESI Maps by the NOWPAP Members and it would exceed the limitation of MERRAC budget and activities.

In the meantime, it has been recognized in the region that the ESI Maps using GIS is one of indispensable tools on counter measures for oil spill incidents in the sea.

Therefore, it is proposed to examine technical subjects on information exchange of ESI Maps in the NOWPAP region as a short-term's activity and mid- and long-term activities.

3.1 Short-term's Activity

Step 1: Converting ESI Maps of each NOWPAP Member into a Shapefile format and sharing them among MERRAC and the NOWPAP Members

As described above, it is difficult to develop a common ESI Map in the NOWPAP region, so the NOWPAP Members should aim to share ESI Maps with each other. To this end, it is necessary to determine a common and public format which is able to develop and display the ESI Maps of NOWPAP Members.

It is recommended that the NOWPAP Members should convert ESI Maps into a shapefile (.shp) spatial data format (hereafter referred to as Shapefile), which is determined by ESRI (www.esri.com), because the Shapefile is a familiar format in the GIS (Geographic Information System) field and can be processed by many GIS applications. Actually the NOWPAP Members have already used ESRI's products and it is expedient to convert all ESI Maps into the Shapefile. Therefore, ESI Maps should be converted into a Shapefile format as native language because each NOWPAP Member has a responsibility to respond to oil spill incidents promptly and effectively. In a case of a Joint Operation, Annex D would be helpful to understand the styles and symbols on ESI Maps.

Also, it is necessary to promote to exchange ESI Maps in view of the present condition in each NOWPAP Member. For this reason, Each NOWPAP Member is requested to prepare a list of the ESI Map information that can be provided for

other members as Shapefile. In order to share ESI Maps among MERRAC and NOWPAP Members, the Shapefile version of ESI Maps should be distributed by optical media such as CD or DVD, including the operation manual and the relevant information in English.

And then, each NOWPAP Member should test whether the shape file of other countries can be processed by the system of its own country.

In addition, it is recommended to update these ESI Maps every five years or less in view of the condition of each NOWPAP Member. MERRAC and NOWPAP Members should establish a procedure for operating the Shapefile version of ESI Maps. And also the comparative table of ESI and Symbols in the NOWPAP Members as shown in Annex D should be kept in the latest.

Step 2: Liking of the Shapefile version of ESI Maps with results of oil spill prediction

According to step 1, MERRAC and NOWPAP Members could share the Shapefile version of ESI Maps and display them on GIS-like software/system. And each NOWPAP Member has been developing or already operating an oil spill predication model. Therefore, each NOWPAP Member is requested to build and maintain a very close relationship between the Experts of ESI Maps and Oil Spill Prediction Models in each NOWPAP Member in order to modify the software/system and establish a procedure for linking of the ESI Maps and the results of oil spill predictions and other relevant information.

3.2 Mid- and Long-term activities

As the Medium and Long Term Plan on ESI Map activities in the region, the following should be considered in the future:

- 1) Regional cooperation on the technological improvement of ESI Map,
- 2) Examination on the operation of ESI Map in the region, and
- 3) Cooperation on ESI Map with activities of the other Regional Activity Centers (RACs) and other international programs or organizations concerned.

In the first item of this plan, we should consider the standardization of the symbol and index among the members in order to avoid miss-understanding when ESI Maps are referred at the actual incident. Reference manual of each ESI Map may be prepared in English for the operation.

In the third item of the plan, public relations on ESI Map in MERRAC should be considered. To develop the webpage on the activity of the ESI Maps at the MERRAC website could be an idea, for example.

References

- Environmental Sensitivity Index Guidelines Version 3.0, *NOAA Technical Memorandum NOS OR&R 11*, NOAA, 89 pp.
- ESI Maps, *Office of Response and Restoration, National Ocean Service, National Oceanic and Atmospheric Administration*, <http://response.restoration.noaa.gov/>
- Kang, Seong-Gil, 2002: Example of Korean ESI Map & Oil Spill Prediction Model, *Report of IMO/UNEP Forum on regional arrangements for co-operation in combating marine pollution incidents*, 30 September – 2 October 2002, pp.140~144.
- Report on the Sensitivity Maps, *the Fifth NOWPAP MERRAC Focal Points Meeting, 20-24 May 2002, UNEP/IMO/NOWPAP/MERRAC/FPM 5/10*, 5 pp.
- Sensitivity Mapping for Oil Spill Response, *IMO/IPIECA Report Series, Vol. 1*, 24 pp.

Annex A

List of National Experts of the Expert Group for the Sensitivity Mapping

People's Republic of China

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Japan: Leading Country

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Annex B

Questionnaire of the status of Environmental Sensitivity Index Maps in NOWPAP Members

24 February 2003

INSTRUCTIONS

- Please fill out all items in English.
- Words and phrases are in detail but briefly if possible.
- Plain text by ASCII characters or Microsoft Word using normal font such as Century, Times Roman is accepted.
- The real thing and any additional documents, data and information are welcome both of paper and electronic format stored in CD or other electronic devices. In this case, please attach a translation to English from original text and available software.
- Example partly based on the status of Japanese ESI Maps is presented by *Italic font*.
- Any questions or comments for this questionnaire, please contact to cims@jodc.go.jp

I. Publishing of ESI Maps

1. Responsible organization(s): name and contact address

*Oceanographic Data and Information Division
Hydrographic and Oceanographic Department
Japan Coast Guard
5-3-1, Tsukiji, Chuo-ku, Tokyo 104-0045, JAPAN
Tel.:
FAX:
Email:
URL: http://*

2. Purpose or background of publishing

*For protection of the nature and environment
For work out a policy or law, etc.*

3. Target area of publication

All coastal regions

4. Update period

*Any time if needed
Every year
Every four years, etc.*

5. Future plan for publishing

*All shorelines/coastlines will be digitized and included in ESI Maps until 200X.
All ESI Maps will be available in electronic format for ArcView until 200X.*

6. Availability / Users

*For example)
Coast Guard and the related government office only
All government office and local government
National Institute, University and Educational institute for research and education
Any Commercial company and private person*

7. How to get or provide to user

*For example)
By the Internet (user ID/password is required or just name and address, etc.),*

*Electronic format/device requested by application,
Apply to Coast Guard directly or local government office, etc.*

II. Specification of ESI Maps

1. Media/device

*All papers
Papers and Electronic maps*

2. Using software and its information if electronic version of ESI Maps is available

*TNTmips (Microimages, Inc. <http://www.microimages.com>)
ArcView (ESRI, <http://www.esri.com>)*

3. Style, size, scale and color

*For example)
For paper)
Each paper divided by many regions
Each paper divided by categories
Books (A4, 100pp)
Same size of navigational charts (media, XX inch/cm x XX inch/inch,
etc.)
1:25000, 1:50000, 1:100000, 1:2000000
Black/White only, partially color, 4 colors, etc.
For Electronic map)
All information in one DVD-ROM
All area consists of 4 CD-ROM sets
Any scale is available, changing 4 steps (from 1:5000 to 1:2000000)
16/24bit or full color, or auto correct depend on display/device*

4. Basic maps

*Nautical Charts (paper)
Electronic Navigational Charts
Land Maps (raster from satellite or other source, or vector format)*

5. Datum

WGS84 (since 2002, before Tokyo Datum), etc.

III. Data and Information on ESI Maps

1. Items by category

i) Shoreline / Coastline types

*No information for shoreline/coastline
Sand, beach rock, seawall, mixed sand/gravel, etc.*

ESI classification:

*List and reference of ESI classification,
Definition of ESI classification,
Guideline for ESI classification judging, etc.*

ii) Nature and subtidal habitats

*Tidal flats, marshy, seagrass/kelp beds, coral reef, birds, animals,
hydrobios, etc.*

iii) Preservation areas

Sanctuary, reserve, nature preserve for birds, animals, hydrobios, etc.

iv) Socio-economic features

*National Parks, national monuments/treasures, fishing grounds, marine
leisure area (swimming beach, etc.), harbors, marinas, moorings, power
stations, etc.*

v) Oil spill response features

Oil recovery ships, oil skimmers, oil booms, etc.

vi) Other information

2. Legends and symbols

(Please write or attach documents for all legends in the ESI Maps)

3. Selectable information

*For electronic map)
All data and information are displayed on the ESI Maps
Any data and information are selected by user*

IV. Relation to the Oil Spill Prediction Model

1. Does the ESI Maps have the function of the Oil Spill Prediction Model? If the answer is yes, please explain or attach documents the specification of the

model.

2. If not, is it possible to display the result of the Oil Spill Prediction on the ESI Maps?

V. Other information

Please explain or attach any additional documents, data or information for useful our task and activities.

Annex C

ESI Map Specifications in NOWPAP Members

Publishing ESI Maps

Responsible Organization

Category	PRC	Japan	ROK	Russia
Organization	Yantai Maritime Safety Administration (MSA)	Oceanographic Data and Information Division, Hydrographic and Oceanographic Department, Japan Coast Guard (JCG)	Maritime Pollution Response Division, Maritime Pollution Control Bureau, Korea Coast Guard	Institute of Sea Protection Maritime State University under named admiral G.I. Nevelskoy
Contact address	Huanhai Road No.8 Yantai	5-3-1, Tsukiji, Chuo-ku, Tokyo 104-0045	1-105 Bukseong-dong, Chung-ku, Incheon 400-201	
Telephone	+86 535 6683685	+81-3-3541-3853	+82-32-883-1846	+7 (4232) 51-52-70
Facsimile	+86 535 6256205	+81-3-3545-2885	+82-32-888-0594	+7 (4232) 51-52-70
Email	wangsm_cn@sina.com	cims@jodc.go.jp		moninets@msun.ru
URL		www1.kaiho.mlit.go.jp	www.keg.go.kr	www.msun.ru/div/ins/spi/

Purpose and Background

PRC	For protection of the nature and environment, according to Maritime Environment Protection Law of the People's Republic of China
Japan	It is requested to collect and detail the natural, social and economic information, according to the national emergency plan of preparation and response based on the article 6-1-b of international treaty in 1990 for the preparation for, action and cooperation for oil spills. Therefore the preparation for ESI Maps has been started from April 2002, and the project will be completed in March 2007.
ROK	It is requested to collect and adjust the natural, social and economic information, according to regional contingency plan for the twelve local sea areas covering the whole Korea sea. ESI Maps have been started in August 1999, and the project has been completed in August 2002.
Russia	The sensitivity maps are to be one of the main elements of the central reference information database (together with the oil spill response recourses database, hydro-meteorological information and so on) used for designing structures to contain hazardous materials responding to oil spills. These maps should be a part of the legal system. So they are to be formed and maintained by the agency having special authorities from Natural Recourses Protection Department of Russia (or Regional Administration). The sensitivity maps of appropriate regions must enter to structure of Oil Spill Response Plans of all levels.

Target Area

PRC	Whole coastal areas of the northern China Sea (all the way northward from 35° 08' 30"			
Japan	Whole coastal areas			
ROK	Whole coastal areas which are divided into twelve sub-regions			
Russia	Whole coastal areas between 33 – 55° N and 121 – 145° E are to have the sensitivity maps. But generating these maps should be divided into the several stages according to the next matrix.			
	Risk of pollution	high	middle	low
sensitivity to oil spill				
very high sensitivity		I	II	III
high sensitivity		II	III	IV
middle and low sensitivity		II	III	V

Update Period

PRC	Any time if needed
Japan	Any time if needed
ROK	Any time if needed
Russia	Update procedure must be defined by specially authorized agencies and depend on the region particularities and other conditions. At the first period update may be done quite often (may be one time in month), then the update may be made in longer intervals (one time in the season). Updating depends also on the availability of the correction data.

Future Plan

PRC	
Japan	The project of ESI mapping based on shoreline/coastline classification in NOAA ESI guideline has been initiated in April 2002 and it will be completed in March 2007. The results from April 2002 are arranged, estimated and ranked after April 2003. These results are converted to ArcView format and they will be provided by the Web.
ROK	
Russia	At the first stage the sensitivity maps are to be generated for regions which need oil spill response plans. Continually as far as the sensitivity maps will be enhanced they may be accessed on the user service conditions.

Availability / Users

PRC	China MSA
Japan	Firstly Japan Coast Guard, next the related government and local office, finally NPOs, etc.
ROK	Korea Coast Guard and related government and local offices
Russia	<p>Among the users of map sensitivity information system some groups may be picked out:</p> <ul style="list-style-type: none"> • agencies creating oil spill response plans; • local authorities and natural recourses departments; • social and public departments. <p>These groups differ in the fullness of information used and size and order of service costs.</p>

How to get / provide

PRC	
Japan	Web, user ID and password are required
ROK	Paper Map and CD-ROM included operating system
Russia	Agencies creating oil spill response plans are obtaining the most detailed data. Information services for these agencies will depend on the number of users. If the number of users is not so much then the sensitivity map information and corrections may be disseminated by CD-ROMs. If the number of users enlarges then the dissemination system may include the Internet. For public organizations it is intended to generate the web-sites.

ESI Maps Specification

Category	PRC	Japan	ROK	Russia
Media	Paper maps	TNTmips format ArcGIS format SIS format (for the Web)	Paper Maps CD-ROM	The base of the ESI Maps should be GIS systems with the possibility of printing the maps of required configuration.
Software	ArcINFO [ESRI, www.esri.com]	TNTmips (to August 2003) [MicroImages, Inc., www.microimages.com] ArcGIS (from September 2003) [ESRI, www.esri.com] SIS ASC50 (for Web) [CadCorp, www.cadcorp.com]	KRESI (Korea Environmental Sensitivity Index), which was developed by using MapObjects of ESRI.	The ESRI company products are used but when installing some parameters will have copying protection.
Style	Books	Web	Paper CD-ROM	For paper Each paper divided by region difference by scale. ESI Maps is full color, possibly
Size	A3	Auto correction depend on device or display	Auto correction depend on device or display	

<p>Scale</p>	<p>1:250,000 for vital sensitive resources in the northern China Sea and 1:350,000 for sensitive resources of the Yantai offshore regions</p>	<p>Up to 1:50,000</p>	<p>Up to 1:25,000</p>	<p>presentation in black / white. Map size can modify (from A4 to custom size). For electronic Possibly presentation the ESI Maps in CD-ROM. The maps is full color, the scale is modify (from 1:10,000 to 1:1,000,000).</p>
<p>Colors</p>	<p>10 colors</p>	<p>Full color</p>		
<p>Basic maps</p>	<p>Nautical Charts (paper) Electronic Navigational Charts (ENC) Land Maps (raster from satellite)</p>	<p>Electronic Navigational Chart (ENC) Land maps (vector)</p>	<p>Electronic Navigational Chart (ENC) Land maps (vector)</p>	<p>Electronic navigation and land maps and raster maritime and land maps</p>
<p>Datum</p>		<p>WGS84</p>	<p>TD (Tokyo Datum)</p>	<p>Pulkovo_42 Pulkovo_95 WGS_94</p>
<p>Language</p>	<p>Native</p>	<p>Native</p>	<p>Native</p>	<p>Native</p>

Relation to the Oil Spill Prediction

ESI Maps including the Oil Spill Prediction Model

PRC	The model predicts the movement and spread of an oil spill, defines the marine and shoreline resources at risk, and evaluates the likely loss and damages there from.
Japan	The natural, social and economic information in ESI Maps cannot take in any oil spill prediction. It is necessary to resolve some technical problems, i.e., different computer systems and data formats between the ESI Maps management and oil spill prediction model in order to include the results of oil spill prediction model in ESI Maps in future.
ROK	ESI Maps don't include oil spill prediction model. ESI Maps, however, can load results of oil spill prediction model, if the results are prepared by the specified format.
Russia	Now Sea Protection Institute (SPI) of Marine State University (Vladivostok) has the technical and software resources required to solve the next tasks: <ul style="list-style-type: none"> • giving the registered users the ESI maps made as Shapefiles by Internet; • centralized giving the possibility to simulate the oil spill combined with ESI maps made as Shapefiles for some beforehand considered region by Internet; • storing and spreading the data about the resources of whole NOWPAP region by Internet.

Function to superimpose or overlay on the ESI Maps

PRC	
Japan	No function.
ROK	We can overlay satellite image on the ESI Maps.
Russia	




Other Information and Comments







	<p><u>Regarding ESI map complexation</u></p> <p>For the time being, China has no uniformed criteria for ESI map, but according to, for example, the “China Environment Protection Law”, “China Maritime Environment Protection Law” and other relevant regulations for marine administration, maps of marine function plotting of the state have been worked out. On these maps, which were verified and publicized by the China State Maritime Administration, criteria and objectives for protection are defined based on nature attributes and utilization requirements. In the Contingency plan for oil spill from vessels at sea, China MSA has established regional ESI maps such as in the Oil Spill Contingency Plan for the northern China Sea and the Oil Spill Contingency Plan for the South China Sea. In the regional ESI map, classification of shoreline sensitivity was based on NOAA, and China governmental institutions concerned shall make further amendments, create unified criteria and publish at a certain time before finally opening to those departments with an oil spill contingency plan.</p> <p>Attached is the briefing only to ESI maps for the northern China Sea.</p>
Japan	
ROK	
Russia	<p>Please explain or attach any additional documents, data or information for useful our task and activities.</p> <p>The sensitivity map creating procedures should be approved by the authorized agencies of NOWPAP Members.</p> <p>Besides this it is necessary to determine the organizations as the sensitivity maps developers for every state.</p>






Annex D





ESI Maps Shoreline Rankings and Symbolization in NOWPAP Members

ESI Shoreline Classification

No.	NOAA, USA	PRC (the northern China Sea)	Japan	ROK	Russia
	Description <i>Color name</i> <i>Color(CMYK)</i> <i>Color(RGB)</i>	Description	Description <i>Color name</i> <i>Line style</i>	Description <i>Color name</i> <i>Color(CMYK)</i> <i>Color(RGB)</i>	Description <i>(Color name</i> <i>and color are</i> <i>the same as</i> <i>NOAA)</i>
1A	Exposed rocky shores <i>Dark Purple</i> <i>56/94/0/13</i> <i>119/38/105</i>	1 (= 1A + 1B + 1C)	Same as NOAA <i>Blue</i> 	1 (= 1A + 1B + 1C) <i>Light</i> <i>Green</i> <i>100/0/80/0</i> <i>0/255/0</i>	Same as NOAA
1B	Exposed, solid man-made structures <i>Dark Purple</i> <i>56/94/0/13</i> <i>119/38/105</i>		Same as NOAA <i>Blue</i> 		Same as NOAA
1C	Exposed rocky cliffs with boulder talus base		X		X
2A	Exposed wave- cut platforms in bedrock, mud, or clay <i>Light Purple</i> <i>38/44/0/0</i> <i>174/153/191</i>	2 (= 2A + 2B)	2 (=2A + 2B) <i>Cyan</i> 	2 (= 2A + 2B) <i>Blue</i> <i>80/60/0/0</i> <i>0/80/128</i>	2 (=2A+2B)
2B	Exposed scarps and steep slopes in clay <i>Light Purple</i> <i>38/44/0/0</i> <i>174/153/191</i>				

3A	Fine- to medium-grained sand beaches <i>Blue</i> 88/19/0/0 0/151/212	3 (= 3A + 3B + 3C)	Same as NOAA <i>Yellow</i> 	3 (= 3A + 3B + 3C) <i>Light Blue</i> 80/0/0/0 0/112/128	3 (=3A+3B)
3B	Scarps and steep slopes in sand <i>Blue</i> 88/19/0/0 0/151/212		Same as NOAA <i>Yellow</i> 		
3C	Tundra cliffs <i>Light Blue</i> 50/0/0/0 146/209/241		X	X	
4	Coarse-grained sand beaches <i>Light Blue</i> 50/0/0/0 146/209/241	Same as NOAA	Same as NOAA <i>Orange</i> 	Same as NOAA <i>Green</i> 40/0/60/0 104/152/64	Same as NOAA
5	Mixed sand and gravel beaches <i>Light Blue Green</i> 50/0/25/0 152/206/201	Same as NOAA	Same as NOAA <i>Brown</i> 	Same as NOAA <i>Yellow Green</i> 10/0/100/0 208/255/6	Same as NOAA
6A	Gravel beaches <i>Green</i> 100/0/100/0 0/149/32	6 (=6A+6B)	Same as NOAA <i>Pink</i> 	Same as NOAA <i>Yellow</i> 0/5/100/0 255/255/0	Same as NOAA
6B	Riprap <i>Light Green</i> 22/0/100/0 221/214/0		Riprap or tetrapod <i>Pink</i> 	Same as NOAA <i>Yellow Orange</i> 0/20/50/0 255/200/128	Same as NOAA

7	Exposed tidal flats <i>Olive</i> 0/0/100/25 214/186/0	Same as NOAA	Same as NOAA <i>Purple</i> 	Sheltered scarps in bedrock, mud or clay (same as 8A of NOAA) <i>Pink</i> 0/70/10/0 208/80/192	Same as NOAA	
8A	Sheltered scarps in bedrock, mud, or clay <i>Yellow</i> 0/0/100/0 255/232/0	8 (= 8A + 8B + 8C + 8D + 8E)	Including 8C and 8D <i>Red</i> 	Exposed tidal flats (same as 7 of NOAA) <i>Brown</i> 0/60/80/0 176/96/0	Same as NOAA	
8B	Sheltered, solid man-made structures <i>Peach</i> 0/34/28/0 254/189/170		Same as NOAA <i>Red</i> 			8B=8B+8C+8D
8C	Sheltered riprap <i>Light Orange</i> 0/17/81/0 247/205/75		Included with 8A			
8D	Sheltered rocky rubble shores <i>Light Orange</i> 0/17/81/0 247/205/75		Included with 8A			
8E	Peat shorelines <i>Light Orange</i> 0/17/81/0 247/205/75		X			Same as NOAA
9A	Sheltered tidal flats <i>Orange</i> 1/42/99/0 248/163/0		9 (=9A+9B)			Same as NOAA <i>Yellow green</i> 
9B	Vegetated low banks <i>Orange</i> 1/42/99/0 248/163/0	Same as NOAA <i>Yellow green</i> 				












10A	Salt- and brackish-water marshes <i>Red</i> 0/100/100/0 214/0/24	10 (= 10A + 10B + 10C + 10D + 10E)	Same as NOAA <i>Green</i> 	Sheltered, solid man-made structures (same as 8B of NOAA) <i>Red</i> 20/100/100/0 255/0/0	Same as NOAA
10B	Freshwater marshes <i>Light Magenta</i> 0/50/0/0 245/162/188		Same as NOAA <i>Green</i> 		Same as NOAA
10C	Swamps <i>Dark Red</i> 0/81/56/13 209/77/80		Same as NOAA <i>Green</i> 		Same as NOAA
10D	Scrub-shrub wetlands; Mangroves <i>Brown</i> 0/56/69/25 197/114/70		Same as NOAA <i>Green</i> 		Same as NOAA
10E	Inundated low-lying tundra <i>Light Magenta</i> 0/50/0/0 245/162/188		X		X
Remarks		Classify the sensitive resources into four categories of A,B,C and D in reference of ecological, special and economic value.	X means no data.		Contour, structure of beach, granulation composition, description of coast and photo, ESI classification, guideline.
















Comment from Russia:

















Besides coming to a decision on the range on colors of shoreline ESI it may be necessary to regulate the range of colors of the remaining part of sensitivity map. In addition it is necessary to consider the issue on displaying the ESI in black-white version, by shading or another ways.


















Symbols in ESI Maps

Sensitive Biological Resources

Category	NOAA <i>Color name</i> <i>Hatch pattern</i> <i>angle</i> <i>Color(CMYK)</i> <i>Color(RGB)</i>	PRC (the northern China Sea)	Japan	ROK	Russia <i>(Color name,</i> <i>hatch pattern,</i> <i>angle and color</i> <i>are the same as</i> <i>NOAA)</i>
BIRD	<i>Green</i> <i>45</i> <i>56/0/100/0</i> <i>136/185/0</i>	Nature spots for birds			<i>Same as</i> <i>NOAA</i>
Alcid / Pelagic Bird					
Diving Bird					
Gull/Tern					
Passerine Bird					
Raptor					
Shorebird					
Wading Bird					
Waterfowl		Sea fowl Swan			
TERRESTRIAL MAMMAL	<i>Light brown</i> <i>90</i> <i>19/44/88/0</i> <i>215/153/52</i>	Animals	ND	ND	<i>Same as</i> <i>NOAA</i>
Bat					




















Bear					
Deer					
Small Mammal					
MARINE MAMMAL	<i>Light brown</i> 0 19/44/88/0 215/153/52				Same as NOAA
Dolphin		ND	ND		
Manatee		ND	ND		
Polar Bear		ND	ND		
Sea Otter		ND	ND		
Seal / Sea Lion		Harbor seal			
Whale		ND	ND		
REPTILE/ AMPHIBIAN	<i>Red</i> 135 0/100/56/0 216/0/67				Same as NOAA
Alligator / Crocodile		ND	ND		
Turtle		ND			












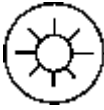
Other Reptiles / Amphibians		Snake	ND		
FISH	<i>Cyan</i> 135 100/0/0/0 0/159/230	ND	ND		ND
Fish					
Nursery Area					
SHELLFISH AND INSECT	<i>Orange</i> 45 0/31/100/0 255/184/0		ND		Same as NOAA
Bivalve		 Clam		ND	
Crab		ND			
Echinoderm		ND		ND	
Gastropod		ND			
Lobster / Crayfish		ND		ND	
Shrimp				ND	
Squid / Octopus		ND		ND	
























Insect		ND		ND	
Scallop	ND			ND	ND
HABITAT	<i>Violet 90 18/73/5/0 168/0/102</i>				Same as NOAA
Coral / Hardbottom Reef		ND		ND	
Floating Aquatic Vegetation		ND	ND	ND	
Mangrove	ND	ND		ND	ND
Marsh	ND	(defined)	 Ramsar Convention	ND	ND
Rare Plant		 Wetland	ND		Same as NOAA
Seagrass beds	ND	Kelp beds		ND	ND
Submerged Aquatic Vegetation		 Algae	ND		Same as NOAA
Tidal flats	ND	(defined)			ND
Treasury sea food	ND		ND	ND	ND






















ND means no data.














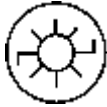
Human-use Features













Category	NOAA	PRC (northern China Sea)	Japan	ROK	Russia
Access		ND	ND	ND	Same as NOAA
Airport		ND	ND	ND	
Aquaculture		 Cultivation area	ND		
Archaeological Site		ND	ND		
Beach			 Swimming beach		
Boat Ramp		ND	ND	ND	
Camping		ND	ND	ND	
Coast guard		 Maritime Safety Agency (MSA)	 Central office, Regional coast guard headquarters  Regional coast guard office  Coast guard air station		










			 District communications center  Hydrographic observatory  Aids to navigation office  Traffic advisory service center  Coast guard academy / school		
Commercial Fishing		ND	ND	ND	
Critical Habitat		ND	ND	ND	
Diving		ND	ND	ND	
ESI / RSI Change		ND	ND	ND	
Facility		ND	(preparation)	ND	
Factory		ND	ND		

Ferry		ND	ND	
Hazardous Waster Site		ND	ND	ND
Historical Site		ND		ND
Hoist		ND	ND	ND
Lock / Dam		ND	ND	ND
Logging		ND	ND	ND
Marina		ND		
Marine sanctuary		ND	ND	ND
Mining		ND	ND	ND
National park		 Tourist spot		
Quasi-national park	ND	ND		ND
Park			 Seawater Park	ND
Recreational Fishing		 Fishing zone	ND	ND

Special Management Area		ND	ND		
Subsistence Fishing		ND	ND	ND	
Surfing		ND	ND	ND	
Washover		ND	ND	ND	
Water Discharge		ND	ND	ND	
Water Intake					
Water Quality		ND	ND	ND	
Water Supply		ND	ND	ND	
Wildlife Refuge, Reserve, Preserve		 Reserves	 Wildlife sanctuary		
National or state boundary		ND	 Prefecture boundary	ND	
Park or refuge boundary		ND	ND	ND	
Fishing port	ND	ND			ND

Harbor	ND				ND
Harbor under the regulation	ND	ND		ND	ND
Harbor area	ND	ND		ND	ND
Harbor area under the harbor regulation	ND	ND		ND	ND
Fishing port area	ND	ND		ND	ND
Fishing rights	ND	ND	 Cooperation  Division  Trap net	ND	ND
Fish preserve	ND	ND		ND	ND
Shellfish preserve	ND	ND		ND	ND
Power plant	ND	ND			ND

Shoreline equipment	ND	ND	(preparation)	ND	ND
Natural monument	ND	Relic		ND	ND
Scenic spot	ND	 Tourist spot		ND	ND
Shell gathering beach	ND	ND		ND	ND
Port photograph	ND	ND		ND	ND
Farming cage	ND		ND	ND	ND
Salt field	ND		ND	ND	ND
Railway	ND		ND	ND	ND
Highway	ND		ND	ND	ND
Shoreline	ND		ND	ND	ND
Shoreline for priority protection	ND		ND	ND	ND
River	ND		ND	ND	ND
Traffic route	ND	ND	(preparation)	ND	ND
U.S. Navy maneuvering ground	ND	ND	(preparation)	ND	ND

OIL SPILL RESPONSE FEATURES					
Seasweeper	ND	ND			ND
Oil boom extending boat	ND	ND			ND
Oil recovery ship (ORV)	ND	ND			ND
Oil spill response equipment (boom, chemical dispersant, absorbent, etc.)	ND	ND			ND
Oil skimmer	ND	ND			ND
Oil tank	ND	ND			ND
Oil tanker berth	ND	ND		ND	ND

ND means no data.

Symbols may be added in the future.

Comment from Russia:

Object location on the ESI map should be shown both by point symbols and by polygons in the places of concentration of corresponding living resources. The range of colors of species variety including black-white displaying may require additional examination.

It concerns the nature usage objects and other social and economic constructions. Symbols and notations grouped according to the chosen criteria should be identifiable both on electronic map and hard copy.

The black-white version of ESI maps should be examined individually. In this case it is possible to group the objects according to their hierarchical classification.

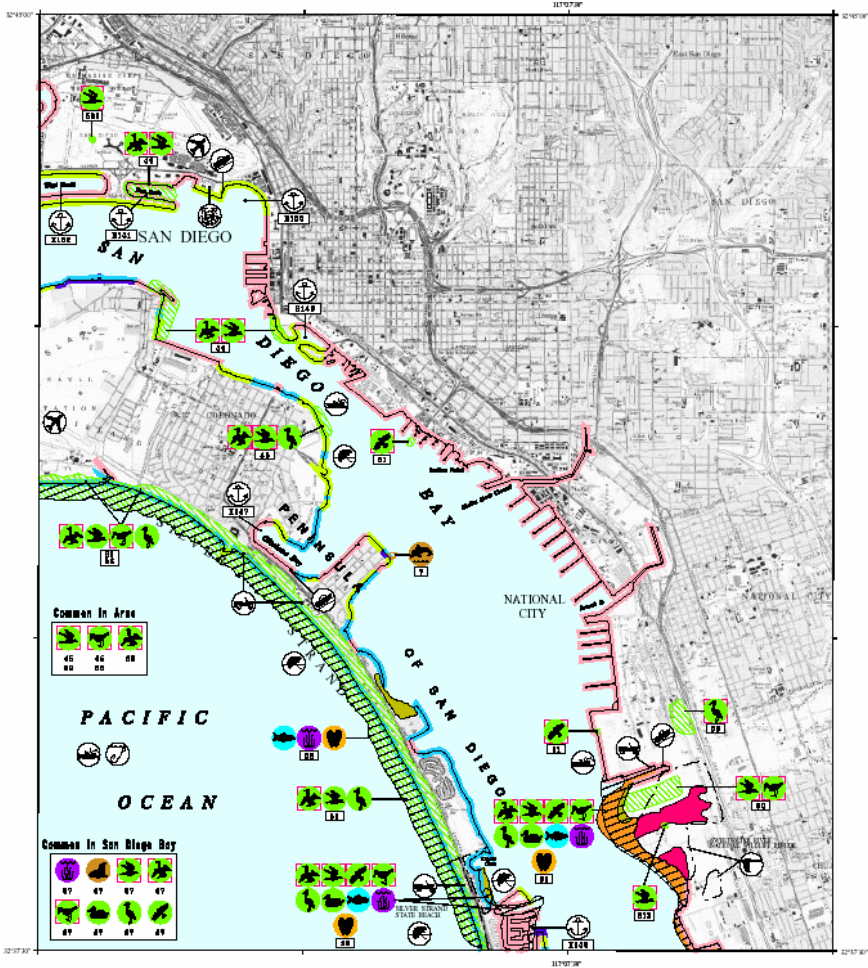
The ESI maps must be one of the blocks of unified information system. So plotting the OSR resources on the maps should not be connected with ESI maps because this is separate block of information system having another purpose and another principle of development.





Selectable Information

PRC	
Japan	All data and information can be displayed and are selectable on the ESI Maps.
ROK	Free selection of information of particular interest among the digitalized database using a layer function (visual or non-visual function); Easy linking of the textual and tabular information to map by pointing at a site or pressing a button for further information such as contact details and others;
Russia	All data at the ESI Maps is drawn by season therefore possible selectable recourses depending time of year. User can select any data and its reference by you discretion making area, species or type of objects.

Examples of ESI Maps

United States by NOAA <http://response.restoration.noaa.gov/esi/esisample.html>
Southern California ESI Atlas Page – San Diego

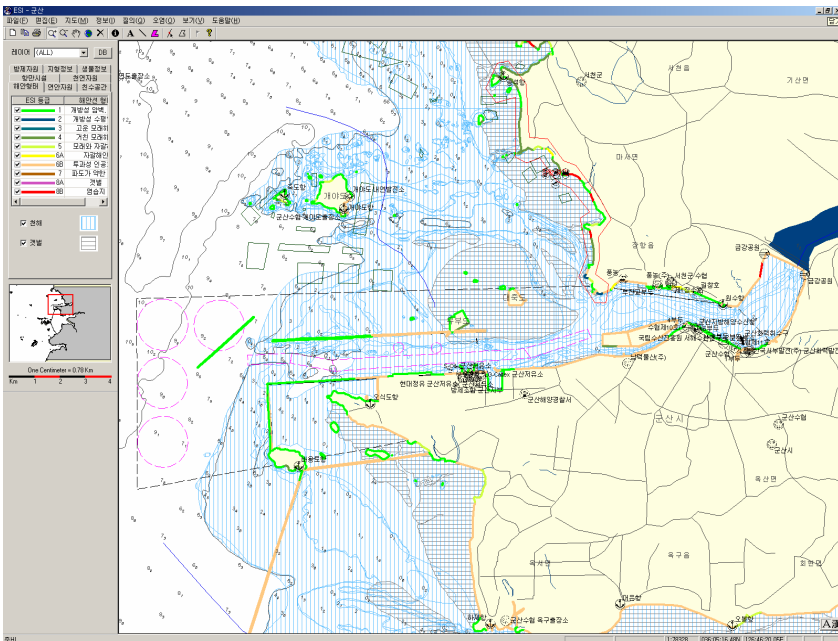


 <p>Office of OIL SPILL PREVENTION and RESPONSE California Department of Fish and Game</p>	Prepared for	 <p>HAZARDOUS MATERIALS RESPONSE and ASSESSMENT DIVISION National Oceanic and Atmospheric Administration</p>
 SCALE 1:48000		
PUBLISHED: MARCH 1995		NATIONAL CITY, CALIF. (1975) POINT LOMA, CALIF. (1975) SC-2

Japan by Japan Coast Guard in Tokyo Bay

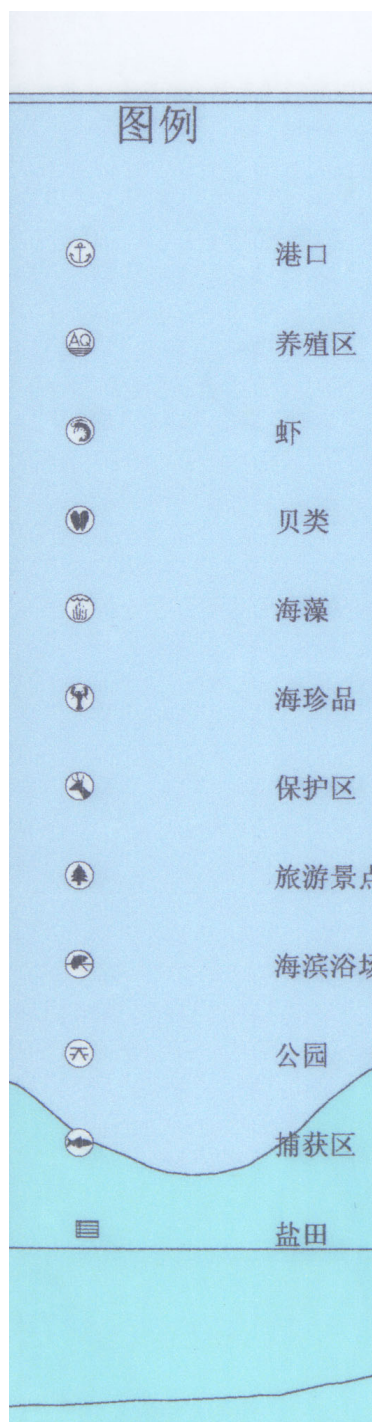


Republic of Korea by Korea Coast Guard



People's Republic of China (sample of figure legends)





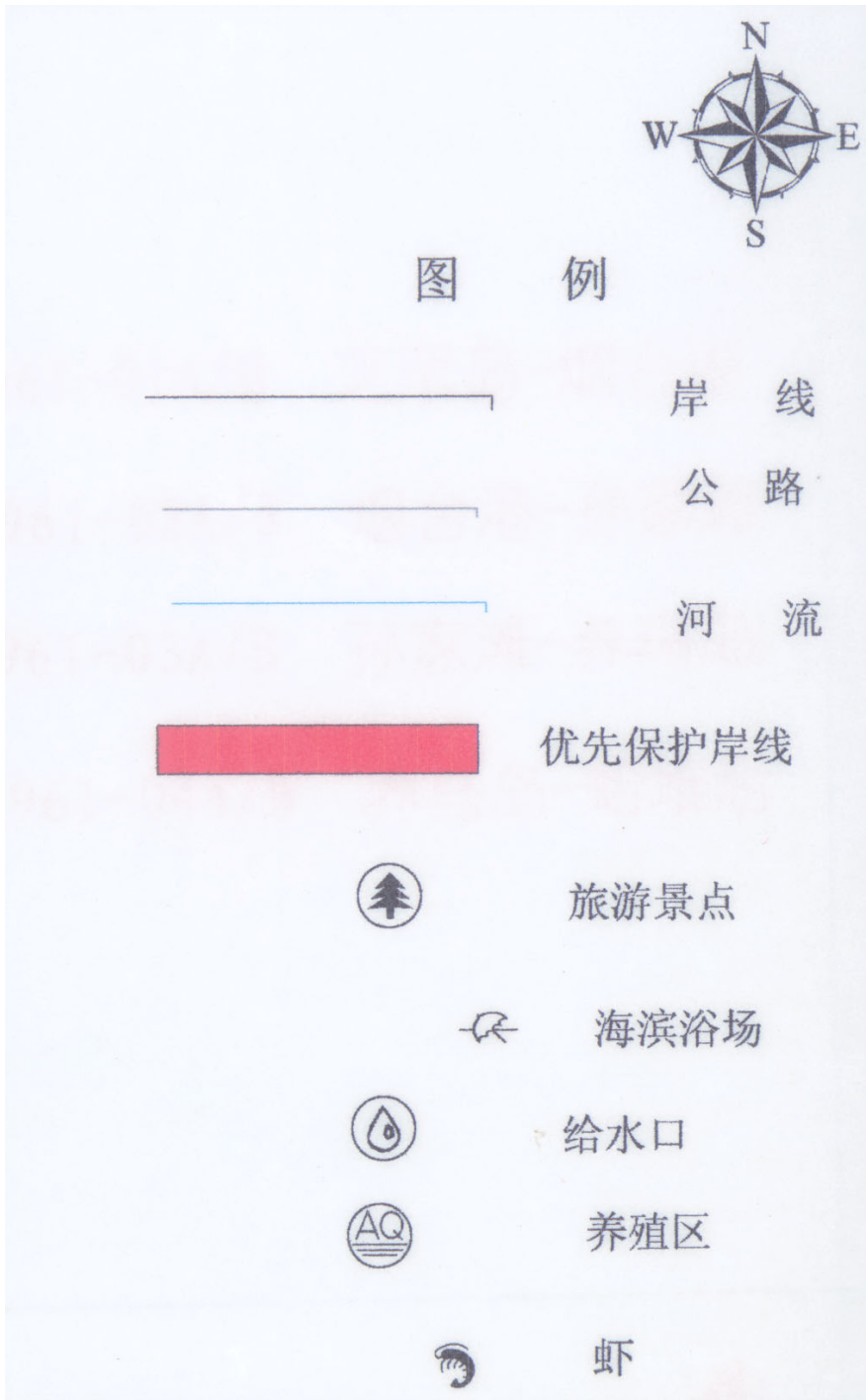


图		例	
	岸 线		养殖区
	公 路		扇贝
	河 流		虾
	旅游景点		海藻
	海滨浴场		网箱
	公 园		海珍品
	港 口		海事局



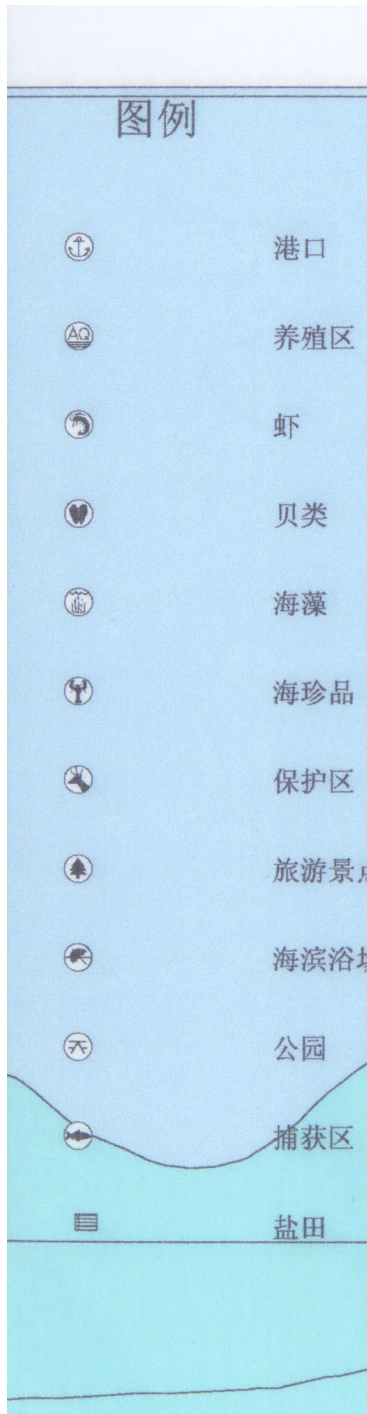


图 例

1	岸 线
2	公 路
3	河 流
4	最 优 先
	优 先
	次 优 先

Blank

Blank

Sensitivity Mapping