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Entwurf

**Geoinformation –
Land Administration Domain Model (LADM) –
Teil 3: Georegulierung des Meeres (ISO/DIS 19152-3:2023);
Englische Fassung prEN ISO 19152-3:2023**

Geographic information –
Land Administration Domain Model (LADM) –
Part 3: Marine georegulation (ISO/DIS 19152-3:2023);
English version prEN ISO 19152-3:2023

Information géographique –
Modèle du domaine de l'administration des terres (LADM) –
Partie 3: Géorégulation de la mer (ISO/DIS 19152-3:2023);
Version anglaise prEN ISO 19152-3:2023

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Nationales Vorwort

Dieses Dokument (prEN ISO 19152-3:2023) wurde vom Technischen Komitee ISO/TC 211 „Geographic information/Geomatics“ in Zusammenarbeit mit dem Technischen Komitee CEN/TC 287 „Geoinformation“ (Sekretariat BSI, Vereinigtes Königreich) erarbeitet.

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Für die in diesem Dokument zitierten Dokumente wird im Folgenden auf die entsprechenden deutschen Dokumente hingewiesen:

ISO 19107:2019	siehe	DIN EN ISO 19107:2020-09
ISO 19109:2015	siehe	DIN EN ISO 19109:2016-05
ISO 19110:2016	siehe	DIN EN ISO 19110:2017-05
ISO 19111:2019	siehe	DIN EN ISO 19111:2020-09
ISO 19115-1:2014	siehe	DIN EN ISO 19115-1:2014-07
ISO 19126:2021	siehe	DIN EN ISO 19126:2021-09
ISO 19152-1:—*	siehe	DIN EN ISO 19152-1:—*
ISO 19157:2013	siehe	DIN EN ISO 19157:2014-04
ISO 19101-1:2014	siehe	DIN EN ISO 19101-1:2015-03
ISO 19136-1:2020	siehe	DIN EN ISO 19136-1:2020-12

Aktuelle Informationen zu diesem Dokument können über die Internetseiten von DIN (www.din.de) durch eine Suche nach der Dokumentennummer aufgerufen werden.

* Zurzeit Entwurf.

Nationaler Anhang NA (informativ)

Begriffe

Reihenfolge und Inhalt der folgenden Begriffe sind identisch mit denen im Abschnitt Begriffe der Englischen Fassung.

Für die Anwendung dieses Dokuments gelten die Begriffe nach ISO 19152-1 und die folgenden Begriffe.

ISO und IEC stellen terminologische Datenbanken für die Verwendung in der Normung unter den folgenden Adressen bereit:

- ISO Online Browsing Platform: verfügbar unter <https://www.iso.org/obp>
- IEC Electropedia: verfügbar unter <https://www.electropedia.org/>

3.1.1

Begrenzung

<marine_Georegulation> Delimitation zwischen zwei oder mehr Zonen

Anmerkung 1 zum Begriff: Bei einer Begrenzung sind zwei oder mehr Gruppen involviert.

Anmerkung 2 zum Begriff: Delimitation findet zwischen zwei oder mehr Gruppen statt.

Anmerkung 3 zum Begriff: Übernommen aus IHOS-121 Maritime Limits and Boundaries [8].

3.1.2

Kurve

1-dimensionales geometrisches Primitiv, das das kontinuierliche Bild einer Linie darstellt

Anmerkung 1 zum Begriff: Die *Begrenzung* (3.1.1) einer Kurve ist die Menge der Punkte an beiden Enden der Kurve. Falls es sich bei der Kurve um einen Kreis handelt, sind die beiden Enden identisch, und es wird angenommen, dass die Kurve (wenn sie topologisch geschlossen ist) keine Begrenzung aufweist. Der erste Punkt wird als Startpunkt und der letzte Punkt als Endpunkt bezeichnet. Die Konnektivität der Kurve wird durch den Abschnitt „kontinuierliches Bild einer Linie“ sichergestellt. Ein topologisches Theorem besagt, dass ein kontinuierliches Bild einer verbundenen Menge verbunden ist.

[QUELLE: ISO 19136-1:2020, 3.1.17]

3.1.3

internationale Begrenzung

<marine_Georegulation> Delimitationslinie zwischen zwei oder mehr Staaten in Übereinstimmung mit UNCLOS Artikel 15, 16, 74, 75, 83 und 84

Anmerkung 1 zum Begriff: Bei einer internationalen Begrenzung sind zwei oder mehr Gruppen involviert.

3.1.4

Grenze

<marine_Georegulation> *Kurve* (3.1.2), die eine *Begrenzung* (3.1.1) oder Ausdehnung einer Zone definiert

Anmerkung 1 zum Begriff: Bei einer Grenze ist eine Gruppe involviert.

Anmerkung 2 zum Begriff: IHO S-121 Maritime Limits and Boundaries [8].

3.1.5

marin

in Zusammenhang stehend mit Navigation oder Verschiffung oder in Zusammenhang oder in Verbindung stehend mit dem Meer, auf dem Meer verwendet oder für die Verwendung auf dem Meer übernommen

Anmerkung 1 zum Begriff: Gelegentlich als *maritim* bezeichnet, doch *maritim* wird häufiger für etwas verwendet, das an das Meer angrenzt.

Anmerkung 2 zum Begriff: IHO S-32 Hydrographic Dictionary, Pos. 3123, 2019 – neu formatiert [10].

3.1.6

Marine-Kataster

Management-Werkzeug, das formell und informell definierte Begrenzungen und dazugehörige Rechte sowie Einschränkungen und Verantwortlichkeiten in der *marinen* (3.1.5) Umgebung räumlich beschreibt, visualisiert und als Datenschicht in einer marinen SDI realisiert, und somit erlaubt, dass diese identifiziert, verwaltet und zugreifbar gemacht werden können

Anmerkung 1 zum Begriff: Zusätzlich zu Begrenzungen adressiert ein Marine-Kataster auch Orte, *Grenzen* (3.1.4), Basislinien, Zonen und Räume.

Anmerkung 2 zum Begriff: Ein Marine-Kataster ist eine Art der Georegulation, die sich auf Eigenschaftsregistrierung, wie in 19152-2 beschrieben, bezieht, wobei das Konzept „Land“ auch „über Wasser“ mit beinhaltet.

Anmerkung 3 zum Begriff: Übernommen aus FIG, 2006 Administering Marine Spaces: International Issues [5].

3.1.7

maritim

angrenzend an das, oder handelnd von dem, oder in Zusammenhang stehend mit dem Meer

Anmerkung 1 zum Begriff: IHO S-32 Hydrographic Dictionary, Pos. 3125, 2019 – neu formatiert [9].

Nationaler Anhang NB (informativ)

Abkürzungen

baunit	Grundverwaltungseinheit (en: Basic administrative unit)
CRS	Koordinatenreferenzsystem (en: Coordinate Reference System)
DOALOS	Abteilung für Meeresangelegenheiten und Seerecht, Büro für Rechtsangelegenheiten, Vereinte Nationen (en: Division of Ocean Affairs and the Law of the Sea, Office of Legal Affairs, United Nations)
ENC	Digitale Seekarte (en: Electronic Nautical Chart)
FIG	Internationale Vereinigung der Vermessungsingenieure (en: International Federation of Surveyors)
GUID	Global eindeutiger Bezeichner (en: Globally Unique Identifier)
IALA	Internationale Vereinigung für Navigationshilfen und Leuchtturmbehörden (en: International Association of Marine Aids to Navigation and Lighthouse Authorities)
IETF	Gremium für Netzwerkdesign (en: Internet Engineering Task Force)
IHO	Internationale Hydrographische Organisation (en: International Hydrographic Organization)
IMO	Internationale Seeschifffahrts-Organisation der Vereinten Nationen (en: International Maritime Organization of the United Nations)
LADM	Referenzmodell für die Bodenverwaltung (en: Land Administration Domain Model)
MRN	Maritimer Ressourcenname (en: Maritime Resource Name)
RRR	Recht, Einschränkung, Verantwortlichkeit (en: Right, Restriction, Responsibility)
SOLAS	Internationales Übereinkommen zum Schutz des menschlichen Lebens auf See (en: International Convention on Safety of Life at Sea)
UML	Vereinheitlichte Modellierungssprache (en: Unified Modelling Language)
UNCLOS	Seerechtsübereinkommen der Vereinten Nationen (en: United Nations Convention on the Law of the Sea)
URI	Einheitlicher Ressourcenbezeichner (en: Uniform Resource Identifier)
URN	Einheitlicher Ressourcenname (en: Uniform Resource Name)

Nationaler Anhang NC (informativ)

Literaturhinweise

DIN EN ISO 19107:2020-09, *Geoinformation — Raumbezugsschema (ISO 19107:2019); Englische Fassung EN ISO 19107:2019*

DIN EN ISO 19109:2016-05, *Geoinformation — Regeln zur Erstellung von Anwendungsschemata (ISO 19109:2015); Englische Fassung EN ISO 19109:2015*

DIN EN ISO 19110:2017-05, *Geoinformation — Objektartenkataloge (ISO 19110:2016); Englische Fassung EN ISO 19110:2016*

DIN EN ISO 19111:2020-09, *Geoinformation — Koordinatenreferenzsysteme (ISO 19111:2019); Englische Fassung EN ISO 19111:2020*

DIN EN ISO 19115-1:2014-07, *Geoinformation — Metadaten — Teil 1: Grundsätze (ISO 19115-1:2014); Englische Fassung EN ISO 19115-1:2014*

DIN EN ISO 19126:2021-09, *Geoinformation — Verzeichnisse und Register für Featurekonzepte (ISO 19126:2021); Englische Fassung EN ISO 19126:2021*

DIN EN ISO 19152-1:—*, *Geoinformation — Land Administration Domain Model (LADM) — Teil 1: Grundlagen (ISO/DIS 19152-1:2022); Englische Fassung prEN ISO 19152-1:2023*

DIN EN ISO 19157:2014-04, *Geoinformation — Datenqualität (ISO 19157:2013); Englische Fassung EN ISO 19157:2013*

DIN EN ISO 19101-1:2015-03, *Geoinformation — Referenzmodell — Teil 1: Grundsätze (ISO 19101-1:2014); Englische Fassung EN ISO 19101-1:2014*

DIN EN ISO 19136-1:2020-12, *Geoinformation — Geography Markup Language (GML) — Teil 1: Grundsätze (ISO 19136-1:2020); Englische Fassung EN ISO 19136-1:2020, nur auf CD-ROM*

Contents

Page

Foreword	vi
Introduction	vii
1 Scope	1
2 Normative references	1
3 Terms, definitions and abbreviated terms	2
3.1 Terms and definitions	2
3.2 Abbreviated terms	3
4 Conformance	4
4.1 Conformance requirements and testing	4
4.2 Conformance classes	4
4.3 Conformance class 1 — Marine Limits and Boundaries in support of UNCLOS	4
4.4 Conformance class 2 — General marine georegulation	4
5 Notation	4
6 Context	5
7 Feature and attribute structure	6
7.1 Structural overview	6
7.2 Geometry structure	7
7.3 Packages of the LADM Part 3	7
8 Marine Georegulation Application Schema	8
8.1 Marine Georegulation Elements	8
8.2 Inherited Core Packages	10
8.3 MRN	10
8.4 Party Section	11
8.4.1 Party Section General	11
8.4.2 MG_Party	12
8.4.3 MG_Party attributes and relationships	12
8.4.4 MG_PartyMember	13
8.4.5 MG_PartyMember attributes and relationships	13
8.4.6 MG_PartyTypeList	14
8.4.7 MG_GroupPartyTypeList	14
8.4.8 Special Data Types	14
8.5 Administrative Section	15
8.5.1 Administrative Section General	15
8.5.2 MG_BAUnit	17
8.5.3 MG_BAUnit attributes and relationships	17
8.5.4 MG_BAUnitTypeList	18
8.5.5 MG_RRR	18
8.5.6 MG_RRR attributes and relationships	19
8.5.7 MG_Right	19
8.5.8 MG_Right attributes and relationships	19
8.5.9 MG_Responsibility	20
8.5.10 MG_Responsibility attributes and relationships	20
8.5.11 MG_Restriction	20
8.5.12 MG_Restriction attributes and relationships	20
8.5.13 MG_Governance	20
8.5.14 MG_Governance attributes and relationships	21
8.6 Party to Administrative Section	22
8.7 Party to Administrative relationships	22
8.7.1 rrrParty relationship	22
8.7.2 baunitAsParty relationship	22
8.8 Spatial Unit Section	22

8.8.1	Spatial Unit Section General.....	22
8.8.2	MG_FeatureUnit.....	24
8.8.3	MG_FeatureUnit attributes and relationships.....	25
8.8.4	MG_SpatialAttribute.....	25
8.8.5	MG_SpatialAttribute attributes and relationships.....	25
8.8.6	MG_AdditionalSpatialInformation.....	26
8.8.7	MG_AdditionalSpatialInformation attributes and relationships.....	27
8.8.8	MG_Location.....	28
8.8.9	MG_Location attributes and relationships.....	29
8.8.10	MG_Point.....	29
8.8.11	MG_Point attributes and relationships.....	29
8.8.12	MG_PointAttributes.....	29
8.8.13	MG_PointAttributes attributes and relationships.....	30
8.8.14	locationReference dataType.....	30
8.8.15	MG_PointAttributes attributes.....	30
8.8.16	MG_LocationTypeList.....	31
8.8.17	MG_PointTypeList.....	31
8.8.18	MG_InterpolationTypeList.....	31
8.8.19	MG_Limit Spatial Unit Class.....	31
8.8.20	MG_Limit.....	32
8.8.21	MG_Limit attributes and relationships.....	32
8.8.22	MG_Curve.....	33
8.8.23	MG_Curve attributes and constraints.....	33
8.8.24	MG_Curve_Attributes.....	33
8.8.25	MG_Curve_Attributes attributes and constraints.....	33
8.8.26	8MG_ArcGeometryTypeList.....	34
8.8.27	MG_LimitTypeList.....	34
8.8.28	MG_Zone Spatial Unit Class.....	34
8.8.29	MG_Zone.....	35
8.8.30	MG_Zone attributes and relationships.....	35
8.8.31	MG_Surface.....	36
8.8.32	MG_Surface attributes.....	36
8.8.33	MG_Surface_Attributes.....	36
8.8.34	MG_ZoneTypeList.....	37
8.8.35	MG_JurisdictionDomainTypeList.....	37
8.8.36	LA_SurfaceRelationType.....	37
8.8.37	LA_AreaType.....	37
8.8.38	LA_AreaValue.....	37
8.8.39	MG_Space Spatial Unit Class.....	37
8.8.40	MG_Space.....	38
8.8.41	MG_Space attributes and relationships.....	38
8.8.42	MG_Volume.....	39
8.8.43	MG_Volume_Attributes attributes.....	39
8.8.44	MG_SpaceTypeList.....	39
8.8.45	LA_VolumeValue.....	40
8.9	Source Section.....	40
8.9.1	Source Section General.....	40
8.9.2	MG_Source.....	41
8.9.3	MG_Source attributes and relationships.....	41
8.9.4	LA_AvailabilityStatusType.....	43
8.9.5	ExtArchive.....	43
8.9.6	CI_OnlineResource.....	43
8.9.7	DQ_Element.....	44
8.10	Versioning.....	44
8.10.1	General Approach to Versioning.....	44
8.10.2	Versioned Object.....	45
	Annex A (normative) Abstract test suite.....	46

Annex B (normative) Marine contexts	47
Bibliography	53

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics*.

An additional part is planned to address Implementation Aspects (Part 6) under the general title Geographic information — Land Administration Domain Model (LADM).

This edition of the ISO 19152 multi-part series of standards is backwards compatible to ISO 19152:2012 version of the Land Administration Domain Model.

In accordance with the ISO/IEC Directives, Part 2, 2018, Rules for the structure and drafting of International Standards, in International Standards the decimal sign is a comma on the line. However, the General Conference on Weights and Measures (Conférence Générale des Poids et Mesures) at its meeting in 2003 passed unanimously the following resolution:

“The decimal marker shall be either a point on the line or a comma on the line.”

In practice, the choice between these alternatives depends on customary use in the language concerned. In the technical areas of geodesy and geographic information it is customary for the decimal point always to be used, for all languages. That practice is used throughout this document.

A list of all parts in the ISO 19152 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The initial version of this document, ISO 19152:2012, specifically addressed the land registration aspects of land administration. This version introduces the broader term georegulation that addresses any area of geographic information in which Rights, Restrictions or Responsibilities (RRR) can be applied. Georegulation is the activity to delimit and assert control over geographical spaces through regulations. This standard allows the objects of georegulation to be documented in a systematic and consistent manner. Although the broader term georegulation is used throughout the document, the title of the document remains the “Land Administration Domain Model” to retain compatibility with the previous version of the standard.

This part of the document addresses georegulation in the marine environment. Rights and obligations created by georegulation share a basic structure described in Part 1 of this document. Marine activity is of great importance including transportation, resource extraction and food production (fishing and marine aquaculture). Different rights and obligations may exist on the surface, in the water column and on the seabed. The model defined in this part (Part 3) may be used for marine cadastres as well as other Use Cases such as Conservation Areas, Living Resources and Fishery Management Areas, Non-Living Resources Management Areas, Seabed tenure, etc, as well as to describe data in support of the United Nations Convention on the Law of the Sea (UNCLOS)^[15] or other conventions such as administrative areas described in support of safe navigation under the International Convention for the Safety of Life At Sea (SOLAS)^[16].

The oceans are the common heritage of humankind, and specific areas along coastlines are the jurisdiction of nation states. In specific cases there are private rights, such as the rights associated with fishing or resource extraction. Some individuals may have property rights on land adjacent to water potentially extending into the area covered by water. This may be described in a marine cadastre, described using the structures available in this document.

International marine rights are addressed in international treaties globally through UN conventions and between nations; in particular, the United Nations Convention on the Law of the Sea (UNCLOS)^[15]. Marine safety and navigation are addressed by the IMO international convention on Safety Of Life At Sea (SOLAS) 1974^[16]. Other international conventions, treaties and national laws establish rights and obligations.

United Nations’ Sustainable Development Goal 14C and United Nations’ General Assembly Resolution A/RES/59/24 directed the International Hydrographic Organisation (IHO) to provide technical standards for maritime zones. The International Hydrographic Organization (IHO)¹⁾ is an international standards development organization that supports standards development for oceanography, marine science and the UN SOLAS and UNCLOS conventions. IHO has developed a series of standards and specifications²⁾ that address the marine space. In particular the IHO standard S-121 on Maritime Limits and Boundaries^[8].

A characteristic of georegulation objects in the marine space is that their geometry structure may need to be aligned with the IHO S-100 standard and the ISO 19107 standard. As such there may be different “Feature” types. This is in alignment with the way feature is defined in the General Feature Model from ISO 19109 and the approach to feature cataloguing defined in ISO 19110. For their geographic information aspects, the IHO suite of hydrographic standards is based on the ISO ISO/TC 211 suite of Geographic Information standards, through the IHO Universal Hydrographic Data Model S-100^[6]. The IHO S-121 standard on Maritime Limits and Boundaries directly supports the UNCLOS and is built upon the ISO standard 19152 LADM (this document). Because of the close links between the IHO S-121 standard and the ISO 19152 LADM suite of standards this document part makes direct reference to IHO S-100 and S-121.

Since many of the rights and restrictions in the marine space come either from international or bi-national treaties, or national proclamations or laws, there may be need to express the text or preamble of the treaty or law. A “Governance” object has been added to the administrative structure to allow

1) International Hydrographic Organization <<https://iho.int/>>

2) IHO Standards, Specifications and Regulations <<https://iho.int/en/standards-and-specifications>>

legal text to be associated with an administrative unit. In many cases the parties involved in Rights, Restrictions and Responsibilities (RRR) relationships in the marine space are nations. This means that the code lists of types of parties and administrative units defined in other parts of this document may not apply. Unique code lists have been defined to address the marine space. Also, treaties are often the reference source for both the administrative and spatial aspects, so the distinction between types of sources has been eliminated.

This document is a derived work, developed under a cooperative agreement with IHO based, on IHO standard S-121 and used with permission.

Geographic information — Land Administration Domain Model (LADM) —

Part 3: Marine georegulation

1 Scope

This document provides the concepts and structure for standardization for georegulation in the marine space.

This document addresses the information structures related to management of legal spaces, such as the international maritime limits and boundaries, marine living and non-living resources management areas, marine conservation areas, etc. and their related rights and obligations.

This document establishes the common elements and basic schema to structure marine georegulation information system. It builds upon the common components defined in ISO 19152-1 — Generic Conceptual Model.

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.

ISO 19103:2015, *Geographic information — Conceptual schema language*

ISO 19107:2019, *Geographic information — Spatial schema*

ISO 19109:2015, *Geographic information — Rules for application schema*

ISO 19110:2016, *Geographic information — Methodology for feature cataloguing*

ISO 19111:2019, *Geographic information — Referencing by coordinates*

ISO 19115-1:2014, *Geographic information — Metadata — Part 1: Fundamentals*

ISO 19126:2021, *Geographic information — Feature concept dictionaries and registers*

ISO 19131-1:2007, *Geographic information — Data product specifications*

ISO 19135,³⁾ *Geographic information registration — Requirements*

ISO 19152-1:—,⁴⁾ *Geographic information — Land Administration Domain Model (LADM) — Part 1: Generic Conceptual Model*

ISO 19152-2:—,⁵⁾ *Geographic information — Land Administration Domain Model (LADM) — Part 2: Land registration*

ISO 19157:2013, *Geographic information — Data quality*

3) Under preparation. (Stage at the time of publication ISO/CD 19135).

4) Under preparation. (Stage at the time of publication ISO/DIS 19152-1).

5) Under preparation. (Stage at the time of publication ISO/CD 19152-2).

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 19152-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1.1

boundary

<marine_georegulation> delimitation between two or more zones

Note 1 to entry: A boundary involves two or more parties.

Note 2 to entry: Delimitation between two or more parties.

Note 3 to entry: Adapted from IHO S-121 Maritime Limits and Boundaries^[8]

3.1.2

curve

1-dimensional geometric primitive, representing the continuous image of a line

Note 1 to entry: The *boundary* (3.1.1) of a curve is the set of points at either end of the curve. If the curve is a cycle, the two ends are identical, and the curve (if topologically closed) is considered to not have a boundary. The first point is called the start point, and the last is the end point. Connectivity of the curve is guaranteed by the “continuous image of a line” clause. A topological theorem states that a continuous image of a connected set is connected.

[SOURCE: ISO 19136-1:2020, 3.1.17]

3.1.3

international boundary

<marine_georegulation> delimitation line between two or more States in accordance with UNCLOS Articles 15, 16, 74, 75, 83, and 84

Note 1 to entry: An international boundary involves two or more parties.

3.1.4

limit

<marine_georegulation> *curve* (3.1.2) that defines a *boundary* (3.1.1) or extent of a zone

Note 1 to entry: A limit involves one party.

Note 2 to entry: IHO S-121 Maritime Limits and Boundaries^[8]

3.1.5

marine

relating to navigation or shipping or relating to or connected with the sea or used, or adopted for use at sea

Note 1 to entry: Sometimes called *maritime*, but maritime is more frequently applied to that which borders on the sea.

Note 2 to entry: IHO S-32 Hydrographic Dictionary, item 3123, 2019 – reformatted ^[10]

3.1.6

marine cadastre

management tool which spatially describes, visualizes and realizes formally and informally defined boundaries and associated rights, restrictions and responsibilities in the *marine* (3.1.5) environment as a data layer in a marine SDI, allowing them to be identified, administered and accessed

Note 1 to entry: In addition to boundaries a marine cadastre may also address locations, *limits* (3.1.4), baselines, zones and spaces.

Note 2 to entry: A marine cadastre is a type of georegulation related to property registration as addressed in 19152-2 where the concept of “land” is extended to include “over water”.

Note 3 to entry: Adapted from FIG, 2006 Administering Marine Spaces: International Issues ^[5]

3.1.7

maritime

bordering on, or concerned with, or related to the sea.

Note 1 to entry: IHO S-32 Hydrographic Dictionary, item 3125, 2019 – reformatted^[9]

3.2 Abbreviated terms

baunit	Basic administrative unit
CRS	Coordinate Reference System
DOALOS	Division of Ocean Affairs and the Law of the Sea, Office of Legal Affairs, United Nations
ENC	Electronic Nautical Chart
FIG	Fédération Internationale des Geomètres / International Federation of Surveyors
GUID	Globally Unique Identifier
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IETF	Internet Engineering Task Force
IHO	International Hydrographic Organization
IMO	International Maritime Organization of the United Nations
LADM	Land Administration Domain Model
MRN	Maritime Resource Name
RRR	Right, Restriction, Responsibility
SOLAS	International Convention on Safety of Life at Sea
UML	Unified Modelling Language
UNCLOS	United Nations Convention on the Law Of the Sea
URI	Uniform Resource Identifier
URN	Uniform Resource Name

4 Conformance

4.1 Conformance requirements and testing

Conformance to this part of the ISO 19152 series on a Land Administration Domain Model (LADM) (Part 3 – Marine georegulation) consists of alignment with the requirements established in Clauses 4.3 and 4.4. The Abstract Test Suite given in Annex A describes a methodology for testing conformance to these requirements.

4.2 Conformance classes

Two conformance classes are identified in this part of ISO 19152, one for the description of a Land Administration Domain Model – Marine georegulation system in support of Maritime Limits and Boundaries for UNCLOS and the other in support of other marine georegulation domain areas as outlined in Annex B. The conformance class for marine georegulation system in support of Maritime Limits and Boundaries for UNCLOS provides a general model that is used by the IHO standard S-121^[8]. This includes code lists and other structures such as the governance class MG_Governance and the attribute type Marine Resource Name (MRN) as defined in IHO standard S-100^[6] and geometry constraints to align with IHO standard S-101^[7]. The more general conformance class for other types of marine georegulation, permits but does not require the use of the code lists and other structures specific to Maritime Limits and Boundaries for UNCLOS. These code lists and structures may be extended or other code lists and structures included. Where compatibility is desirable between data products that comply with conformance class 1 and extensions that comply with conformance class 2 it is desirable that extensions be used. That is, these two conformance classes are not mutually exclusive. By making use of extensions it is possible to support both conformance criteria. Support for the geometric constraints described in Clause 7.2 is required for any marine georegulation data product that supports compatibility with the IHO S-100 based suite of Electronic Nautical Chart (ENC) navigation standards.

4.3 Conformance class 1 — Marine Limits and Boundaries in support of UNCLOS

Requirement 1: The description of a Land Administration Domain Model – Marine georegulation schema in support of Maritime Limits and Boundaries for UNCLOS using this part (Part 3) of ISO 19152 LADM shall consist of a set of UML classes with associated attributes that make use of or subtype the classes defined in Clause 8 including the code lists defined in Clauses 8.4.6, 8.4.7, 8.5.4, 8.5.15, 8.8.16, 8.8.26, 8.8.33, and 8.8.34, the attribute Marine Resource Number defined in Clause 8.3 and the geometry constraints defined in Clause 7.2.

NOTE The IHO standard S-121^[7] is compliant with conformance class 1 of this document.

4.4 Conformance class 2 — General marine georegulation

Requirement 2: The description of a Land Administration Domain Model – Marine georegulation schema for general application, such as for marine cadastre or any of the other marine contexts described in Annex B using this part (Part 3) of ISO 19152 LADM shall consist of a set of UML classes with associated attributes that make use of or subtype the classes defined in Clause 8. The code lists, the attribute Marine Resource Number and the geometry constraints identified in conformance class 2 are optional and may be replaced with other code lists and geometric constraints.

5 Notation

The conceptual schema specified in this part of ISO 19144 is described using the Unified Modelling Language (UML), following the guidance of ISO 19103.

Several model elements used in this schema are defined in other ISO geographic information standards. By convention within some ISO/TC 211 standards, names of UML classes, with the exception of basic data type classes, include a two-letter prefix that identifies the standard and the UML package in which

the class is defined. This provides a global unique name for the class. UML classes defined in this part of ISO 19152 have the two-letter prefix of MG. The two-letter prefix of LA is used for Part 1 and Part 2 to support backward compatibility. Table 1 lists the other standards and packages in which UML classes used in this part of ISO 19152 have been defined.

Table 1 — Sources of externally defined UML classes

Prefix	Standard	Part
CI	19115-1	Metadata — Fundamentals
DQ	19157	Data quality
GM	19107	Spatial schema
LA	19152-1	LADM — Generic Conceptual Model
LA	19152-2	LADM — Land registration
MG	19152-3	LADM — Marine georegulation

<<MLB>> — This stereotype applies to attributes that are specific to conformance class 1 relating to Maritime Limits and Boundaries per IHO standard S-121^[8].

<<MRN>> — This stereotype applies to attributes used to carry the Maritime Resource Name, which is a specific identifier managed by the IHO and defined for the IHO S-100^[6] suite of standards, including IHO S-121^[8].

6 Context

The purpose of this part of ISO 19152 is to establish a structure for the description of georegulation in the marine space.

Jurisdictions in the marine space may be quite different than those on land and may be covered by international conventions such as the UN Convention on the Law of the Sea (UNCLOS)^[15]. Nations have internal waters in which they have jurisdiction. UNCLOS defines the marine zones and the rights and duties of a country regarding those zones. Other treaties and agreements between nations and national instruments define specific aspects of georegulation in the maritime space, including, among other subjects, fisheries, passage, exploration and exploitation and other activity.

Although georegulation in the marine space may be different than land administration, the same underlying structure of Rights, Restrictions and Responsibilities (RRR) established in ISO 19152-1 Land Administration Domain Model – Generic Conceptual Model, apply. There may be different rights assigned to the seafloor, the water column and the surface within different zones. An example is the “right of innocent passage” as described in UNCLOS Article 17 which is subject to restrictions as described in Article 19. However, in some cases individuals or corporations may also have rights, such as the fishing rights or exploration rights granted by nations in their waters or multilateral bodies. In some nations, property rights on land adjacent to water may extend into areas covered by water and property rights may exist in the water.

This part uses a feature-oriented approach for spatial geometry in alignment with the general feature model defined in ISO 19109 Rules for Application Schema. Features are defined in accordance with ISO 19110 Methodology for feature cataloguing. The features may be locations, limits, zones or spaces with associated spatial geometry as defined in ISO 19107 Spatial schema of points, curves, and surfaces. For example, a Base Line Point is a specific type of location represented as a point geometry. A zone such as the Exclusive Economic Zone⁶⁾ is represented as an area with surface geometry. A specific type of limit such as the “Outer Limit of the Territorial Sea⁷⁾” is represented as a line with curve geometry. This approach is similar to the approach taken in many other areas of geographic information and is fully supported by the ISO/TC 211 suite of standards.

6) UNCLOS Part V Exclusive Economic Zone

7) UNCLOS Article 4 Outer limit of the territorial sea

In the international context some Rights, Restrictions and Responsibilities in the marine space derive from treaties between nations, where the nations are the parties, other Rights, Restrictions and Responsibilities may derive from national instruments such as laws or government declarations. Rights, Restrictions and Responsibilities may also derive from marine property rights expressed using a marine cadastre. International treaties and national instruments or other sources may be referenced using the “source” construct described in Part 1 of this document. However, the associated legal text may need to be included in the marine space georegulation dataset. In order to accommodate this, a “Governance” object has been added to the structure to contain legal text that is associated with an administrative unit. Often treaties and national marine regulations serve as both the administrative and spatial source.

There is a close relationship between marine georegulation as defined in this standard and the standard for Maritime Limits and Boundaries as defined by the International Hydrographic Organization. The IHO has defined a series of standards to support several UN conventions; in particular, the International convention for the Safety of Life at Sea (SOLAS)^[16] and UN Convention on the Law of the Sea (UNCLOS)^[15]. The SOLAS convention addresses safe navigation and UNCLOS addresses maritime space and associated rights and responsibilities. The IHO has developed the Universal Hydrographic Model S-100^[6] based on the ISO/TC 211 suite of standards. S-100 is a profile of the ISO/TC 211 suite of standards applicable to the marine space. S-100 is quite broad allowing for a number of specific product specifications to be developed addressing different areas related to safe navigation, oceanography and marine georegulation. However, S-100 does make some specific selections with respect to spatial geometry and feature relations. These constraints allow for rigorous testing of marine Electronic Chart Display Information Systems to comply with the UN International Marine Organization (IMO) regulations.

The IHO Product Specification S-121 addresses the requirements of the Division of Ocean Affairs and the Law of the Sea, Office of Legal Affairs, United Nations (DOALOS)^[17] for Maritime Limits and Boundaries. S-121 is based on the structures defined in Part 1 of this document of Rights, Restrictions, Responsibilities and Party making use of the Universal Hydrographic Model from S-100. The geometry and other constraints defined in S-100 also apply to S-121. This document, ISO 19152-3 Marine georegulations, is broader than S-121 addressing additional marine georegulation application areas beyond international maritime limits and boundaries; however, to remain compatible with S-121 it abides to the same constraints defined in S-100.

7 Feature and attribute structure

7.1 Structural overview

The LADM Part 1 – Generic Conceptual Model document describes a high-level model that establishes the basic structures for all aspects of Land Administration/Georegulation. This part describes the specific model related to georegulation in the marine space. The marine space is quite diverse and includes marine limits and boundaries, navigation, resource management, oceanography, bathymetry and aspects of climatology such as tides and currents. Marine geographic information systems make use of the full spectrum of capabilities available in the ISO/TC 211 suite of geographic information standards. Some of these areas require the administration of rights, restrictions and responsibilities in a similar manner to the administration of land. In fact, in some cases it is more complex, where different rights or restrictions apply to different levels in the water column. For example, navigational rights may exist on the surface with fishing rights in the water column and mining rights on the bottom. These rights may apply to different parties and have complex interrelations.

The high-level conceptual model for marine georegulation is based on the General Feature Model defined in ISO 19109 and aligns with the conceptual model defined in IHO S-100 Universal Hydrographic Model^[6] with the addition of the Rights, Restrictions, Responsibilities and Parties structure defined in this document. There are many different types of features that occur in the marine space, including locations represented by point geometric spatial attributes, limits represented by geometric curves, zones represented by surface geometric spatial attributes and spaces represented by surface spatial attributes with height (or depth) as an attribute. The geometric primitives are defined in ISO standard 19107 Spatial schema. This document, Part 3, addressing the marine space makes use of the subset of

the spatial primitives defined in ISO 19107 that are also used in the IHO S-100 Universal Hydrographic Model (S-100 Part 7 – Spatial Schema). This ensures alignment between the IHO standards and other uses of marine georegulation based on this part (Part 3) of ISO 19152 LADM. In all aspects related to this document part (Part 3) there is full compatibility with IHO S-100.

The International Hydrographic Organization is an international standards development organization that specializes in the marine space. It develops standards for safe navigation, marine jurisdictions, oceanography and other aspects of the marine space in close cooperation with other international organizations such as the UN DOALOS^[17] and ISO. In particular it supports several UN conventions such as UNCLOS^[15] and SOLAS^[16] in cooperation with the UN IMO^[18]. Alignment between ISO standards for the marine space and IHO is important.

7.2 Geometry structure

IHO establishes certain constraints on the geometry used under S-100. This is a subset of the broader set of geometric primitives allowed in ISO 19107. The constraints are:

- Each curve must reference a start and end point (they may be the same);
- Curves must not self-intersect;
- Areas are represented by a closed loop of curves beginning and ending at a common point;
- In the case of areas with holes, all internal features' geometric boundaries must be completely contained within the external geometric boundary and the internal geometric boundaries must not intersect each other or the external geometric boundary. Internal geometric boundaries may touch other internal boundaries or the external geometric boundary tangentially (that is at one point);
- The convention used is that the outer geometric boundary of a surface must be in a clockwise direction (surface to the right of the curve) and the curve orientation positive. The inner geometric boundary of a surface must be in a counter-clockwise direction (surface to the right of the curve) and the curve orientation negative;
- Only the geometry types Point, MultiPoint, Curve, Surface, Coverage, Curve (arcByCentrePoint and circleByCentrePoint) are used. MultiPoint is only used for hydrographic soundings and Coverage is limited to bathymetry and tides and currents.

There is no Volume primitive used. This approach aligns with IHO S-100 and is needed for alignment with the IHO suite of standards. A volume must be constructed out of a Surface primitive with a height attribute. This is commonly referred to as 2 ½ Dimensions (i.e. 2 Dimensions with height as an attribute). These constraints permit a planar graph topology to be constructed. Also, Curve is constrained to be defined as a series of vertices, or one of two specific arcs (arcByCentrePoint and circleByCentrePoint). Systems that implement IHO standards for use at sea must undergo marine equipment compliance testing. Limiting the number of possible spatial primitives makes compliance testing possible.

7.3 Packages of the LADM Part 3

This part (Part 3) of the LADM makes use of the core packages defined in Part 1 of this document together with a package addressing marine georegulation. The base package for this part (Part 3) is "ISO 19152-3 Edition 1 Marine Georegulation". This package has four subpackages, "MG_PartySection", "MG_Administrative", "MG_SpatialUnit" and "MG_Source". These packages are realizations of the equivalent packages in Part 1. The package relationship structure is illustrated in Figure 1.

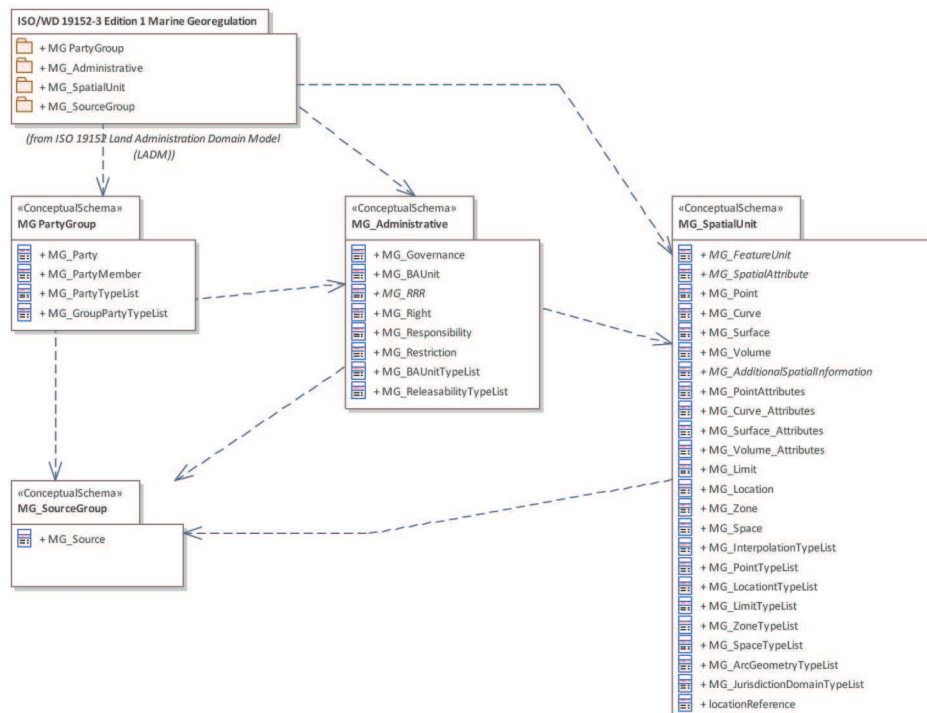


Figure 1 — Packages of the core LADM and Marine Georegulation

8 Marine Georegulation Application Schema

8.1 Marine Georegulation Elements

This part (Part 3) of the LADM describes an Application Schema model for managing rights, restrictions and responsibilities for georegulation within the marine space within the context of the LADM and also in alignment with the IHO S-100 Universal Hydrographic Model and the IHO standard S-121 on Maritime Limits and Boundaries.

The Marine Georegulation Application Schema uses the same Feature and Attribute model as defined in ISO 19110 Geographic information — Methodology for feature cataloguing and ISO 19126 Geographic information — Feature concept dictionaries and registers and in IHO S-100^[6]. Feature types, attribute types and listed values for code lists and enumerations have their definitions recorded in a Feature Concept Dictionary Register in accordance with ISO 19126. These Feature Concepts are then used to construct a particular feature catalogue in accordance with ISO 19110 for a product specification defined in accordance with ISO 19131 Geographic information — Data product specifications. This allows for different product specifications to be developed by various organizations to address different application areas within the marine space. This is also the normal process of the development of product specifications using the ISO/TC 211 suite of standards.

For the IHO standard S-121^[8] the feature concept dictionary is established by the IHO as a register in compliance with ISO 19135-1. The IHO Geospatial Information Registry^[9] is available online and as a document from the IHO. The ISO 19110 compliant Feature Catalogue for S-121 is available as Annex A to the S-121 document^[8].

S-121 addresses Maritime Limits and Boundaries. For other uses within the marine space other feature catalogues and product specifications may be developed. For those application areas governed by the IHO, feature concepts are recorded in the IHO Geospatial Information Registry^[9]. If other organizations or nations develop applications addressing georegulation within the marine space they would similarly need to develop a Feature Catalogue (with or without a Feature Concept Dictionary) and a Product Specification based on this document ISO 19152-3.