Ref: ISO 19131:2022

Guidelines

for Bhutan Standard of Data Product Specification

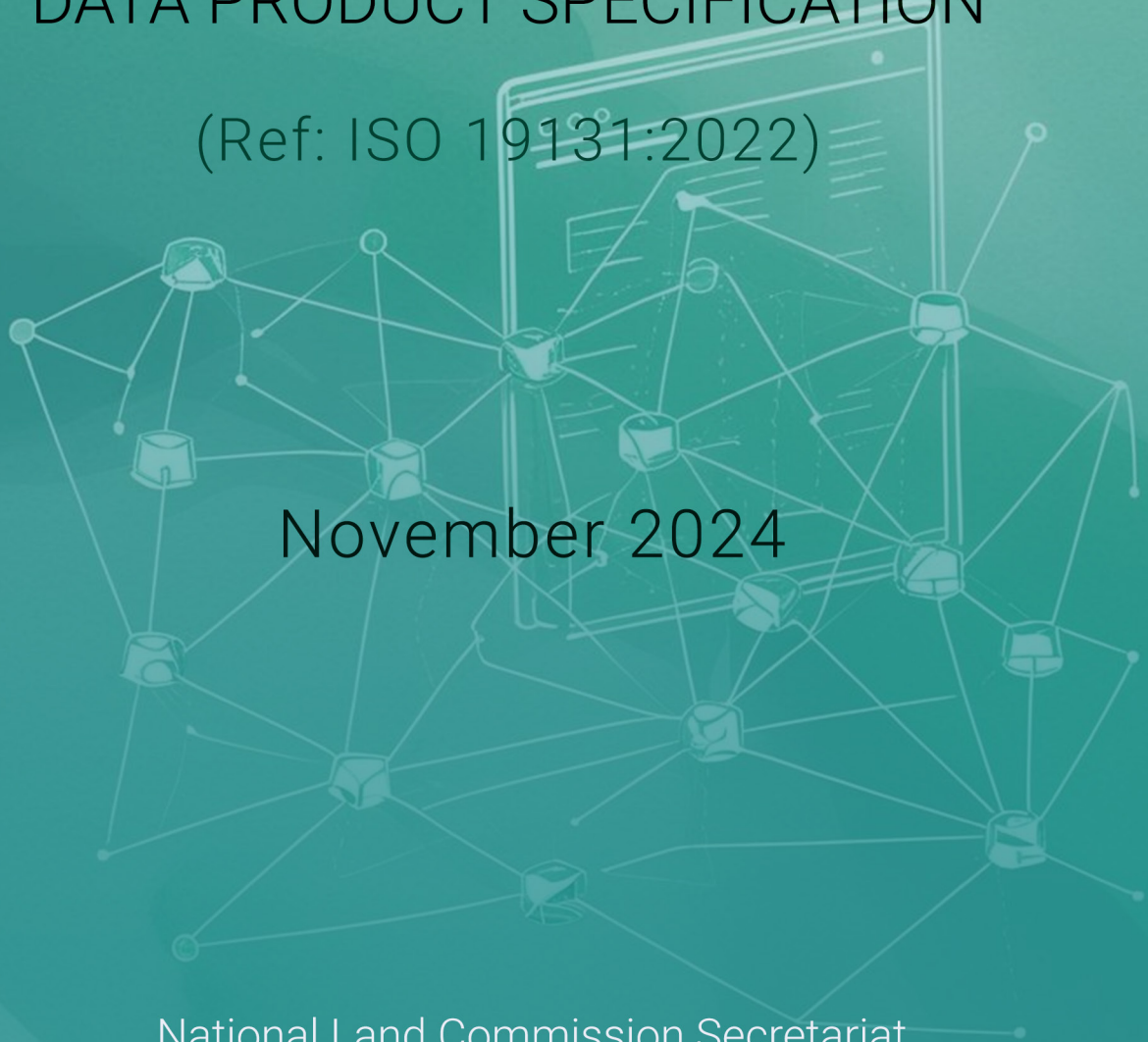
2024

Department of Survey and Mapping
National Land Commission Secretariat
Royal Government of Bhutan

GUIDELINES FOR

DATA PRODUCT SPECIFICATION

(Ref: ISO 19131:2022)



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Contents

Introduction 7

Scope 7

Objective 8

Normative Reference 8

Terms and Definitions 9

Acronyms and Abbreviations 9

Conformance 9

Requirements for Data Product Specification 10

Data Product Speci fication Template 14

Reference 18

Annexure I: Example of DPS for Trek Route 19

Introduction

A data product specification defines the requirements for a data product. It serves as a comprehensive guide for development of the data product outlining the structured framework containing the essential required elements such as data identification, scope, data content and structure, reference system, data quality, data capture, maintenance, delivery and metadata enabling users to evaluate the data product to determine its fitness for use.

Currently, there is no standardized framework for the collection of geographic information which hinders the quality and interoperability of the data from the source. The absence of data product specifications can lead to inconsistencies in data quality, reliability, and usability across various sectors, creating significant challenges in managing and sharing geospatial information. Without a standardized framework that outlines the parameters, formats, and quality benchmarks for data production, agencies may follow different methodologies, resulting in data that may be incompatible or redundant. This lack of specification can hinder efficient data integration, limit data interoperability, and slow down decision-making processes due to the time required to verify or transform data to meet project requirements. Additionally, without clear specifications, the responsibility for data accuracy, updates, and validation may become unclear, leading to duplicated efforts, data discrepancies, and potential conflicts among stakeholders. Therefore, establishing and adhering to detailed data product specifications is crucial to establish a standardized methodology for the collection of geospatial information and to ensure that data is consistently usable, interoperable and accessible across all levels of governance and public use.

Scope

This document describes requirements for specifying Geographic Data Products, based on the ISO 19131: Geographic information- Data product specifications (DPS). The guidelines specify the detailed sections of the data product including the data content and structure. It also provides a template with instructions to as-

sist users in preparing a DPS for their data products. The guidelines do not cover XML encoding, portrayal sections,UML Class Diagrams and feature catalog for data content and structure section of data product specifications.

Objective

The main objective of this guideline is to define the user requirements of data products.

Normative Reference

A normative reference refers to the documents, standards that are indispensable for the application of the guidelines. These references are necessary for inclusion of the mandatory parts of the guidelines that must be followed or used to ensure compliance with the guidelines.

- ISO 19131:2022, Geographic information — Data product specifications
- ISO 19115-1, Geographic information — Metadata — Part 1: Fundamentals
- ISO 19157-1, Geographic information — Data quality— Part 1: General requirements
- Guidelines for Geographic Information Metadata (Centre for Geo-Information)
- Guidelines for Geographic Information Data Quality (Centre for Geo-Information)

Terms and Definitions

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

- **Conformance Quality Level:** Threshold value or set of threshold values for data quality results used to determine how well a dataset meets the criteria set forth in its data product specification or user requirements.
- **Data Capture:** Action or process of collecting data.
- **Data Product:** Data or dataset.
- **Data Product Specification:** Specification of a data product together with additional information that will enable it to be created, supplied to and used by another party.
- **Dataset:** Identifiable collection of data.
- **Feature:** Abstraction of real-world phenomena.
- **Attribute:** Characteristic of a feature quality.
- **Metadata:** Information about a resource.
- **Quality:** Degree to which a set of inherent characteristics of an object fulfills requirements.
- **Specification:** Document containing requirements and abstract test cases for those requirements.

Acronyms and Abbreviations

This document adopts the following conventions for presentation purposes:

- **ISO:** International Organization for Standardization
- **DPS:** Data Product Specification
- **UML:** Unified Model Language
- **XML:** Extensible Markup Language
- **URI:** Uniform Resource Identifier

Conformance

These guidelines align with ISO 19131:2022 for Data Product Specification and generally adheres to its requirements. However, the Portrayal and Additional In-

formation sections have been excluded. The DPS Template does not include all the elements from the ISO standard for DPS, as some optional elements have been omitted as it was less relevant in our context.

Requirements for Data Product Specification

These guidelines include requirements and information about the Data Product Specifications with nine sections where each section addresses a specific aspect of the data product. To maintain a consistent structure and uniformity of DPS, all the sections must be included for the creation of data product specification. Each section may be subdivided based on the scope of the data product specification as outlined in the scope section.

About the Data product Specification

A data product specification defines the requirements for a data product. The overall creation of DPS involves defining the requirements and standards of the data product. Following are the Sections of DPS:

Identification Section

The purpose of the identification section is to provide information for identification, search, and discovery of data products.

Scope Section

When providing different requirements for different parts of data, a data product specification requires a partitioning of the data content of the data product. Each such part of the data content is regarded as a specification scope. The partitioning can be done based on the following criteria;

- spatial or temporal extent,
- feature type,
- property type,
- property value,
- spatial representation,
- product hierarchy.

If two or more scopes are defined, it should be noted that for each scope the re-

maining sections shall be filled.

EXAMPLE:
If a dataset contains feature classes with the same spatial representation type, they can be grouped into a single scope. The data product sections can then be filled out based on this defined scope. For example, in a digital topographic map data product, both the road and river feature classes can be grouped together into one scope as both the classes are represented by the same spatial representation type (line).

When defining scope based on extent, all features within a particular extent can be grouped into one scope, while features in different extents can be grouped into other scopes.

Data Content and Structure Section

The data content and structure section of a data product specification provides the content structure, and characteristics of data to be created. It includes all the features under the specified data products with representation of attribute information of each feature. This can be represented as table-style descriptions shown below.

Example:
Buildings_Point and Buildings_Polygon represent the features under the building data product specifying the attribute information of each feature as follows.

- Buildings_Point

File Name	Buildings_Point
Geometry Type	Point
Data Format	ESRI shapefile
Summary	Buildings as Point for 1: 25,000 Scale Digital Topographic Maps

Attribute Table			
Name	**Data Type**	**Definition**	**Remarks**
Code	String	Code number which is defined in the map symbols regulation	
Layer_Code	Integer	Code number which is defined in the map symbols regulation as text format	
Remarks	String	Input special comments as text format, if necessary	
Angle	Double	Angle	

- Buildings_Polygon

File Name	Buildings_Polygon
Geometry Type	Polygon
Data Format	ESRI shapefile
Summary	Buildings as Polygon for 1: 25,000 Scale Digital Topographic Maps

Attribute Table			
Name	**Data Type**	**Definition**	**Remarks**
Code	String	Code number which is defined in the map symbols regulation	
Layer_Code	Integer	Code number which is defined in the map symbols regulation as text format	
Remarks	String	Input special comments as text format, if necessary	

Name	String	Name of the Building
Shape_length	Double	Line length
Shape_area	Double	Area

Reference Systems Section

The reference systems provide details on the coordinate or geographic reference systems and, if relevant, the temporal reference systems (Calendar and Time system).

Data Quality Section

The data quality section outlines the quality standards and required quality conformance levels for the data product. The components of the data quality and its measure shall be filled up based on the Guidelines for Data Quality.

Data Capture and Production Section

The purpose of the data capture and production section is to provide instructions, requirements and/or descriptions of the data capture and production. This may include details referring to specific methods and/or processing steps. It also captures the source of data creation.

Maintenance Section

The maintenance section provides the instructions regarding maintenance and update of data including frequency with which updates are made to the data product.

Delivery Section

The data product delivery section provides the instructions, requirements and/or descriptions of data delivery format and means for physical delivery or for data delivery using download services or view services. Delivery format can cover exchange formats such as Geography Markup Language, Geopackage and Geotiff. The most suitable format should be selected based on the requirements for the data product specification.

Metadata Section

The metadata section provides the requirements on the metadata to be provided with a data product. Metadata for geographic data products based on the Data Product Specifications are created based on the Guidelines for Metadata.

Data Product Specification Template

1. About the Data Product Specification

Title	The official designation of the data product specification	
Overview	Short human-readable, narrative description of the data product specification	
Version	Version of the DPS	
Published	Publication date (dd-mm-yyyy) of DPS	
Updated	Update date (dd-mm-yyyy) of DPS	
Language	Language used for DPS creation	
Contact	**Organization:**	Name of the organization responsible
	Name:	Name of the responsible DPS creator
	Phone:	Contact number
	Email:	Email address
Format	File format in which the data product specification is provided (eg. pdf/text/xml)	
Maintenance	Schedule/Plan of DPS updation (Yearly/Monthly/Quarterly/AsNeeded etc.)	

2. Identification

Title	Title of the data product
Abstract	Brief narrative summary of the content of the data product
Purpose	Intentions with which the data product is developed

Topic Categories	Theme applicable to the data product (Refer Annexure II,Table 1 of the Guidelines for Geographic Information Metadata)
Spatial Representation	Feature type (Vector data/Raster data)
Extent	Extent of geographic area and temporal extent covered by the data product if any.

3. Scope

Scope identification	A simplified and concise name for identifying the scope of a data product specification. The scope identification name can be based on: • Spatial or temporal extent(e.g. Urban boundary name, Gewog name, Chiwog name, Dzongkhag name, Country name), • Feature type (e.g. point feature, line feature , polygon feature and annotation), • Property type(e.g. For water dataset: “pH”, “Dissolved oxygen") For soil dataset : “Soil pH”, “Soil moisture content Level”), For a road dataset: “Width”, “Surface material”). • Property value, (e.g. For water dataset : property value of pH: "7.0", property value of Dissolved Oxygen (DO): "8 mg/L"), For soil dataset property value of Soil pH : "7.2" , property value of Soil moisture content Level :"35%" , For a road dataset property value of Width : "5 meters", property value of Surface material : “Asphalt”). • Spatial representation (e.g. Raster, Vector), • Product hierarchy. (e.g. Level 1: Country boundary data, Level 2: Dzongkhag boundary data, Level 3: Thromde boundary data, Level 4: Gewog boundary data)
Specification Scope	• A description of its scope addressing a certain part of the content of the data product. Specification scope may be based on: 1. Spatial or temporal extent 2. Certain feature types or properties 3. Product hierarchy

	• List of data product within the specification scope
Extent	Spatial, vertical and temporal extent of the data specified by the specification scope (Eg. Xmin, Xmax, Ymin, Y max)

4. Data Content and Structure

Narrative Description	Describe the basic information and attribute information of each specification scope as table-style.

5. Reference System

Spatial Reference System	The coordinate reference system used in the dataset. (e.g. EPSG:5266)
Temporal Reference System	Temporal reference system comprises Calendar and Time system. (e.g. Gregorian Calendar, UTC+6)

6. Data Quality Requirements

Requirements	**Data Quality Group**	Specify the data quality group as per the Data Quality Guideline
	Data Quality Element	Specify the data quality element as per the Data Quality Guideline
	Data Quality Measure	Specify the data quality measure as per the Data Quality Guideline
	Threshold Value	Minimum acceptable value

7. Data Capture and Production

Data acquisition and processing	Narrative, free text description of the process and the source for the capture and production of the data

8. Maintenance

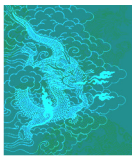
Maintenance and Update Statement	Narrative free text description of the process for the maintenance of the data
Frequency	Frequency with which changes and additions are made to the data product (Yearly/Monthly/Quarterly/As Needed etc.)

9. Data Delivery Methods

Format Name	Format in which the product is delivered (shp, gdb, CAD, CSV, TIFF, etc)
Format Version (if applicable)	Specify the format version of the product delivery if any
Language	Language used for the data production and delivery
Character Set	Specify the name of the character encoding standard used for the data product (eg. UTF-8)
Units of Delivery	Unit of delivery (e.g. tiles, layers, geographic areas, single objects, feature types, full dataset)
Medium Name	Medium in which the product is delivered (E-Mail, Drive, etc)
Other Delivery Information	Other information about the delivery method (Website URL for data access)

10. Metadata Requirements

Specification	Specify the standard and guideline used for the creation of metadata.
Encoding	Format and/or encoding for the metadata (eg, ISO/TS 19139-1:2019- XML schema implementation)



Reference

- Data Product Specification for Fundamental Geospatial Data (Scale 1/25,000) Prototype Ver.0 (August 2017, NLCS, RGoB)
- ISO 19131:2022, Geographic information — Data product specifications
- ISO 19115-1, Geographic information — Metadata — Part 1: Fundamentals
- ISO 19157-1, Geographic information — Data quality— Part 1: General requirements
- Guidelines for Geographic Information Metadata (Centre for Geo-Information)
- Guidelines for Geographic Information Data Quality (Centre for Geo-Information)

Annexure I: Example of DPS for Trek Route

1. About the Data Product Specification

Title	Data Product Specification for Trek Route	
Overview	The dataset of trek routes and waypoints in Bhutan, aims to facilitate outdoor activities such as trekking, hiking, and mountain biking, providing guidance for adventurers exploring the diverse landscapes of Bhutan.	
Version	NA	
Published	21-06-2024	
Updated	NA	
Language	English	
Contact	**Organization:** **Name:** **Phone:** **Email:**	National Land Commission Pema 17777777 pema@nlcs.gov.bt
Format	pdf	
Maintenance	As Needed	

2. Identification

Title	Trek Route and Campsite Map
Abstract	This data product will contain the information regarding the waypoints and Trek route
Purpose	Provide trek route and campsite location information to the trekkers and tourists
Topic Categories	Transportation, Location

Spatial Representation	Vector Data
Extent	North: 28.2964385035 East: 92.1037117859 South: 26.7194029811 West: 88.8142484883

3. Scope

Scope Identification	Line Feature
Specification Scope	• Based on feature type • Trek Route
Extent	Same as the extent of dataset
Scope Identification	Point Feature
Specification Scope	• Based on feature type • Way Points
Extent	Same as the extent of dataset

4. Data Content and Structure

4.1 Line Feature

File Name	Trek Route
Geometry Type	polyline
Data Format	ESRI shapefile
Summary	The dataset of trek routes in Bhutan, will be surveyed with Handheld GPS devices and it aims to facilitate outdoor activities such as trekking, hiking, and mountain biking, providing guidance for adventurers exploring the diverse landscapes of Bhutan.

Attribute Table			
Name	**Data Type**	**Definition**	**Remarks**
dom_Trekid	Double		
Trek Name	String	Name of trek route	
Details	String		
t_Class	String	Classification: Main Route, Side Trip	
Remarks	String		Source: Existing trekking routes and camp-sites.docx (Department of Tourism)
hik-trk	String	Classification: Trek, Side Trip, Hike	

4.2 Point Feature

File Name	Waypoints
Geometry Type	point
Data Format	ESRI shapefile
Summary	The Bhutan Treks Waypoints dataset will provide essential geographic reference points to assist trekkers in route planning, navigation, and exploration of the diverse landscapes and cultural sites of Bhutan.

Attribute Table			
Name	**Data Type**	**Definition**	**Remarks**
id	Double		
name	String	Name of trek route	Source: Existing trekking routes and camp-sites.docx (Department of Tourism)
description	String		
remarks	String	Classification: Main Route, Side Trip	
image_name	String		
type_id	Double	Classification: Trek, Side Trip, Hike	
is_visible	Integer	Classification: -2, -1, 0, 1, 2	
wp_type	String		
Elevation	Double		

5. Reference System

Routes	
Spatial Reference System	EPSG:5266
Temporal Reference System	Gregorian Calendar
Waypoints	
Spatial Reference System	EPSG:5266
Temporal Reference System	Gregorian Calendar

6. Data Quality Requirements

6.1 Trek Route

Requirement 1	**Data Quality Group**	Completeness
	Data Quality Element	Omission
	Data Quality Measure	Number of missing Items
	Threshold Value	1

Requirement 2	**Data Quality Group**	Logical Consistency
	Data Quality Element	Domain Consistency
	Data Quality Measure	Number of items not in conformance with their value domain
	Threshold Value	1

Requirement 3	**Data Quality Group**	Logical Consistency
	Data Quality Element	Topological Consistency
	Data Quality Measure	Connectivity Error
	Threshold Value	2

6.2 Waypoints

Requirement 1	**Data Quality Group**	Completeness
	Data Quality Element	Omission
	Data Quality Measure	Number of missing Items
	Threshold Value	3

Requirement 2	**Data Quality Group**	Positional Accuracy
	Data Quality Element	Absolute/ External Accuracy
	Data Quality Measure	Number of positional uncertainties above a given threshold
	Threshold Value	3

7. Data Capture and Production

7.1 Trek Routes

Data acquisition and processing	The trek route data shall be captured through field validation of the trek route. Data collection tools such as handheld GARMIN GPS and mobile devices shall be used to collect the trek route data.

7.2 Waypoints

Data acquisition and processing	The Waypoints data shall be captured through field validation of the route. Various handheld GARMIN GPS and mobile devices shall be used to collect the way point data.

8. Maintenance

Routes	
Maintenance and update statement	The trek route data shall be maintained and updated through field validation of the trek route.Various handheld GARMIN GPS and mobile devices shall be used to capture the trek route data.
Frequency	As Needed
Waypoints	
Maintenance and update statement	The waypoint data shall be maintained and updated through field validation of the trek route.Various handheld GARMIN GPS and mobile devices shall be used to capture the waypoint data.
Frequency	As Needed

9. Data Delivery Methods

9.1 Routes

Format Name	Shapefile
Format Version (if applicable)	NA
Language	English
Character Set	UTF- 8
Units of Delivery	Feature Type (Lines)
Medium Name	Drive and online
Other Delivery Information	NA

9.2 Waypoints

Format Name	Shapefile
Format Version (if applicable)	NA
Language	English
Character Set	UTF- 8
Units of Delivery	Feature Type (Points)
Medium Name	Drive and online
Other Delivery Information	NA

10. Metadata Requirements

Routes	
Specification	Guidelines for Metadata
Encoding	ISO/TS 19139-1:2019- XML schema implementation
Waypoints	
Specification	BTS for Metadata Guideline
Encoding	ISO/TS 19139-1:2019- XML schema implementation

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