Ministry of Finance
Islamic Republic of Afghanistan

Ministry of Communication & Information Technology
Islamic Republic of Afghanistan

Asian Development Bank

Afghanistan Geospatial Data Standardisation Policy

Building Resilience to Fragility in ADB-Supported Projects - Geographic Information System (GIS) and Information Technology (IT) Services

Asian Development Bank

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Executive Summary

The challenges regarding the lack of availability, the quality, organisation, accessibility, and sharing of geospatial information are common to a large number of policies and activities and are experienced across the various levels of government and non-government organisations. In order to solve these problems it is necessary to take measures of coordination between the users and providers of geospatial information.

The "Building Resilience to Fragility GIS Project" funded by the Asian Development Bank (ADB) aims at establishing a framework for standardisation of geospatial data through this policy. This policy describes the geospatial data standards to be adopted and endorsed by the Afghan Government institutions and organisations in order to overcome the issues highlighted above and ultimately to improve decision making. This policy is focussed on geospatial data standards that relate to Afghan Government's initiatives in collecting, maintaining, managing, and sharing geospatial data. It applies to all geospatial information that the government collects, stores, processes, generates or shares to deliver services and conduct business, including information received from or exchanged with external partners.

All Afghan government agencies and its staff have a duty to respect and maintain the standardisation of any government geospatial information.

All Afghan Government Departments and Agencies should apply this policy and ensure that consistent controls are implemented throughout their partners.

The Afghan Government Security Classifications will come into force on 02 April 2017.

The President's Office

April 2017

Definitions

Central Meridian: The line of longitude that defines the centre and often the x-origin of a projected coordinate system. In planar rectangular coordinate systems of limited extent, such as state plane, grid north coincides with true north at the central meridian.

Coordinate System: A reference framework consisting of a set of points, lines, and/or surfaces, and a set of rules, used to define the positions of points in space in either two or three dimensions. The Cartesian coordinate system and the geographic coordinate system used on the earth's surface are common examples of coordinate systems.

Data Capture: Any operation that converts GIS data into computer-readable form. Geographic data can be captured by being downloaded directly into a GIS from sources such as remote-sensing or GPS data, or it can be digitized, scanned, or keyed in manually from paper maps or photographs.

Data Conversion: The process of translating data from one format to another.

Data Format: The structure used to store a computer file or record.

Data Model: In GIS, a mathematical construct for representing geographic objects or surfaces as data. For example, the vector data model represents geography as collections of points, lines, and polygons; the raster data model represents geography as cell matrixes that store numeric values; and the TIN data model represents geography as sets of contiguous, non-overlapping triangles.

Datum: The reference specifications of a measurement system, usually a system of coordinate positions on a surface (a horizontal datum) or heights above or below a surface (a vertical datum).

Metadata: Information that describes the content, quality, condition, origin, and other characteristics of data or other pieces of information. Metadata for spatial data may describe and document its subject matter; how, when, where, and by whom the data was collected; availability and distribution information; its projection, scale, resolution, and accuracy; and its reliability with regard to some standard. Metadata consists of properties and documentation. Properties are derived from the data source (for example, the coordinate system and projection of the data), while documentation is entered by a person (for example, keywords used to describe the data).

Orthoimage: A satellite image from which distortions owing to camera tilt and ground relief have been removed. An orthoimage has the same scale throughout and can be used as a map.

Projection: A method by which the curved surface of the earth is portrayed on a flat surface. This generally requires a systematic mathematical transformation of the earth's graticule of lines of longitude and latitude onto a plane.

Compliance

All Afghan government institutions have an obligation to comply with relevant statutory, legal and contractual requirements. The geospatial data standardisation policy is a part of the GI standardisation suite of policies, designed to enhance the integration processes of geospatial data and information into daily decision-making at all levels of society.

Violations of this policy may result in suspension or loss of the violator's use privileges with respect to data security regulations. Additional administrative sanctions may apply disciplinary actions up to termination of employment. Civil, criminal and equitable remedies may apply.

Authority

The AGICC has maintained close observation of the development of the policy and approves it for use across government with the support and backing of his Excellence the President of Islamic Republic of Afghanistan.

Revision History

Version	Description	Revision Date	Author
1.0	Policy approved	2017/01/31	
1.1	*(Any changes)*		

1. Introduction

This document sets out Afghan Government's policy relating to the adoption of geospatial data standards for improved decision making.

This policy is focussed on geospatial data standards that relate to Afghan Government's initiatives in collecting, maintaining, managing, and sharing geospatial data. Generally, it will be focussed on data standards that are specific to geospatial; but may also, where necessary, include more general standards related to the capture, management, maintenance and dissemination of geospatial data.

1.1 Geospatial Standards

Geospatial standards impact spatial data capture, management, maintenance and dissemination in land, sea and air domains. Well-defined and viable standards within the geospatial sector allow geospatial information, devices, applications, data repositories, services and networks to communicate. These standards include the wider information technology (IT) standards that underpin the operation of the World Wide Web; for example linked data, as well as specific geospatial standards such as the Open Geospatial Consortium (OGC®) Web Map Service (WMS).

1.2 The Role of Geospatial Standards

Standards have always been important for cartographic and charting purposes; for example standardising the way geographic data is captured and portrayed on paper maps, and how nautical distance is defined and measured. In the current digital age, standards have become of significant importance for the exchange of data between organisations at a national, regional and global level.

Standardisation, the process of developing and implementing technical standards, brings uniformity, compatibility and interoperability to millions of processes, devices, and applications in all sectors of a global economy. In the geospatial sector, having the right standard-setting procedures and interoperability rules in place creates the means for geospatial information, devices, applications, data repositories, services and networks to all communicate as one.

Standardisation is a key aspect to enhancing the integration processes of geospatial data and information into daily decision-making at all levels of society. Geospatial information, spatial data infrastructures and geospatial web services are now widely accessible, shared and reused in many contexts primarily because geospatial information, systems, and services are interoperable – that is, able to be integrated and shared. Standardisation has contributed significantly to the evolution and development of the interoperability of geospatial information and services. Geographic components, such as fundamental data types for geospatial and temporal information, conceptual modelling rules, semantics of real world phenomena, metadata, services, encoding, etc. are developed into standards to set the foundation and building blocks that enable interoperability of geospatial information.

2. The Standards Context

This section contains a brief outline of the relevant standards bodies and the types of standards.

2.1 Standards

The standards related to geospatial data, data capture, management, maintenance and dissemination includes:

- Geospatial data format - such as File Geodatabase;
- Coordinate systems - such as WGS 1984 and UTM Zone 42N;
- Metadata - such as INSPIRE
- Geospatial data specification; such as BS7666, INSPIRE specifications;
- Data quality - such as ISO 19157 Geographic Information Data Quality;
- Data model standards; such as UML; and
- Web services; such as XML, JSON, Web map services (WMS) and Web feature services (WFS).

2.2 Standards development organisations

There are three key international organizations which have the objective of developing standards for geospatial information:

- The International Organization for Standardisation (ISO) Technical Committee 211 Geographic information/Geomatics[1];
- The Open Geospatial Consortium (OGC)[2];
- The International Hydrographic Organization (IHO)[3].

These international standards organizations have representative members from government, industry, research, and academia who arrive at decisions through a consensual process. The organizations develop, maintain and make publicly available open standards that enable the ability to publish, discover, access, manage and use geospatial information across a range of applications, systems and business enterprises.

[1] www.isotc211.org

[2] www.opengeospatial.org

[3] www.iho.int

3. Governance and Coordination

Over time, user experience has shown that lack of consensus, leadership commitment and a clear governance structure are the principal factors limiting the full achievement of the benefits of geospatial data. Constrained funding, inadequate governance arrangements, a lack of understanding of the value proposition of using a standards-based approach and a lack of knowledge and experience in geospatial standards implementation are major limiting factors and are often related to a lack of consensus among stakeholders.

The Steering Committee (SC) of the project will be responsible for approving this policy and any subsequent amendments, and for ensuring the operation of the policy by putting in place the necessary governance structures. The Technical Working Group (TWG) of the project will ensure that the approved standards are fit for purpose, approved standards are maintained and properly used, and engagement of stakeholders for periodic review of the standards takes place.

4. The Policy

4.1 Purpose

The purpose of this policy is to establish a framework for standardisation of geospatial data and require the use of these standards. This applies to all location based data/databases, geospatial data, and geospatial data exchanges.

4.2 Scope

4.2.1 This policy applies to all geospatial data and related information held by the Afghan government organisations. It also applies to all staff, partners, and third party agencies handling government geospatial data.

4.2.2 This policy does not cover data used by individuals for their own personal purposes.

4.3 Standard

The government of Afghanistan adopts open data standards and guidelines as its spatial data standards for all applicable geospatial data collection efforts. Adopting these data standards will assure the greatest compatibility between data that are developed and maintained within and across Afghan government entities.

The policies on standard data contents of various foundation geospatial datasets have been developed. These policies and standards allow various Afghan government entities to use the same format and structure shared by different organisations. The standards are discussed below. The principals developed and outlined in this document should be applied to other non-foundation datasets, to ensure interoperability and consistency.

4.4 The Coordinate System

There are two primary coordinate systems on which most geographic information is referenced: Geographic Coordinate System (GCS), and Projected Coordinate System (PCS).

A geographic coordinate system is a method for describing the position of a geographic location on the earth's surface using spherical measures of latitude and longitude (Figure 1). A geographic coordinate system (GCS) uses a three-dimensional spherical surface to define locations on the earth. A GCS is often incorrectly called a datum, but a datum is only one part of a GCS (Figure 2). A full GCS includes an angular unit of measure, a prime meridian, and a datum (based on a spheroid)[4].

[4] http://help.arcgis.com

Figure 2: Geographic location on the earth's surface

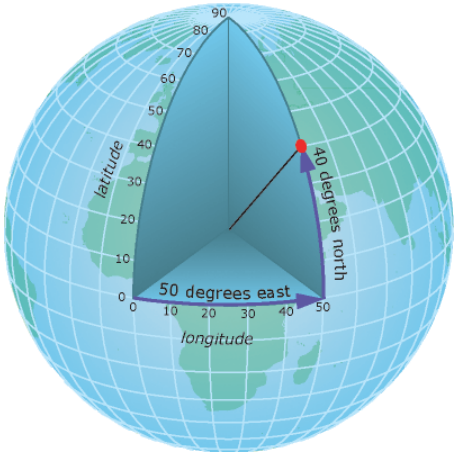
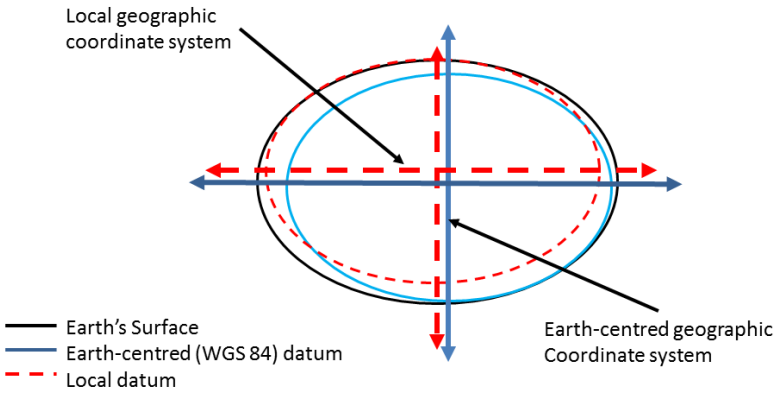


Figure 2: Geographic Coordinate System and Datum



A projected coordinate system (PCS) is defined on a flat, two-dimensional surface. Unlike a GCS, a PCS has constant lengths, angles, and areas across the two dimensions. A PCS is always based on a GCS that is based on a sphere or spheroid. In addition to the GCS, a PCS includes a map projection, a set of projection parameters that customize the map projection for a particular location, and a linear unit of measure. Locations are identified by x-coordinate and y-coordinate specifying its horizontal and vertical position on a grid, with the origin at the centre of the grid[5] (Figure 3).

Figure 3: X-coordinate and Y-coordinate specifying locations on a grid

X < 0 Y > 0	X > 0 Y > 0 (0, 0)
X < 0 Y < 0	X > 0 Y < 0

[5] http://www.arcgis.com

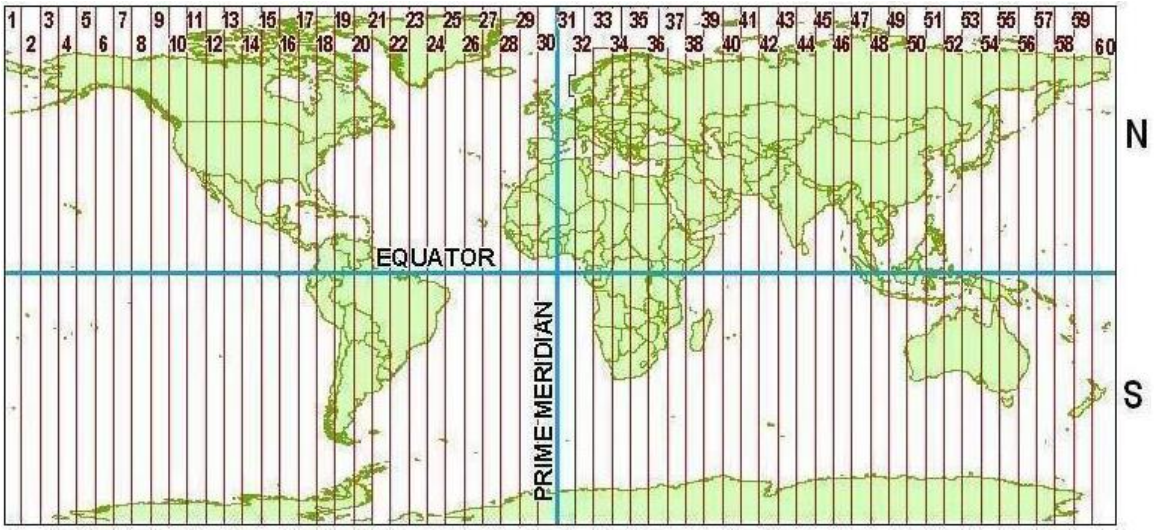
The official Geographic Coordinate System (GCS) and the Projected Coordinate System (PCS) for engineering survey and topographic mapping activities in Afghanistan are:

Geographic Coordinate System (GCS)	
Name:	WGS 84
Type:	Geographic 2D
Area of Use:	World
Datum:	WGS 1984
Coordinate System:	Ellipsoidal 2D CS. Axes: latitude, longitude. Orientations: north, east; Unit of Measurement: degree
Projection:	Geographic 3D to Geographic 2D

Projected Coordinate System (PCS)			
Name:	UTM Zone 42		
Area of Use:	World - N hemisphere - 66°E to 72°E		
Conversion Method:	Transverse Mercator		
Conversion Parameters:	**Parameter**	**Value**	**Unit**
	Latitude of natural origin	0	degree
	Longitude of natural origin	69	degree
	Scale factor at natural origin	0.9996	unit
	False easting	500000	metre
	False northing	0	metre

Afghanistan is situated within 3 UTM zones – 41, 42, and 43 (Figure 4), and majority of the country is in UTM zone 42. Designation of the central meridian as the reference y-axis (i.e. easting = 0) of the coordinate system within each zone would result in negative easting values for points to the west of the central meridian. For this reason, the central meridian is assigned an arbitrary value of 500000 meters, thus avoiding any negative easting coordinates; points lying to the east of it would have an easting value greater than 500000m and points lying to the west would have a value less than 500000m. This assignment would place the origin outside the zone at 500000m west of the central meridian, as a result the origin is called a *false origin* and the easting coordinates are referred to as *false easting*. Because of this, the central meridian of UTM zone 42 with a false easting of value 500000m is considered in the above projection parameters and the neighbouring countries also use the same projection parameters.

Figure 4: UTM Zone Numbers



4.5 Geospatial Data Format

The official standard geospatial data and associated information formats are:

S. No.	Data Type	Data Format	Remarks
1.	Vector	**Geodatabase** – *Personal Geodatabase* or *File Geodatabase*	The geodatabases can be in a *Personal Geodatabase* or *File Geodatabase* format, however, the **File Geodatabase** is the most suitable format of geodatabase in order to build enterprise level of database. The geodatabase should be zipped for delivery.
2.	Vector	**Shape File**	A proprietary format created by ESRI, Shapefiles are common but should not be used for core foundation data
3.	Satellite Images	**IMG (Image Format)**	A proprietary format created for use in ERDAS IMAGINE software. This format is used widely for processing remote sensing data, since it provides a framework for integrating sensor data and imagery from many sources.
3.	Satellite Images	**ECW (Enhanced Compression Wavelet)**	ECW is a suitable format optimized for aerial and satellite imageries.
4.	Satellite Images	**TIFF (Tag Image File Format)**	TIFF is a suitable format for aerial photo, satellite imagery, LIDAR, and DTMs.
5.	CAD Drawing Files	**DWG**	The individual layers of a CAD drawing should be converted to individual Shape File or Feature Classes in a geodatabase
6.	Tables	**CSV (comma delimited)**	The CSV file (comma delimited) for a location (point) features should contain a Easting (X) and Northing (Y) metric values compatible to UTM 42N

4.6 File Naming Standard

This section provides the direction for following a standard file naming convention for all foundation geospatial datasets. The delivery of geospatial datasets must adhere to the naming standard outlined below.

When delivering geospatial datasets, the following naming convention should be used:

THEME_SUBTHEME_ORIGINATOR_CLASS_DATECREATED

Theme – This is a data theme code describing a broad category of data type as listed in Annex 1.

Sub Theme – This is a code for specifying the content of data as listed in Annex 1.

Originator – This is a letter code depicting the name of the organisation that first created the datasets. A list should be maintained as part of the coded element in Annex 2.

Class – The sensitivity level of data as per the data classification policy. This is a 3 letter code depicting the sensitivity level as listed in Annex 3.

DateCreated – This is the date of data creation or revision to keep track of the versioning of the dataset. The date should be in the form YYYYMMDD, e.g. 20170312 (12th March 2017).

For example: The road transportation data created/revised by Ministry of Public Works on 25th January 2017 and classified as “for internal use” in data classification policy should be named as:

TRANSPORT_ROAD_MOPW_INT_20170125

4.7 Data Content Standards

This section provides the data content standards for all foundation geospatial datasets which will fulfil the objectives of Afghan GIS communities. These data standard is a minimum set of attributes and geometry description for each feature.

4.7.1 Cadastral Parcels Data

Cadastral parcel data consist of the boundaries of land ownership parcels and attributes of those parcels. These attributes generally include information about the property owner, and descriptors related to the value and use of land. Both components – boundaries and attributes - change rapidly as new property is created and existing property is re-evaluated, improved, sold or redeveloped. Cadastral core data is a minimum set of elements that describe land parcels used for publication and distribution by land registration authorities. The elements provide basic land parcel information for integration across jurisdictional boundaries to facilitate research and analysis.

Table 4.1 below shows the desirable key attributes that meet common producer and stakeholder needs for sharing, displaying, and use of geospatial parcel data. As with all datasets listed in this policy, individual organisations may need to append other data to these tables for their own requirements.

Table 4.1: Data content standard for the Cadastral Parcels data

Cadastral Parcel		
Attributes	**Description**	**Data Type**
Title	Parcel unique reference identity	A/N
Area	Area coverage of parcel in metre square	Number
OwnerName	Name of the owner	String
OwnerAddress1	Owner's street address	String
OwnerAddress2	Owner's town address	String
Name_English	Location name in English [Geographical Names)	String
Name_Dari	Location name in Dari [Geographical Names)	String
OwnerContactNumber	Owner's contact telephone number	String
ParcelAddress1	Address of the parcel location	String
ParcelAddress2	Address of the parcel location	String
ParcelCity	Address of the parcel location	String
DeedArea	Land area from deed	Number
SourceReference	Source reference, e.g. deed	String
SourceReferenceDate	Source reference date	Date
Revision Date	Date of the last revision	Date
SourceScale	Scale of the source reference	String
OwnerType	Land tenure type, e.g. leasehold, freehold	String
Authority	Name of the land authority department	String
LandCoverType	Description of parcel use [Land Cover]	String
TotalValue	Value of the parcel	Number
LinkToDeeds	Link to scanned deed document	String

4.7.2 Transportation Network Data

The Transport Networks theme is defined as road, rail, air and water transport networks and related infrastructure, and links between different networks.

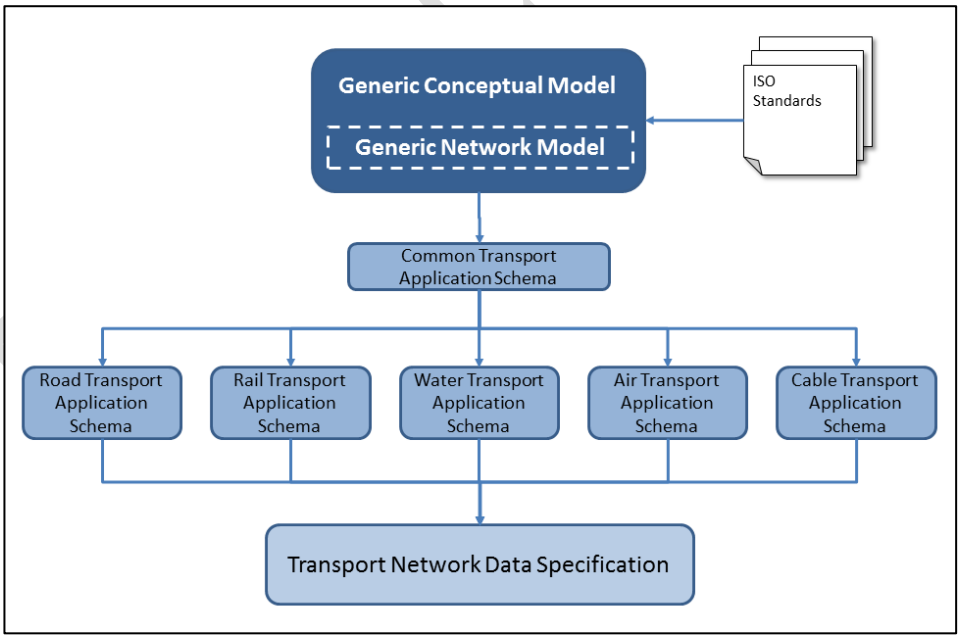
Transportation data includes topographic features related to transport by road, rail, water, and air. It is important that the features form geometric networks where appropriate, and that links between different networks are established. This offers a way to model common networks and infrastructures, such as calculating the best optimum route, finding the closest facilities, finding service areas within a certain time frame, etc.

The Transport Networks Data Product Specification incorporates five distinct transport themes:

- Road transport
- Rail transport
- Water transport
- Air transport
- Cableways

This is summarised in the diagram below (Figure 4.6.2) which shows the Generic Conceptual Model (GCM) that contains a basic framework for any kind of network model (the Generic Network Model [GNM]). From the GNM, a Common Transport application schema is adapted and this then is used as the basis for all five application schema.

Figure 4.6.2: Framework for Transport Network Data Specification



Given that roads are by far the most significant aspect of the transport network in Afghanistan, this policy only documents the standards around that theme. As this situation changes, the policy will be updated to reflect other methods within the overall transport theme

Table 4.2 below shows the data content standard for the Road Transport Network data which is a minimum set of attributes and geometry description for road features and should be used for publication and distribution of transportation information by road information producers and maintainers. This standard is intended to provide sufficient information to support integrating basic transportation information across jurisdictional boundaries, answering fundamental questions for business processes dependent upon transportation, and serve as a basis for other functionality within GIS applications (e.g. routing, geocoding).

Table 4.2: Data content standard for the Road Transport Network data

Road Transportation		
Attribute	**Description**	**Data Type**
NationalRouteId	A descriptive number to be used as a label or road sign	Number
RoadName	The officially designated name as determined by the government	A/N
RoadTypeID	A unique number to be used for type of roads	Number
RoadClassificationType	The street type as referenced by the government	String
RoadSurfaceCategory	Road surface type	String
RoadLength	Length of the road in metre	Number
RoadWidth	Average width of the road in metre	Number
Lanes	No. of lanes	Number
RoadCondition	Status or condition of the road	String
MaintenanceProvider	The entity responsible for the maintenance of the road	String
DateCreated	Date of data creation	Date
DateRevised	Last date that change occurred to this record	Date

A domain is associated for *RoadClassificationType*, *RoadSurfaceCategory*, and *RoadCondition,* which constraints the allowed values in the respective fields. In other words, the field will not accept a value that is not in that domain. Using domains helps ensure data integrity by limiting the choice of values for a particular field.

The associated domains with the fields *RoadClassificationType*, *RoadSurfaceCategory*, and *RoadCondition*, are given below.

RoadTypeID	RoadClassificationType
RT-1	Highways
RT-2	Primary Roads
RT-3	Secondary Roads
RT-4	Trails

RiadSurfaceID	RoadSurfaceCategory
RS-1	Paved
RS-2	Unpaved

RoadConditionID	RoadCondition
RC-1	In operation
RC-2	Restricted
RC-3	Under construction
RC-4	Closure

4.7.3 Hydrography Data

The data specification for *Hydrography* is required to facilitate the interoperability of hydrographic information between government entities. Hydrography is the capture and description of the sea, lakes, rivers and other waters, with their associated attributes, however, sea and coastal water features are not relevant in the Afghan context. The river and lake water features are only within the scope in the context of Afghanistan. The Hydrography data schema is divided into two separate application schemas (Figure 4.6.3):

- Physical Waters (primarily for mapping purposes)
- Network model (the connectivity of water elements primarily for spatial analysis and modelling)

The Physical Waters application schema includes natural and man-made objects and hydrographic points of interest. The Network model includes derived data such as flow direction, flow accumulation, river basin, etc. primarily used for spatial analysis and modelling.

Figure 4.6.3: Hydrography Application Schema

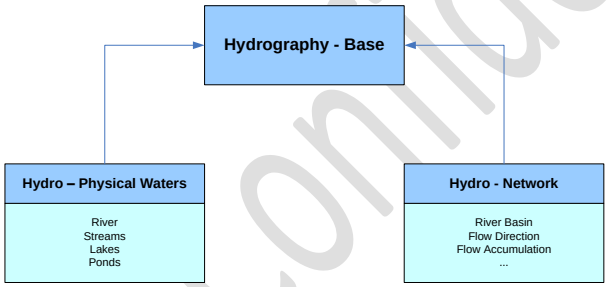


Table 4.3a and 4.3b below are the standard data content for *River and Streams* and *Lakes and Ponds* which are minimum set of attributes and geometry description for physical hydrology features and should be used for publication and distribution of hydrography information by information producers and maintainers.

Table 4.3a: Data content standard for the River and Streams data

Rivers and Streams		
Attribute	**Description**	**Data Type**
FeaureTypeID	Unique ID for classification of feature type	Number
FeatureType	Descriptive information about feature type(major Minor, stream)	String
Name	Name of the river	String
System	Name of river system (e.g. watershed)	String
Name_English	Location name in English [Geographical Names)	String
Name_Dari	Location name in Dari [Geographical Names)	String
Length	Length in metre	Number
AverageWidth	Average width in metre	Number
DateCreated	Date of creation of the data	Date
DateRevised	Date of last revision	Date
DataSource	Source of the data	String

Table 4.3b: Data content standard for the Lakes and Ponds data

Lakes and Ponds		
Attribute	**Description**	**Data Type**
FeaureTypeID	Unique ID for classification of feature type	Number
FeatureType	Descriptive information about feature type(lakes, ponds)	String
Name	Name of the lake	String
Elevation	The location of feature above mean sea level in metre	Number
Depth	Depth in metre	Number
Name_English	Location name in English [Geographical Names)	String
Name_Dari	Location name in Dari [Geographical Names)	String
DateCreated	Date of creation of the data	Date
DateRevised	Date of last revision	Date
DataSource	Source of the data	String

4.7.4 Land Use and Land Cover

Land cover data provides a description of the earth's surface by its (bio) physical characteristics. In the real world, this surface is populated with physical landscape elements (e.g. buildings, roads, trees, plants, water bodies etc.). Many of these elements are themselves spatial features and represented in other individual themes. The physical characteristics of the landscape elements combine to form the land cover of an area. Land cover is in this sense an abstraction and should be perceived as a surface characteristic rather than a collection of features. Mapping and description of land cover is therefore also different from the mapping of the individual landscape elements.

Afghanistan has adopted FAO Land Cover Classification (LCCS)6 system for land cover mapping, which is a comprehensive, standardized classification system that enables comparison and correlation of land cover classes regardless of mapping scale, land cover type, data collection method or geographical location. LCCS's inherent flexibility, its applicability in all climatic zones and environmental conditions, and in particular, its built-in compatibility with other classification systems, makes this system of classification ideal for national land cover mapping including the creation of the national land cover database, in which comparison with previously created land cover datasets (such as the 1990-93 dataset) is very relevant.

The LCCS has a very comprehensive data coding scheme for various type of land use and land cover classes. Table 4.4a below are the standard data content for Land Use and Land Cover which are minimum set of attributes and geometry description for various land cover features and should be used for publication and distribution of land cover information by information producers and maintainers.

Table 4.4a: Data content standard for Land Use and Land Cover data

Land Use and Land Cover		
Attribute	**Description**	**Data Type**
LCCSCODE	Unique LCCS code for feature type	Number
AGG_LC	Aggregated land cover type defined by LCCS Code	String
LCCSUSLB	Unique ID for land cover sub-class	Number
LandCoverType	Land use / land cover type	String
PercentCover	Percentage of the coverage	Number
DistrictName	Name of the district [District Boundary]	String
ProvinceName	Name of the province [Province Boundary]	String
Area	Area in square metre	Number
DateCreated	Date of creation of the data	Date
DateRevised	Date of last revision	Date
DataSource	Source of the data	String
SourceDate	Date of the source	Date

[6] FAO Land Cover Atlas of Afghanistan, 2016

Afghanistan's land cover classification consists of 25 land cover classes identified in FAO Land Cover Atlas (2016) and is a standard classification system. The codes and details of land cover types are given in Annex-4.

The 25 land cover classes have been aggregated into 11 generalized classes (Table 4.4b) in order to provide an appropriate basis for agriculturally important land covers.

Table 4.4a: Data content standard for Land Use and Land Cover data

AGGREGATED LAND COVER CLASSES	CLASS CODES	CLASS COMPONENTS
Irrigated Agriculture Land	**AGI**	3A, 3A1, 3B, 3C
Rainfed Agriculture Land	**AGR**	4A, 4B
Fruit Trees	**AGT**	2A
Vineyards	**AGV**	2B
Barren Land	**BRS**	8A
Sand Cover	**BSD**	8B, 8C
Forest & Shrubs	**NFS**	6A, 6B, 6B1, 6C
Rangeland	**NHS**	7
Permanent Snow	**SNW**	13
Built-up	**URB**	1A, 1B
Water Body and Marshland	**WAT**	9A, 9B, 10A 10B 11, 12

4.7.5 Administrative Units

Administrative units are considered as reference data, i.e. data that constitute the spatial frame for linking to and/or pointing at other information that belong to specific thematic fields such as the environment and socio-economic statistics, alongside many others.

The core element of the Administrative Units is the administrative unit represented by a surface geometry. Each administrative unit carries a unique identifier. Administrative units are further described by their geographical name, the country of location, the national administrative code, and the hierarchical level within the administrative structure of the country.

The administrative division of the country follows a hierarchical structure (Figure 4.6.5) where the lowest level units (often communes) are united in higher level units (like districts, etc.) that compose other units at a higher level. It must be ensured that an administrative unit of an upper level is composed of one or more administrative units of a lower level. Lowest level administrative units are further characterised by their geometry and, where available, by the corresponding local administrative unit code.

Administrative units are separated by administrative boundaries that are specified as lines. As mandatory properties they carry a unique identifier, information on the country, the administrative hierarchic level and their own geometry. These are complemented, when available, with the legal and technical status of the boundary and the life cycle information.

Figure 4.6.5: Hierarchal Structure of the Administrative Units

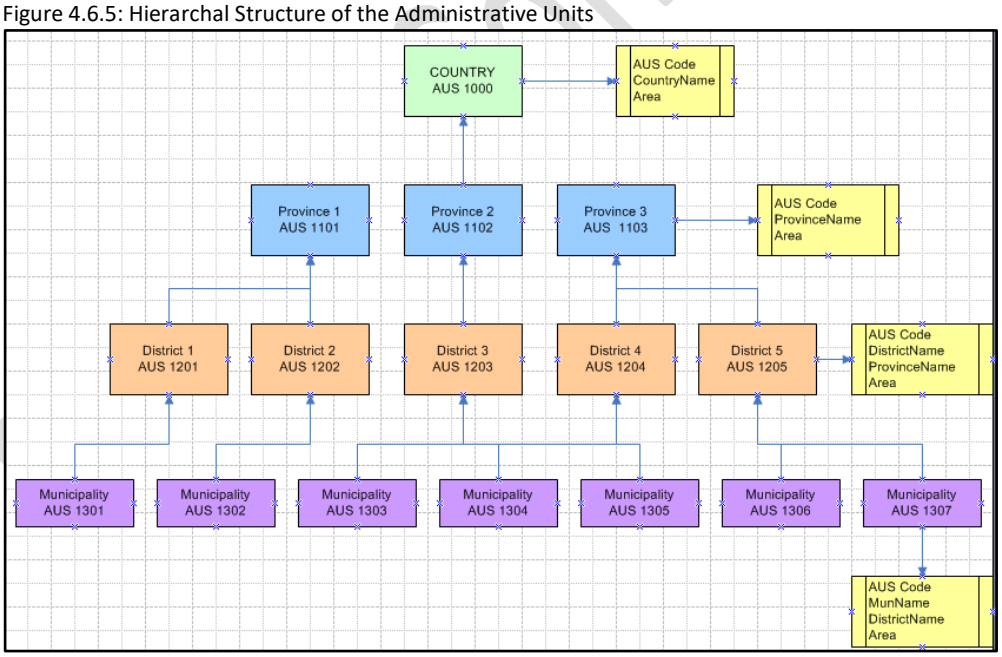


Table 4.5a, 4.5b, and 4.5c below are the standard data content for different level of administrative units, which are minimum set of attributes and geometry description for various administrative units feature and should be used for publication and distribution of administrative unit's information by information producers and maintainers.

Table 4.5a: Data content standard for the National Boundary data

National Boundary		
Attribute	**Description**	**Data Type**
AdminLevel	Administrative Level	Number
AUS_Code	Unique Administrative Unit Structure identifier	Number
CountryName	Name of the administrative unit (Country)	String
Area	Area in square Kilometre	Number
DateCreated	Date of creation of the data	Date
DateRevised	Date of last revision	Date
DataSource	Source of the data	String
SourceDate	Date of the source	Date

Table 4.5b: Data content standard for the Province Boundary data

Province Boundary		
Attribute	**Description**	**Data Type**
AdminLevel	Administrative Level	Number
AUS_Code	Unique Administrative Unit Structure identifier	Number
ProvinceName	Name of the administrative unit (Province)	String
Area	Area in square metre	Number
DateCreated	Date of creation of the data	Date
DateRevised	Date of last revision	Date
DataSource	Source of the data	String
SourceDate	Date of the source	Date

Table 4.5c: Data content standard for the District Boundary data

District Boundary		
Attribute	**Description**	**Data Type**
AdminLevel	Administrative Level	Number
AUS_Code	Unique Administrative Unit Structure identifier	Number
DistrictName	Name of the administrative unit (District)	String
ProvinceName	Name of the administrative unit (Province)	String
Area	Area in square metre	Number
DateCreated	Date of creation of the data	Date
DateRevised	Date of last revision	Date
DataSource	Source of the data	String
SourceDate	Date of the source	Date

4.7.6 Geographical Names

Geographical names are widely used in every-day communication for referring to various natural and man-made objects in the real world. Consequently they are interconnected with other themes. Administrative units, addresses, elements of hydrography (lakes, rivers etc.), elements of transport networks (airports, bridges etc.) and protected sites are usually referred to by their names.

Geographical names are used extensively when searching for information in web-services (including geoportals), navigating, referencing thematic information to a location (geocoding), visualising geographic information on maps and screens, as well as when processing spatial data sets comprising historical data. Correct usage of geographical names is a principal aspect of everyday communication; consequently the status (official, historical…) linguistic properties (language, spelling, eventual transliteration, etc.) are a prime interest of many users, including press agencies, map publishers, spatial analysts, authorities, etc.

Each named place has a unique identifier (GN). It is further characterised by the eventual name(s), i.e. names in English as well as in Dari, location, and associated district and province names. Table 4.6 below are the standard data content for Geographical Names, which are minimum set of attributes and geometry description for various geographical names feature and should be used for publication and distribution of geographical name's information by information producers and maintainers.

Table 4.6: Data content standard for the Geographical Names data

Geographical Names		
Attribute	**Description**	**Data Type**
GN_ID	Unique ID for geographical names	Number
Name_English	Name of the location in English	String
Name_Dari	Name of the location in Dari	String
HierarchyLevel	Hierarchy level in administrative structure	Number
Authority	Responsible authority	String
DistrictName	Name of the district	String
ProvinceName	Name of the province	String
X_Coordinate	X-Coordinate of the place	Double
Y_Coordinate	Y-Coordinate of the place	Double
DateCreated	Date of creation of the data	Date
DateRevised	Date of last revision	Date
DataSource	Source of the data	String
SourceDate	Date of the source	Date

4.7.7 Protected Sites

According to the International Union for the Conservation of Nature (IUCN) a Protected Site is an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means. Protected sites may be located in terrestrial, aquatic and marine environments, and may be under either public or private ownership. They may include localities with protection targets defined by different sectors and based on different objectives. Objectives for protection may include the conservation of nature; the protection and maintenance of biological diversity and of natural resources; and the protection of manmade objects including buildings, historic archaeology sites, and other cultural objects.

Table 4.7 below are the standard schema for *Protected Sites* feature containing a number of attributes with their own complex data types, which are minimum set of attributes and geometry description and should be used for publication and distribution of information related to protected sites by information producers and maintainers. The schema includes a domain class to describe an appropriate status about the protected sites from the list.

Protected Sites		
Attribute	**Description**	**Data Type**
SiteID	Unique ID for protection sites	Number
Name	Name of the protection site	String
GeographicName	Geographical name of the location [GeogrpahicName]	Number
Easting	Longitude values	String
Northing	Latitude values	Number
Status	Status of the site (from domain)	Domain
ProvinceName	Name of the province [ProvinceBoundary]	String
DistrictName	Name of the district [DistrictBoundary]	String
Area	Area in square metre	Number
DateCreated	Date of creation of the data	Date
DateRevised	Date of last revision	Date
DataSource	Source of the data	String
SourceDate	Date of the source	Date
Link	Hyperlinks to reports, photos, videos etc.	String

Status Domain	
PS-1	Classified
PS-2	Declared
PS-3	Designated
PS-4	Candidate

4.7.8 Elevation

The Elevation of a terrain surface, whether land based or bathymetric in nature, is one of the most important descriptors of the Earth's morphology. The Elevation data theme includes digital elevation models for land, ice and ocean surfaces both for terrestrial elevation and bathymetry, as well as shorelines.

Elevation data is being used in a wide range of applications like civil engineering, Earth science applications (especially flood mapping), planning and resource management, surveying and photogrammetry (in particular orthoimagery) and defence.

The main purpose of a Digital Elevation Model (DEM) is to provide an elevation property with reference to a specified origin (vertical reference or datum). This property may be height (when the value is measured opposite to the gravity field of the Earth) or depth (when the value is measured in the direction of the gravity field). Therefore they share the basic modelling concepts. Integrated land-sea models may be provided using either a height or depth property referenced to a known vertical reference. When an elevation property describes the bare surface of the land or sea floor the related model is called Digital Terrain Model (DTM). When an elevation property includes the heights of the objects present on the surface (e.g. vegetation, man-made objects) the related model is referred as Digital Surface Model (DSM).

The elevation data can be represented in a form of vector model, such as contour lines, TIN (Triangulated Irregular Network), or spot heights. But the elevation data is widely used as grid (raster) representation, which is based on coverage geometry, indicating elevation values at the points of a rectified grid.

Table 4.7a below depicts the standard content for vector representation of an elevation data describing the three-dimensional shape of the Earth's surface. These are the minimum set of attributes and geometry descriptions for vector features representing elevation and should be used for publication and distribution.

Table 4.7a: Data content standard for Elevation (Vector) data

Elevation		
Attribute	**Description**	**Data Type**
ID	Unique ID for features	Number
Height	Height values in metres	Number
Contour_Interval	Interval of contour interval in metres	Number
DateCreated	Date of creation of the data	Date
DateRevised	Date of last revision	Date
DataSource	Source of the data	String
SourceDate	Date of the source	Date

Elevation data are widely used in a form of raster grid, known as DEM, which could be acquired through various techniques such as photogrammetry, LiDAR, land surveying, etc. DEMs are commonly built using data collected using remote sensing techniques and the

quality of a DEM is determined by the size of grid (pixel), also known as resolution. There are commercially available DEMs of various resolutions generated from different satellite equipment, such as SRTM (Shutter Radar Topography Mission), ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer), etc.

Table 4.7b below depicts the standard content for raster representation of an elevation data describing the three-dimensional shape of the Earth‘s surface. These are the minimum set of attributes for a DEM representing elevation and should be used for publication and distribution.

Table 4.7b: Data content standard for Elevation (Vector) data

Digital Elevation Model (DEM)		
Attribute	**Description**	**Data Type**
PixkelValue	Height values in metres	Number
PixelSize	Resolution of the grid	Number
DateCreated	Date of creation of the data	Date
DateRevised	Date of last revision	Date
DataSource	Source of the data	String
SourceDate	Date of the source	Date

4.7.9 Geology

Geological data are used in various domains requiring knowledge of the surface and underground geological environment: detecting geo-hazards; ensuring the safe disposal of waste, carbon capture and storage; ensuring the safe construction of buildings; providing information for environmental planning; providing information for natural resources exploration; vulnerability of the underground to contamination; providing indicators for climatic change; providing construction material and minerals.

The core data model contains the main types of geological features (GeologicUnits, GeologicStructures, and GeomorphologicFeatures). The geometry of these features can be included in geological maps and profiles in the form of points, lines and polygons. The data model also enables a description of the lithological/stratigraphical characteristics of borehole logs, thematic maps, geophysical surveys and measurements, and features related to hydrogeology (aquifers and groundwater bodies).

Table 4.8 represents the standard data content for Geology, which are minimum set of attributes and geometry description for various geological features and should be used for publication and distribution of geological information by information producers and maintainers.

Table 4.8: Data content standard for Geology data

Geology		
Attribute	**Description**	**Data Type**
Geo_ID	Unique ID for geological features	Number
GeologicUnits	Kind of rock of a given age range	String
GeologicStructures	Three-dimensional distribution of rock units	String
GeomorphologicalFeatures	Type of landforms	String
DateCreated	Date of creation of the data	Date
DateRevised	Date of last revision	Date
DataSource	Source of the data	String
SourceDate	Date of the source	Date

4.7.10 Census Data

Census data is information about the population and information describing how human population is spread within an area (population distribution). There are many different kinds of statistical data about human population, such as population density, number of male and female population, average household size, literacy rate of male/female population, etc. This policy document does not intend to provide standards for all these. Table 4.9 below represents the standard data content for Census data, which are standard set of attributes and geometry description and should be used for publication and distribution of census information by information producers and maintainers, however, the content should be updated and maintained depending on the type of information available.

Table 4.9: Data content standard for Census data

Population Distribution		
Attribute	**Description**	**Data Type***
DistrictName	Name of the district [DistrictBoundary]	String
ProvinceName	Name of the province [ProvinceBoundary]	String
PopMale	Total number of male population	Number
PopFemale	Total number of female population	Number
PopSexRatio	Number of males for each female in a population	Double
PopAvgHH	Average household size	Number
PopDensity	Population density per square unit	Double
Child05	Number children below age 5 years	Number
Child18	Number of children between age 5 to 18 years	Number
ChirdMR	Children mortality rate	Double
ChildEAR	Child economic activity rate	Double
EduTLR	Total literacy rate	Double
EduMLR	Male literacy rate	Double
EduFLR	Female literacy rate	Double
EduSchool	Distribution of schools	Number
EduPrimary	Number of primary schools per thousand population	Number
EduSecondary	Number of secondary schools per thousand population	Number
EduHigh	Number of high schools per thousand population	Number
EduTeacherSchool	Teacher - School ratio	Number
GendWomenTeachers	Women teachers at all schools	Number
GendWidow	Proportion of widows	Number
GendWidowr	proportion of widowers	Number
GendDivorce	Proportion of divorced/separated persons	Number
DateCreated	Date of creation of the data	Date
DateRevised	Date of last revision	Date
DataSource	Source of the data	String
SourceDate	Date of the source	Date

4.7.11 Orthoimagery

Photographs and other images taken from airborne or satellite platforms are important means for documenting the surface of the Earth and the state of the environment. However these images have geometrical distortions caused by the optics and the camera/sensor tilt, as well as the differences of the elevations of the Earth‘s surface. Orthorectification is the process of removing these distortions resulting in a specific product: orthoimagery.

Recognising the specific role that orthoimagery may have in the context of Afghanistan in extracting thematic information, mapping, and monitoring the environment, this has been included as a foundation dataset. The Orthoimagery data theme includes imagery from the infrared to ultraviolet region of the electromagnetic spectrum, derived by scanning film positives and negatives, digital airborne and satellite imagery.

The orthoimage coverage may consist of images captured at different times and then orthorectified. By including these mosaic elements, the Orthoimagery data model provides the possibility to spatially represent the data acquisition time of the images that are part of the coverage.

Table 4.9 represents the standard data content for Orthoimagery, which are minimum set of attributes and geometry description for various orthoimages and should be used for publication and distribution of orthoimages by information producers and maintainers.

Table 4.9: Data content standard for Orthoimagery data

Orthoimagery		
Attribute	**Description**	**Data Type***
TileReference	Unique tile reference number	String
SensorName	Name of the satellite sensor	String
NumberBands	Number of bands	Number
AcquisitionDate	Date of acquisition of the data	Date
ProcessedDate	Date of image processing	Date
DateRevised	Date of last revision	Date
DataSource	Source of the data	String
SourceDate	Date of the source	Date
ULX_Coordinate	Upper Left X Coordinate	Double
ULY_Coordinate	Upper Left Y Coordinate	Double
LRX_Coordinate	Lower Right X Coordinate	Double
LRY_Coordinate	Lower Right Y Coordinate	Double

4.8 Metadata Standards

4.8.1 Introduction

A geospatial metadata record is information, presented in a standardized format, which describes a dataset that may represent any of the features in a wide range of geographically referenced data. The government of Afghanistan and its GIS staff recognize the value of valid metadata and will adopt a standard based on the INSPIRE metadata standard for geospatial data.

In recent years, the Afghan GIS communities recognized that most geospatial data managers lacked the time and resources necessary to learn and apply a metadata standard. To address the problem of missing or incomplete metadata records among various government agencies, this policy recommends ways to consistently expand and improve geospatial metadata in Afghanistan that are efficient for the data producer and benefit data users in the discovery and application of geospatial data.

Metadata is required for all geospatial data produced. A significant amount of work and consultation by experts was devoted to the development of the European INSPIRE meta dat model that is now being adopted and mandated by many organisations and governments in Europe. As compared to other metadata standards, like ISO 119115, INSPIRE metadata is simple and provides core information necessary for the users.

4.8.2 Value of Compliant Metadata

Metadata is a set of information that captures and describes the basic characteristics of a data set or an information resource. The metadata record describes the 'who, what, when, where, why and how' of the associated data. Geospatial metadata is commonly used to document geospatial data sets but can also be used to document geospatial resources including mapping applications, data models, and web based services. Metadata records include core library catalogue elements such as title, abstract, and publication date; geographic elements such as spatial extents and projection; and database elements such as attribute label definitions and attribute domain values. Metadata allows users of geospatial data to find the information and data they need and determine how best to use it.

Metadata facilitates:

Data Management

- Preserve data history so the data can be re-used or adapted
- Assess the age and character of data holdings to determine which data should be maintained, updated, or deleted
- Limit data liability by explicitly designating the effective and administrative limits of use of the data Project Management
- Plan and document the data types and content needed to support the project
- Monitor data development by regular review of the process steps completed and recorded within the metadata record

- Provide all project participants a common language of attributes and process methods and a place to record and share progress
- Access the lineage and content of outsourced data production by requiring robust metadata as a contract deliverable

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- Provide all project participants a common language of attributes and process methods and a place to record and share progress
- Access the lineage and content of outsourced data production by requiring robust metadata as a contract deliverable

Due to the business demands listed above, metadata continues to increase in value. The increase of GIS users and government and non-government organisations developing geospatial data extends the use of geospatial data in Afghanistan, but makes it obligatory that these agencies provide compliant metadata in a global environment.

4.8.3 Geospatial Metadata Standards Used to Develop the Profile

Given the increasing number of geospatial metadata standards available and the current shift from the ISO suite of metadata standards to INSPIRE metadata standard, this profile is developed to be easily applied to most geospatial metadata standards.

4.8.4 Implementing Afghan Metadata Profile

The adoption of a new INSPIRE based metadata standard offers an opportunity for agencies that do not currently maintain standardized metadata to engage in compliant practice. Agencies that currently maintain metadata will have an opportunity to transition from their current template to the current standard allowing them to document additional data resources (map services, geospatial models, and applications). Implementing or transitioning metadata standards requires guidance.

The table of elements (Table 4.10) lists and defines the specific mandatory metadata elements identified in this policy as necessary for the effective discovery and application of geospatial data resources.

4.8.5 Recommendations

In an effort to comply with international standards, all the Afghan government agencies are recommended to adopt the INSPIRE compliant metadata standard for cataloguing all geospatial data and resources. The resources contained in this document are intended to assist government agencies with the initial implementation of metadata and the conversion from existing ones for those who currently use other metadata standard.

4.8.6 Geospatial Metadata Profile Elements

Table 4.10 below provides a list of metadata elements considered minimal documentation for the discovery, maintenance, and application of geospatial data. For each element, a

domain for values is specified and best practices are provided to guide users in the effective use of the metadata element.

Table 4.10 - Metadata for Geospatial Data

Category	Element	Best Practice	Example
Item Description	Title	Provide a descriptive, unique, name to convey the nature of the data.	Land Use and Land Cover
	Tags	Provide a set of terms that can be used to search for the resource	Land Use; Land Cover; Agriculture; Food security
	Summary (Purpose)	Provide the summary of the intentions with which the resource was developed. In metadata standards this information is known as the purpose	Support for improving food security assessment; agriculture and rural development planning
	Credits	Provide the name of the organisation or an individual who developed or generated the dataset	Name of the organisation
	Use Limitation	Provide if there is any restrictions applied to use or access the data	Only for internal use
Topics & Keywords	Topics and Keywords	Main theme(s) of the dataset	Environment
Citation	Title	Provide the title/name of the data layer	LandCover_2016
Citation Contact	Name	Provide the name and details of the data technician who is mainly involved in developing this data	Name of the person
	Organisation		Name of the Organisation
	Position		Designation
	Role		Point of Contact
Contacts Manager	Name		Name of the Manager (GIS)
	Organisation		Name of the Organisation
	Position		Designation
	Language	The primary language of information provided in the metadata	English
Maintenance	Update Frequency	The frequency with which the data or metadata is updated	As Needed
Constraints	Security Constraints	Assign the sensitivity of data as per the data classification policy	Internal Data

Annexes

Annex 1- Theme and Sub-theme Code List

S. No.	Theme	Theme Code	Sub Theme	Sub Theme Code
1	Administrative	ADMIN	Admin Boundaries	BND
2	Geographic Names	LOCATION	Name	NAME
3	Transport Networks	TRANSPORT	Road Network	ROAD
			Airport	AIR
			Railways	RAIL
4	Hydrology	HYDRO	Drainage Network	RIVER
			Lakes/Ponds	LAKE
5	Land Cover	LUC	Land use and land cover	LULC
6	Geology	GEO	Geology	GEO
7	Topography	TOPO	Elevation	DEM
8	Cadastral	CAD	Parcels	PARCEL
9	Census	CEN	Demography	POP
10	Raster Images	IMAGE	Topographic Maps	TOP
			Satellite Images	SAT

Annex 2 - Originator Code List

No	Organisation	Code
1	Afghanistan Geo-Informatics Coordinated Committee	AGICC
2	Ministry of Communication and Information Technology	MCIT
3	Ministry of Energy and Water	MOWE
4	Central Statistics Organization	CSO
5	Ministry of Agriculture, Irrigation and Livestock	MAIL
6	Afghanistan Independent Land Authority	ARAZI
7	Ministry of Urban Development and Housing	MUDH
8	Ministry of Public Works	MOPW
9	Kabul Municipality	KM
10	Ministry of Mines and Petroleum	MOMP
11	Ministry of Rural Development and Rehabilitation	MRRD
12	Afghan Geodesy and Cartographic Head Office	AGCHO
13	Afghan National Disaster Management Authority	ANDMA
14	Capital Region Independent Development Authority	CRIDA
15	Independent Directorate of Local Government	IDLG
16	Land Authority	LA
17	Ministry of Counter Narcotics	MOCN
18	Ministry of Economy	MOEC
19	Ministry of Public Health	MOPH
20	Ministry of Finance	MOF
21	Afghanistan Institute of Rural Development	AIRD
22	Ministry of Foreign Affairs	MOFA
23	Ministry of Interior Affairs	MOI
24	Ministry of Commerce and Industries	MOCI
25	Ministry of Education	MOED
26	Ministry of Information and Culture	MOIC
27	Ministry of Higher Education	MOHE
28	Independent Administrative Reform and Civil Service Commission	IARCC
29	Ministry of Labour, Social Affairs, Martyrs & Disabled	MOLSAMD
30	Ministry of Border, Tribal and Ethnic Affairs	MOBTEA
31	Ministry of Refugees and Repatriations	MoRR
32	Ministry of Justice	MoJ
33	Ministry of Transport and Civil Aviation	MoTCA
34	Ministry of Hajj and Islamic Affairs	MoHIA
35	Afghan National Standardisation Authority	ANSA
36	National Security Council	NSC

Annex 3 - Data Classification Code List

S. No.	Data Classification	Classification Code
1	Public	PUB
2	For Internal Use	INT
3	Confidential	CON

Annex 4 – Land Cover Codes and Classes

CODE	LAND COVER CLASS
1A	Settlements/Urban areas.
	This class includes urban areas with gardens.
1B	Non-Urban Built up Areas
	This class includes airports, industrial areas and vegetated areas within large non-urban zones. It also includes parks and large green areas in urban zones.
2A	Fruit Trees
	Tree Crops (Orchards) with surface irrigation.
2B	Vineyards
	Vineyards with surface irrigation.
3A	Intensively cultivated area
	Irrigated Herbaceous Crops inside a very intensively cultivated area. The environmental conditions where this class in found is such that it accommodates two Crops per year.
3A1	Irrigated Herbaceous Crop(s)
	Irrigated Herbaceous Crops. This class can be found in most regions, including dry areas and where the surface water supply is not persistent throughout the year. It can yield one or two Crops per year depending on seasonal variations of water supply.
3B	Marginal Irrigated Crop
	Agricultural lands in a marginal agricultural area, usually devoid of active fields. It also represents the non-active portion of a karez system. The fields, when in use, are predominantly Irrigated Herbaceous Crops.
3C	Karez System
	Herbaceous Crops with surface irrigation derived from an active karez system. Only the active fields, detected in an area where the evidence of karez is present, belong to this class.
4A	Rainfed cultivation in flat areas
	Rainfed cultivation of Herbaceous Crops(Graminoids) in flat (to almost flat) regions.
4B	Rainfed cultivation in sloping land
	Rainfed cultivation of Herbaceous Crops(Graminoids) in sloping/rolling regions.
6A	Closed Trees
	Closed (65 %) Needle leaved Evergreen Trees.
6B	Open Trees
	Open (65-15 %) Needle leaved Evergreen Trees.

CODE	LAND COVER CLASS
6B1	Open Trees Undifferentiated
	Undifferentiated Trees/Woodland with Open(65-15%) cover.
6C	Closed to Open Shrubland
	Shrubland composed of closed to open (100-15 %) Shrubs.
7	Rangeland
	Natural Sparse (15-1 %) dwarf Shrubs OR Open (65-15 %) short Herbaceous vegetation OR Sparse (15-1 %) short Herbaceous vegetation.
8A	Bare Soil OR Rock outcrops
	Bare Soil OR Rock outcrops.
8B	Sandy areas
	Loose And Shifting Sands. This class may be mixed with natural vegetation for very short periods in the rainy season.
8C	Dunes
	Sand Dunes. This class may be mixed with natural vegetation for very short periods in the rainy season.
9A	Marsh (permanently inundated)
	Closed to Open (100-45 %) natural Herbaceous vegetation on a Permanently flooded area.
9B	Seasonally inundated vegetation
	Closed to Open (100-15 %) natural Herbaceous vegetation on a temporarily flooded area OR Closed to Open (100-15 %) natural Shrubs on a temporarily flooded area.
10A	Artificial & Natural Waterbodies
	Perennial standing fresh water bodies, either natural or artificial.
10B	Seasonal Lakes
	Non Perennial Standing Water bodies with duration of water presence less than 4 months. Bare soil surfaces are observed when water is not present.
11	River
	Perennial Rivers. Fresh water flowing more than 9 months/year.
12	River Banks
	This class describes both the area of maximum expansion of a perennial river and the beds of seasonal streams.
13	Perennial snow
	Perennial snow (more than 9 months/year) and glaciers.