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Social Organization Standard

T/CAOE 20.1-2020

Technical guideline for investigation and assessment of coastal ecosystem — Part 1: General

海岸带生态系统现状调查与评估技术导则 第1部分：总则

（English Translation）

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Contents

Foreword

The T/CAOE 20 *Technical Guideline for Investigation and Assessment of Coastal Ecosystem* consists of the following ten parts under the general title:

——*Part 1: General;*

——*Part 2: Remote sensing identification and results verification of the coastal ecosystem;*

——*Part 3: Mangroves;*

——*Part 4: Salt marshes;*

——*Part 5: Coral Reefs;*

——*Part 6: Seagrass bed;*

——*Part 7: Oyster Reef;*

——*Part 8: Sandy Coast;*

——*Part 9: Estuary;*

——*Part 10: Bay.*

This is part 1 of the T/CAOE 20.

This part is drafted in accordance with the rules given in the GB/T 1.1-2009.

This part was proposed by *the Marine Early Warning and Monitoring Division, Ministry of Natural Resources*.

This standard was prepared by *China Association of Oceanic Engineering*.

This part was drafted by *South China Sea Institute of Planning and Environmental Research, State Oceanic Administration; National Marine Hazard Mitigation Service.*

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Introduction

In order to implement the spirit of General Secretary Xi Jinping's important speech at the third meeting of the Central Committee of Finance and Economics on October 10, 2018, promote the construction of coastal protection and restoration projects and scientifically guide the investigation and assessment of the coastal ecosystem status, the *Technical guideline for investigation and assessment of coastal ecosystem* is formulated.

Technical guideline for investigation and assessment of coastal ecosystem —

Part 1: General

1 Scope

This part of T/CAOE 20 specifies the requirements of working procedures, contents, quality control, and archives for the investigation and assessment of coastal ecosystem.

This part is applicable to the investigation and assessment of coastal ecosystem, as well as other related work.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies. For undated references, the latest edition of the referenced document (including any amendment) applies.

GB/T 12763, (all parts), *The specification for oceanographic survey*

GB/T 13989, *National basic scale topographic map framing and numbering*

GB 17378, (all parts), *The specification for marine monitoring*

GB/T 20257.2, *National basic scale topographic map pattern part 2: 1:5000 1:10 000 topographic map pattern*

GB/T 20257.3, *National basic scale topographic map pattern part 3: 1:25000 1:50000 1:100000 topographic map pattern*

GB/T 20257.4, *National basic scale topographic map pattern part 4: 1:250000 1:500000 1:1 000000 topographic map pattern*

GB 21139 *Basic requirements for standard data of fundamental geographic information*

HY/T 058 *Operational norms for archives on the oceanographic survey observation and monitoring*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

coastal zone

the transition zone where ocean and land interact

NOTE The coastal zone ranges from the farthest boundary of the land that modern seawater can extend to the deepest boundary of the seabed affected by waves, or the farthest boundary of the seabed that can be reached by modern coastal deposits.

[GB/T 18190, definition 2.1.3]

3.2

coastal ecosystem

a natural system composed of the interaction of biological communities and their environment in the coastal zone

NOTE Including typical coastal ecosystems, such as mangroves, salt marshes, coral reefs, seagrass beds, oyster reefs and sandy coasts, as well as complex ecosystem of estuaries and bays

3.3

ecosystem damage

due to anthropogenic or natural factors, the detrimental changes of the ecosystem structure and the relationship among the components in the system, the shortage of system resources, breaks of certain ecological processes or ecological chains, degradation or loss of system functions.

4 General rules

4.1 Purpose of Status Investigation and Assessment

Based on on-site investigation, remote sensing and historical data, carry out the investigation and assessment of coastal ecosystems such as mangroves, salt marshes, coral reefs, seagrass beds, oyster reefs, sandy coasts, estuaries, and bays. Such investigations are crucial to assess the current situation and expose problems of the coastal ecosystem, understand the existing damage and causes within the ecosystem, promote the scientific planning and implementation of coastal protection and rehabilitation projects, and achieves the ecological functions and hazard mitigation functions of the coastal ecosystem.

4.2 Principles of the Status Investigation and Assessment

The status investigation and assessment shall be complied with the principles listed below:

a) scientific. The technical methods used in the investigation and assessment of coastal ecosystem shall be based on solid scientific principles, and comply with relevant standards and regulations.

b) systematic. When performing investigation and assessment work, we shall start from the integrity of the ecosystem, and fully consider the interactions among the various elements within the system, and the connections between the system and the environment.

c) representative. The investigation section and station layout shall be very representative and reflect the basic status of the ecosystem.

d) consistent. The methods used in the investigation and assessment of the same type of coastal ecosystem shall be consistent, and the assessment results shall be fair and practical.

e) accurate. The acquisition of the coastal ecosystem characteristics, sea water quality, sedimentary and hydrodynamics data shall be accurate and reliable, and can substantially reflect the current situation.

4.3 Quality Control

4.3.1 Data Collection

The specific requirements for data collection are as follows:

a) Clear quality requirements of the available documents and materials adopted shall be given on their legality, unit system, timeliness, reliability and applicable areas with valid specific quality analysis and assessment.

b) The collected marine ecological environment analysis and test data shall be provided by the institution with eligible inspection and testing qualification certificate.

4.3.2 Investigation Process

The specific requirements for the investigation process of quality control are as follows:

a) The survey unit shall establish a quality management system which can be operated effectively, and formulate a quality control plan according to the unit's quality system and requirements of the project;

b) Investigators shall be proficient in professional knowledge and survey operation skills of coastal ecosystem investigations, conduct survey skill training, and follow relevant safety requirements;

c) The investigation instrument shall be calibrated by metrological verification and applied within the verification period. The instrument used shall meet the requirements of the investigation operation;

d) Carry out on-site investigation and indoor analysis quality control work in accordance with the current effective standards and specifications;

e) Data processing and analysis quality control shall be implemented as specified in the relevant regulations of GB 17378.2;

f) Archives shall be implemented as specified in HY/T 058.

5 Work procedure

5.1 Preparation stage

Collect historical data of coastal ecosystem, determine investigation areas, and formulate status investigation plans based on remote sensing and on-site investigation.

5.2 Investigation stage

Organize and implement the investigation of the coastal ecosystem status, according to the investigation content, investigation site, investigation time and frequency, investigation method, etc., as specified in the status survey plan. The contents of the investigation mainly include the current situation of the ecosystem, biological communities, environmental factors, threat factors, etc.

5.3 Assessment stage

The assessment of the current situation of the ecosystem shall be carried out based on the results of the status investigation and remote sensing interpretation. Analyze and evaluate the damage to the coastal ecosystem with historical data, and analyze reasons.

5.4 Result compilation stage

Prepare status investigation and assessment reports, thematic graphs, and data results, based on the contents and conclusions of status investigation and assessment.

6 Investigation plan design

6.1 General requirements

The investigation plan of coastal ecosystem status survey shall be designed to clarify the investigation area, investigation content, investigation site, investigation time and frequency, investigation methods, personnel, equipment, and safety measures, etc. The investigation plan should see Annex A.

6.2 Area determination

According to the results of remote sensing and historical data analysis, determine the distribution area of coastal ecosystem. Based on on-site investigations, the investigation purpose, and coastal ecosystem characteristics, determine investigation areas of different ecosystem.

6.3 Plan design

The investigation plan shall clarify the investigation contents, site, methods, time, and frequency, etc. The investigation contents shall meet the requirements of the assessment of the status of each ecosystem. The investigation site and layout shall fully cover the investigation area, and the key points shall be highlighted. The investigation methods shall follow corresponding methods specified in current standards and specifications. Investigation time and frequency shall be determined according to the actual conditions of different sea areas and the characteristics of coastal ecosystems. The specs of investigation instruments and equipment shall meet the requirements of investigation projects in corresponding coastal ecosystems. The specific requirements shall be implemented in accordance with the relevant regulations of GB 17378.1 and GB/T 12763.1.

6.4 Investigation staff

The investigation institution shall clarify the responsibilities associated with quality assessment of the personnel involved, conduct quality awareness education, and determine the survey project leader and the investigation team with reasonable professional configuration. The survey project leader shall fully understand the purposes of the coastal ecosystem investigation, master the professional knowledge of the project, and have the corresponding senior and above professional technical titles. The leader shall consider the actual needs of the investigation project, reasonably divide the work of the investigators according to their professional and technical levels, and clarify their job responsibilities.

6.5 Safety

Explicit safety measures for personnel, equipment and materials shall be prepared in advance. Emergency safety measures shall be made sure to be taken under extreme weather conditions and in special situations (such as ship collisions, typhoon storm surge, etc.).

7 Investigation of current situation

7.1 Preliminary identification

Fully collect and analyze the existing data, by combing these with satellite remote sensing, current situation verification and investigation methods, and initially determine the category of ecological system, distribution area, boundary and area, and vegetation coverage of coastal ecosystem.

7.2 Ecological status investigation

Based on the preliminary identification, carry out on-site investigations of current situation of coastal ecosystem, biological communities, environmental factors, and threats. The specific requirements are as follows:

a) Investigation of the current situation of the ecosystem. Investigate the distribution, area, and types of coastal ecosystems such as mangroves, salt marshes, coral reefs, seagrass beds, oyster reefs, sandy coasts, estuaries, and bays.

b) Investigation of biological communities. Investigate elements such as benthic organisms and algae in coastal ecosystem.

c) Investigation of environmental factors. Investigate the hydrodynamic environment, topography, sea water quality, sediments and other factors in the coastal ecosystem, and shall be implemented as specified in the regulations of GB/T 12763 and GB 17378.

d) Investigation of threat factors. Investigate the natural and anthropogenic factors that threaten and interfere with the coastal ecosystem. The natural factor mainly includes marine hazards such as storm surges, waves, and sea ice; while the anthropogenic factors include the reclamation, fishing, and aquaculture, and discharge of pollutants. The investigation of anthropogenic factors shall be implemented as specified in the regulations of GB/T 12763.9.

8 Ecological status assessment

8.1 Reference frame

The reference frame is established and used in the following ways:

a) A reference frame is established by collecting historical data of the investigation area, including ecosystem data obtained from routine monitoring, special investigations, and literature data.

b) The reference frame should use the above-mentioned representative data that can reflect the ecosystem changes.

c) When historical data is complete, use historical data as the reference frame for assessment.

d) When historical data is inadequate, use historical data as much as possible to establish the reference frame for assessment, conducts a descriptive assessment of current situation for the missing part of the data.

e) When historical data is not present at all, only the assessment of current situation of the ecosystem is carried out, and the results should be used as a reference frame for future assessments.

8.2 Assessment method

According to the characteristics of coastal ecosystem such as mangroves, salt marshes, coral reefs, seagrass beds, oyster reefs, sandy coasts, estuaries, bays, etc., and the environmental characteristics of the investigation area, establish an assessment index system in terms of the current status of the ecosystem, biological communities, and environmental factors, determine the weight of the assessment index, build an assessment model, and carry out an ecology status assessment.

8.3 Assessment content

The ecology status assessment includes the assessment of current situation of the ecosystem, the assessment of the biological community, the assessment of environmental factors and the assessment of threat factors. The specific assessment contents are as follows:

a) Make full use of historical data, remote sensing and on-site investigation data to carry out comparative analysis of the distribution, area and vegetation coverage of coastal ecosystems in different periods, conduct assessment of current ecosystem status based on changes of ecosystem vegetation area, coverage, and landscape patterns, the ecosystem fragmentation degree.

b) Analyze and evaluate the basic conditions of ecosystem biological communities in terms of ecosystem spatial changes, biodiversity, and growth status of dominant or constructive species.

c) Based on the data in different periods of the investigation area, evaluate the changing characteristics of seawater quality, sediment environment, topography, scouring and silting environment, and analyze the impact of environmental factors on biological communities and ecosystem.

d) Analyze the ecosystem pressure status in the sea area due to natural and human factors, assess the threats, and the existing damage of the ecosystem (including type, degree, and trend, etc.) and the reasons for the damage.

The ecology status assessment level is generally divided into three levels: stable, damaged, and severely damaged. According to the assessment results, corresponding management measures are proposed for different assessment levels.

9 Results

9.1 Technical reports

Write the ‘Investigation and Assessment Report on Coastal Ecosystem’. The compilation of the report shall be complied with the requirements listed in Annex B.

9.2 Thematic graph

9.2.1 Type

The thematic graphs mainly include the current spatial distribution map of coastal ecosystem, the distribution map of ecosystem biological communities, the temporal and spatial distribution maps of environmental elements and the change characteristics, the distribution map of threat factors, and the distribution map of coastal ecosystem damage. The production of the spatial distribution map and the damage distribution map of coastal ecosystem shall be complied with the requirements listed in Annex C and Annex D.

9.2.2 Data basis and frame

The mathematical foundation and frame of the result graph shall be complied with the following requirements:

a) Coordinate system: adopt China Geodetic Coordinate System 2000;

b) Elevation datum: adopt National Vertical Datum 1985;

c) Depth datum: adopt the local theoretical lowest tidal level;

d) Scale and graph projection: for large-scale investigations and assessments, the scale of the graph should be 1:50000-1:250000, using Gauss-Krüger 6° zone projection; for investigation and assessment of key areas or important ecosystem, the scale of the graph should be 1:5000-1:25000, using Gauss-Krüger 3° zone projection;

e) Frame: The frame and number of maps shall be implemented as specified in the corresponding regulations of GB/T 13989.

9.2.3 Graph elements

The graph elements shall be complied with:

a) Basic geographic elements generally include coastlines, islands, depth contours, administrative division boundaries, contours, railways, major highways, major rivers, text labels, etc., which shall be implemented as specified in GB 21139;

b) The map appearance includes figure name, legend, scale, frame number and connection chart, etc.

c) Compilation instructions include coordinate system, projection, drawing unit, drawing date, etc.;

d) Schematic legends shall be implemented in accordance with the relevant requirements given in Annex C, GB/T 20257.2, GB/T 20257.3, and GB/T 20257.4.

9.3 Data set

The data set includes the following:

a) Ecosystem investigation data sets, including investigation data sheets, photos, images, etc.;

b) Ecosystem thematic database, where the vector data is in ESRI Shapefile format and the raster data is in Tiff format. The element types and attribute definitions of coastal ecosystem vector data shall be complied with the requirements of Annex D.

10 Archiving

10.1 Archiving contents

The project shall be archived after acceptance, and the contents of the archive mainly include:

a) Related request reports, approvals, and important letters, etc.;

b) Status investigation plan and its implementation records;

c) The collected original data, original records of investigation and analysis, laboratory test analysis report;

d) Investigation and assessment reports on current situation of coastal ecosystem;

e) Thematic graph and data sets.

10.2 Archiving requirements

The archive requirements are as follows:

a) The person in charge of the project is responsible for organizing the archive of relevant documents and materials formed during the investigation of current situation, and archive them according to the corresponding regulations of HY/T 058;

b) Investigation data shall be classified according to confidentiality regulations and kept properly;

c) The relevant documents and materials archived and transferred shall be the original copy;

d) The archived materials shall be kept under anti-magnetic, moisture-proof and suitable temperature conditions;

e) The archive of electronic documents and materials shall indicate the technical environmental conditions, relevant software version, data format, operation data, test data and backup requirements, etc.

Annex A
(annex informative)
The ××ecosystem status investigation plan outline

A.1 Text Format

A.1.1 Text Specification

The page size is A4 (210mm×297mm).

A.1.2 Cover Format

The first line: ××ecosystem (No. 1 Song, bold, centered);

The second line: Status investigation plan (No. 1 Song, bold, centered);

The third line: the full name of the institution (No. 3 Song, bold, centered);

The fourth line: ××××year××month (Song Type 3, bold, centered);

The spacing between the above rows should be appropriate to beautify the entire cover.

A.1.3 Inside front cover content

The inside front cover content shall be written in individual lines: the full name of the institution that compiled the suitability assessment report (stamped with the official seal); the name of the report compiler and reviewer, etc.).

A.2 Ecosystem status investigation plan outline

Compile the investigation plan of the current situation of the ×× ecosystem according to Table A.1. The relevant clauses can be appropriately added or deleted according to the characteristics of the investigation area and the content of the investigation.

Table A.1—The ××ecosystem status investigation plan outline

1 Task source
2 Investigation area
3 Investigation content and time
3.1 Investigation content
3.2 Investigation station
3.3 Investigation time and frequency
4 Investigation method
5 Investigation personnel
6 Quality control
7 Safety measures
8 Organization and Implementation
9 Other contents

Annex B
(annex normative)
The ××ecosystem status investigation and assessment report outline

B.1 Text Format

B.1.1 Text Specification

The page size is A4 (210mm×297mm).

B.1.2 Cover Format

The first line: ××ecosystem (No. 1 Song, bold, centered);

The second line: Status investigation and assessment plan (No. 1 Song, bold, centered);

The third line: the full name of the organization (No. 3 Song, bold, centered);

The fourth line: ××××year××month (Song Type 3, bold, centered);

The spacing between the above rows should be appropriate to beautify the entire cover.

B.1.3 Inside front cover content

The inside front cover content shall be written in individual lines: the full name of the institution that compiled the status investigation and assessment report (stamped with the official seal); the name of the report compiler and reviewers, etc.)

B.2 Ecosystem status investigation and assessment report outline

Prepare the status investigation and assessment plan for the ×× ecosystem according to Table A.1. The relevant clauses can be appropriately added or deleted according to the characteristics of the investigation area and the content of the investigation.

Table B.1—The ×× ecosystem status investigation and assessment report outline

1 Overview
1.1 Task source
1.2 Target
1.3 Investigation and evaluation scope
1.4 Investigation and evaluation methods
2 Investigation area
2.1 Hydrological dynamics
2.2 Topography, scouring and silting environment
2.3 Coastal evolution characteristics
2.4 Marine hazards

Table B.1 (*continued*)

3 Distribution investigation
3.1 Remote sensing interpretation
3.2 On-site verification
3.3 Results and analysis
4 Ecology investigation
4.1 Current situation of the ecosystem
4.2 Biome
4.3 Environmental factors
4.4 Threat factors
5 Ecology status assessment
5.1 History
5.2 Basic characteristics of the ecosystem
5.3 Assessment of ecosystem biome
5.4 Analysis of the ecosystem environment element change
5.5 Comprehensive assessment of ecology conditions
6 Conclusions and recommendations

Annex C
(annex normative)
Coastal ecosystem investigation and assessment thematic graph legend standard

According to the results of the investigation and assessment of the current situation of the coastal ecosystem, draw the current spatial distribution map of the coastal ecosystem and the assessment grade distribution map of the coastal ecosystem. The legend shall be complied with the requirements of Table C.1 and Table C.2.

Table C.1—Coastal ecosystem classification legend color scale

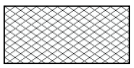
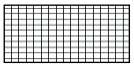
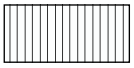
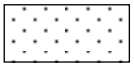
Type Code	Name	Legend	Other Instructions
1	Mangrove		Black; line width 0.1mm; line space 2mm; line angle 45° and 135°
2	Salt Marsh		Black; line width 0.1mm; line space 2mm; line angle 0° and 90°
3	Coral Reef		Black; line width 0.1mm; line space 2mm; line angle 0°
4	Seagrass Bed		Black; line width 0.1mm; line space 2mm; line angle 90°
5	Oyster Reef		Black; line width 0.1mm; line space 2mm; line angle 45°
6	Sandy Coast		Black
7	Estuary		Black; line width 0.1mm; line spacing 2mm; line angle 135°
8	Bay		Black; line width 0.1mm; line spacing 2mm; line angle 45° ; dashed line length 1.764mm, dashed line spacing 1.764mm

Table C.2—Coastal ecosystem assessment grade legend color scale

Type Code	Name	Legend	Legend color RGB value		
			R red	G green	B blue
Ⅰ	Stable		188	229	39
Ⅱ	Damaged		251	158	19
Ⅲ	Severely damaged		255	0	0

Annex D
(annex normative)
Types and Attributes of Coastal Ecosystem Elements

Table D.1 and Table D.2 provide the feature types and attribute definitions of the coastal ecosystem thematic database.

Table D.1—Types of coastal ecosystem elements

Element classification	Geometry type	Name
Mangrove	Surface	HSL_ PY
Salt Marsh	Surface	YZ_ PY
Coral Reef	Surface	SHJ_ PY
Seagrass Bed	Surface	HCC_ PY
Oyster Reef	Surface	MLJ_ PY
Sandy Coast	Surface	SZHA_ PY
Estuary	Surface	HK_PY
Bay	Surface	HW_PY

Table D.2—Definition of coastal ecosystem attributes

Field alias	Name	Type & length	Optional notes
Province	PROVINCE	Text (255)	No
City	MAJOR	Text (255)	No
County	COUNTY	Text (255)	No
Ecosystem Type	ECOSYSTEM_TYPE	Text (255)	No
Longitude	LONGITUDE	Text (255)	No
Latitude	LATITUDE	Text (255)	No
Area/Length	AREA/LENGTH	Double	No
Level	LEVEL	Text (255)	No
Investigation Organization	INVESTIGATION_UNIT	Text (255)	No
Investigator	INVESTIGATOR	Text (255)	No
Investigation Date	INVESTIGATION_DATE	Date	No
Other Instructions	NOTE	Text (255)	Yes