Recent updates on Data Content Standards- Soils in NSDI Framework

**NSDI-12**

20\textsuperscript{th} - 21\textsuperscript{st} December, 2012

New Delhi

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(Indian Council of Agricultural Research)

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NSDI Facilitates

- to develop the datasets with uniform protocols.
- fill the data gaps (both spatial and temporal).
- improve the standards in representation of different datasets.
- improve the consistency in datasets to provide the seamless databases.
- develop the standard protocols for data inter-operability.
## FOUNDATION DATA OF NSDI

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Agency/Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coordinate Reference system</td>
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<td>Transportation</td>
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<tr>
<td>3</td>
<td>Orthoimagery</td>
<td>ISRO</td>
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<td>4</td>
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<td>Soils</td>
<td>NBSSLUP</td>
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<td>FSI</td>
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<td>NHO</td>
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<td>9</td>
<td>Land Use</td>
<td>NRSC</td>
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<td>Metrological Surface data</td>
<td>IMD</td>
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<td>11</td>
<td>Physical water bodies</td>
<td>CWC, NHO</td>
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<tr>
<td>12</td>
<td>Ground Water Profile</td>
<td>CGWB</td>
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<tr>
<td>13</td>
<td>Mineral and Energy Resources</td>
<td>GSI</td>
</tr>
<tr>
<td>14</td>
<td>Water quality data</td>
<td>CPCB, CGWB</td>
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<tr>
<td>15</td>
<td>Economic Data</td>
<td>NCAER</td>
</tr>
<tr>
<td>16</td>
<td>Natural Disaster data</td>
<td>NDMA</td>
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</table>
NSDI ELEMENTS

- NSDI Data Content Standards
- NSDI Metadata
- NSDI Nodes and GIS Servers
- NSDI Search and Access Protocols
- NSDI User Interface
Soil Database of NBSS&LUP
Soil Data

- Field Observation
  - Site
  - Morphology

- Laboratory
  - Physico-chemical data

DATA SOURCE

NSDI-12
NSDI-Soils

- Soil mapping unit
- Soil polygons
- Soil profile
- Soil attributes
Soil Resource Database

SITE CHARACTERISTICS
- Climate
- Slope
- Surface form
- Parent material

PHYSICAL PARAMETERS
- Soil depth
- Surface texture
- Soil drainage
- Soil temperature regime
- Water holding capacity

CHEMICAL PARAMETERS
- Calcareousness
- Soil reaction (pH)
- Salinity
- Sodicity
## Details of Soil Resource Database: 1:250,000 Scale

<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
</tr>
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<tbody>
<tr>
<td>Geographical location and extent</td>
<td>State wise</td>
</tr>
<tr>
<td>Theme map name</td>
<td>Soils</td>
</tr>
<tr>
<td>Level of information</td>
<td>Soil great Groups</td>
</tr>
<tr>
<td>Mapping Scale</td>
<td>1:250,000</td>
</tr>
<tr>
<td>Mode (Hard copy/Soft copy/GIS format)</td>
<td>GIS format</td>
</tr>
<tr>
<td>GIS Format</td>
<td>Vector</td>
</tr>
<tr>
<td>If Vector (Point/line/polygon)</td>
<td>Polygon</td>
</tr>
<tr>
<td>Source</td>
<td>NBSS&amp;LUP</td>
</tr>
<tr>
<td>Projection system</td>
<td>Polyconic</td>
</tr>
<tr>
<td>Datum</td>
<td>India-Nepal</td>
</tr>
<tr>
<td>Other spatial information</td>
<td>Modified Everest</td>
</tr>
<tr>
<td>Contents</td>
<td>Soil great Groups</td>
</tr>
<tr>
<td>Year of last update</td>
<td>2008</td>
</tr>
<tr>
<td>Owner of the data</td>
<td>Director, NBSS&amp;LUP</td>
</tr>
<tr>
<td>Contact Person</td>
<td>Director, NBSS&amp;LUP</td>
</tr>
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</table>
NSDI- Data Content Standards
# Formation of Working Group

<table>
<thead>
<tr>
<th>Working Group</th>
<th>Group Chairperson</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metadata Standard</td>
<td>SAC, Ahmedabad</td>
</tr>
<tr>
<td>Data Content Standard</td>
<td>NBSS &amp; LUP, Nagpur</td>
</tr>
<tr>
<td>Interoperability &amp; Data Exchange</td>
<td>FSI, Dehradun</td>
</tr>
<tr>
<td>Cost Recovery Payment Gateways</td>
<td>NRSC, Hyderabad</td>
</tr>
<tr>
<td>Policy, Legal Security, Projection &amp; Transformation</td>
<td>SOI, Hyderabad</td>
</tr>
<tr>
<td>Outreach Communication &amp; Capacity Building</td>
<td>CWC, New Delhi</td>
</tr>
</tbody>
</table>
**NATIONAL SPATIAL DATA INFRASTRUCTURE (NSDI)-Soils**

- **Development of Data Content Standard** for soil resource database.
- **Coordination of Data Content Standard** development activities of other participating institutes.
- **Development of meta data** for different thematic soil datasets.
SOIL RESOURCE DATABASE FOR NSDI

Soil Resource Database
1:250K

Site Characteristics
Soil Morphological Characteristics
Physical Characteristics
Chemical Characteristics
Soil Site Characteristics
### Present Land Use

**Forest**
- Forest with no canopy
- Thin Forest sparse vegetation
- Moderately densely forested and fully stocked
- Dense forest fully stocked with top canopy

**Cultivated**
- Cultivated single crop
- Cultivated double crop
- Cultivated triple crop

**Pasture Land**
- Pasture and grazing land
- Hay Land

**Terraces**
- Poorly bunded
- Poorly terraced
- Benched terraced

**Degraded culturable**
- Gullied and/or ravine land
- Undulating upland with or without scrub
- Surface waterlogged and marsh
- Salt affected land
- Shifting cultivation area
- Degraded forest land
- Degraded pastures/grading land
- Degraded non-forest plantation land
- Strip lands
- Sands
- Mining industrial waste lands

**Degraded unculturable**
- Barren and rocky or stony waste or sheet
- Snow covered and/or glacial area

### Land Capability Class
- Few limitations restrict their use
- Moderate limitations reduce choice of plants or require moderate conservation practices
- Severe limitations reduce choice of plants or special conservation practices are required.
- Very severe limitations restrict choice of plants; special conservation practices are required.
- Not suited to cultivation, little to no erosion hazard, but limitations that limit their use to pasture
- Severe limitations that make them generally unsuitable for agriculture & limit their use to pasture and range
- Very severe limitations make them unsuitable for cultivation & restrict their use.
- Unsuitable for any commercial plant production.

### Land Irrigability Class
- Suitable for irrigated agriculture
- Not irrigable, except under special condition
- Undetermined Suitability for irrigation
- Non irrigable

### Drainage
- Extremely poor
- Very poor
- Poor
- Imperfectly drained
- Moderately well
- Well
- Somewhat Excessive
- Excessive

### Ground Water Depth
- Shallow
- Moderately Shallow
- Moderately Deep
- Deep

### Flooding
- Nil
- Slight
- Moderate
- Severe
- Very Severe

### Natural Vegetation

### Crop Yield
- Present Land Use

### Rock Outcrops

### Sodicity
- Negligible
- Slight
- Strong
- Severe

### Runoff
- Ponded
- Very Slow
- Slow
- Medium
- Rapid
- Very Rapid

### Stoniness (% Sulf Cover)

### Salinity
- Negligible
- Slight
- Moderate
- Strong
- Severe
- Very Severe
# SOIL SITE CHARACTERISTICS

**Observation No, Toposheet No, Photo No, Author And Date Of Examination**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Data Element Name</th>
<th>Short Name</th>
<th>Data Type</th>
<th>Unit Of Measure</th>
<th>Minimum Value</th>
<th>Maximum Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Observation_No</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Follow codification as indicated below (district symbol followed by block, village and profile number).</td>
</tr>
<tr>
<td>2</td>
<td>Toposheet_No</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A toposheet is a shortened name for topographic sheet. They are essentially contain information about an area like roads, railways, settlements, canals, rivers, electric poles, post offices etc.</td>
</tr>
<tr>
<td>3</td>
<td>Photo_No</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The number assigned to the photo, where the photo was captured at the profile site.</td>
</tr>
<tr>
<td>4</td>
<td>Author_And_Date_Of_Examination</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Give the name of the Officer in-charge of the field party and date of observation.</td>
</tr>
<tr>
<td>S.No</td>
<td>Data Element Name</td>
<td>Short Name</td>
<td>Data Type</td>
<td>Unit Of Measure</td>
<td>Minimum Value</td>
<td>Maximum Value</td>
<td>Description</td>
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</tr>
<tr>
<td>5</td>
<td>Location details</td>
<td></td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>Indicate the exact location of the profile on the cadastral map within the survey number and describe the location of the profile with reference to some nearby fixed features.</td>
</tr>
<tr>
<td></td>
<td>Latitude</td>
<td>Lat</td>
<td></td>
<td>Deg, Min, Sec</td>
<td></td>
<td></td>
<td>It is defined with respect to an equatorial reference plane</td>
</tr>
<tr>
<td></td>
<td>Longitude</td>
<td>Long</td>
<td>Character</td>
<td>Deg, Min, Sec</td>
<td></td>
<td></td>
<td>It is defined in terms of meridians which are half circles running from pole to pole</td>
</tr>
<tr>
<td></td>
<td>Village</td>
<td></td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>A group of houses and associated buildings larger than a hamlet and smaller than a town situated in a rural area</td>
</tr>
<tr>
<td></td>
<td>Tehsil</td>
<td>Teh</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>It consists of towns and villages around the towns</td>
</tr>
<tr>
<td></td>
<td>District</td>
<td>Dist</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>A division of territory as a country or state marked off for administrative, electoral or other purposes</td>
</tr>
<tr>
<td></td>
<td>State</td>
<td>St</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>A division of territory as a country marked off for administrative, electoral or other purposes</td>
</tr>
<tr>
<td>S.No</td>
<td>Data Element Name</td>
<td>Short Name</td>
<td>Data Type</td>
<td>Unit Of Measure</td>
<td>Minimum Value</td>
<td>Maximum Value</td>
<td>Description</td>
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<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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<tr>
<td>6</td>
<td>Series_and/or_Local_Name</td>
<td></td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>It is the lowest category in the system. The series is a collection of soil individuals, essentially uniform in differentiating characteristics (like color, texture, structure, consistence, pH, EC) and in arrangement of horizons. It is the series which is most useful for making land use plans of a small area. The series are named after the geographic name of the place where it was first recognized or where they have wide extent of distribution.</td>
</tr>
<tr>
<td>7</td>
<td>Soil_Mapping_legend</td>
<td></td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>Soil Mapping legend are those activities conducted in the field to organize, gather, describe and delineate data needed to provide current and accurate soil maps and interpretations.</td>
</tr>
<tr>
<td>8</td>
<td>Arial Photo Interpretation</td>
<td>API_Unit</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>A method of studying terrain by examining aerial photographs of it, involving detection and identification of the objects photographed determination of their qualitative and quantitative characteristics and recording the graphically, numerically texturally.</td>
</tr>
</tbody>
</table>
## Surface Stoniness

<table>
<thead>
<tr>
<th>S.No</th>
<th>Data Element</th>
<th>S.No</th>
<th>Data Element</th>
<th>S.No</th>
<th>Data Element</th>
<th>S.No</th>
<th>Data Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>Surface Stoniness</td>
<td>-</td>
<td>Character</td>
<td>Per cent</td>
<td>0</td>
<td>&gt;40</td>
<td>The approximate amount of stones and boulders present at the surface</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td>Slight</td>
<td>st1</td>
<td>Character</td>
<td>Per cent</td>
<td>0</td>
<td>15</td>
<td>Stoniness ranges from 0 to 15%</td>
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<tr>
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<td></td>
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<tr>
<td></td>
<td>Moderate</td>
<td>st2</td>
<td>Character</td>
<td>Per cent</td>
<td>15</td>
<td>40</td>
<td>Stoniness ranges from 15 to 40%</td>
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<td></td>
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<tr>
<td></td>
<td>Strong</td>
<td>st3</td>
<td>Character</td>
<td>Per cent</td>
<td>&gt;40</td>
<td>-</td>
<td>Stoniness is greater than 40%</td>
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</tr>
<tr>
<td></td>
<td>Surface Stoniness</td>
<td>-</td>
<td>Character</td>
<td>% Surface cover</td>
<td>0</td>
<td>&gt;75</td>
<td>The approximate amount of stones and boulders present at the surface has to be assessed separately and reported</td>
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<tr>
<td></td>
<td>Character</td>
<td>Per cent</td>
<td>-</td>
<td>&lt;3</td>
<td>Stoniness is less than 3% surface cover</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Character</td>
<td>Per cent</td>
<td>3</td>
<td>15</td>
<td>Stoniness ranges from 3 to 15% surface cover</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Character</td>
<td>Per cent</td>
<td>15</td>
<td>40</td>
<td>Stoniness ranges from 15 to 40% surface cover</td>
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</tr>
<tr>
<td></td>
<td>Character</td>
<td>Per cent</td>
<td>40</td>
<td>75</td>
<td>Stoniness ranges from 40 to 75% surface cover</td>
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</tr>
<tr>
<td></td>
<td>Character</td>
<td>Per cent</td>
<td>&gt;75</td>
<td>-</td>
<td>Stoniness is greater than 75% surface cover</td>
<td></td>
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</tbody>
</table>
Soil Morphological Characteristics
SOIL MORPHOLOGICAL CHARACTERISTICS

Horizon
- Organic Material
- Mineral Horizon
- Bed Rock

Depth
- Very Deep
- Very Shallow
- Shallow
- Moderately Shallow
- Moderately Deep
- Deep
- Extremely Shallow

Boundary
- Abrupt
- Clear
- Gradual
- Diffuse

Distinctness
- Smooth
- Wavy
- Irregular
- Broken

T-Topography

Mottle
- Color (Munsell)
- A-Abundance
  - Few
  - Common
  - Many
- S-Size
  - Fine
  - Medium
  - Coarse

C-Contrast
- Faint
- Distinct
- Prominent

Consistence
- D-Dry
  - Loose
  - Soft
  - Slightly Hard
  - Hard
  - Very Hard
  - Extremely Hard
- M-Moist
  - Loose
  - Very Friable
  - Friable
  - Firm
  - Very Firm
  - Extremely Firm
- W-Wet
  - Non Sticky
  - Slightly Sticky
  - Sticky
  - Very Sticky
  - Non Plastic
  - Slightly Plastic
  - Plastic
  - Very Plastic

Cutans
- Ty-Type
  - Argiilan
  - Farran
  - Mangan
  - Organ
- Th-Thickness
  - Thin
  - Moderately Thick
  - Thick
- Q-Quantity
  - Patchy
  - Broken
  - Continuous

Structure
- S-Size
  - Very Fine
  - Fine
  - Medium
  - Coarse
- G-Grade
  - Structure less
  - Weak
  - Moderate
  - Strong
- Type
  - Granular
  - Crumb
  - Columnar
  - Prismatic
  - Platy
  - Angular
  - Blocky
  - Sub Angular
  - Single Grain
  - Massive
## Soil Morphological Characteristics

<table>
<thead>
<tr>
<th>S.No</th>
<th>Data Element Name</th>
<th>Short Name</th>
<th>Data Type</th>
<th>Unit Of Measure</th>
<th>Minimum Value</th>
<th>Maximum Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Horizon</td>
<td>H</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>Horizon development indicates the extent and degree of soil genesis. It varies widely from soil to soil. In the early stages of soil formation, horizon development may be weak.</td>
</tr>
<tr>
<td></td>
<td>Organic Material</td>
<td>O</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>This layer is dominated by organic material. They consist of undecomposed or partially decomposed litter, deposited on the surface of either mineral or organic soils. The O layer may be present on the surface of a mineral soil or at any depth beneath the surface, if it is buried. A horizon formed by illuviation of organic material into mineral subsoil is not considered as an O horizon.</td>
</tr>
<tr>
<td></td>
<td>Mineral Horizon A</td>
<td>A</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>It is a mineral horizon formed at the surface or below O horizon. They exhibit obliteration of all or much of the original rock structure and show an accumulation of humified organic matter intimately mixed with the mineral fraction. This horizon is not dominated by properties of either E or B horizons or properties resulting from cultivation, pasturing, or similar kinds of disturbance.</td>
</tr>
<tr>
<td></td>
<td>Mineral Horizon E</td>
<td>E</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>Mineral horizon in which the main feature is loss of silicate clay, iron, aluminium, or some combination of these, leaving a concentration of sand and silt particles. These horizons exhibit obliteration of all or much of the original rock structure. This horizon is usually lighter in colour than B and A horizons. The organic matter is normally less than A horizon and occurs commonly near the surface (below O or A horizon and above B horizon).</td>
</tr>
<tr>
<td></td>
<td>Mineral Horizon B</td>
<td>B</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>Horizons that formed below an A, E, or O horizon and are dominated by obliteration of all or much of the original rock structure.</td>
</tr>
<tr>
<td></td>
<td>Mineral Horizon C</td>
<td>C</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>Horizons or layers, excluding hard bedrock, that are little affected by pedogenic processes and lack properties of O, A, E, or B horizons. The material of C layers may be either like or unlike that from which the solum presumably formed. The C horizon has been modified even if there is no evidence of pedogenesis.</td>
</tr>
<tr>
<td></td>
<td>Bed Rock</td>
<td>R</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>The R layer is sufficiently coherent when moist to digging with a spade impractical, although it may be...</td>
</tr>
</tbody>
</table>
# Boundary

<table>
<thead>
<tr>
<th>S.N o</th>
<th>Data Element Name</th>
<th>Short Name</th>
<th>Data Type</th>
<th>Unit Of Measure</th>
<th>Minimum Value</th>
<th>Maximum Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Boundary</td>
<td></td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>A transitional area or layer present between two adjoining horizons or layers is known as the boundary. Boundaries vary in distinctness (contrast) and in topography.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Distinctness is the distance through which one horizon grades into another. It refers to the thickness of the zone within which the boundary can be located. The distinctness depends on the degree of contrast between the layers and thickness of the transitional zone. Distinctness is defined in terms of thickness of the transitional zone.</td>
</tr>
<tr>
<td></td>
<td>Distinctness</td>
<td>D</td>
<td>Character</td>
<td>cm</td>
<td>0.5</td>
<td>&lt;2</td>
<td>Boundary ranges from 0.5 to less than 2 cm</td>
</tr>
<tr>
<td></td>
<td>clear</td>
<td>c</td>
<td>Character</td>
<td>cm</td>
<td>2</td>
<td>&lt;5</td>
<td>Boundary ranges from 2 to less than 5 cm</td>
</tr>
<tr>
<td></td>
<td>gradual</td>
<td>g</td>
<td>Character</td>
<td>cm</td>
<td>&lt;5</td>
<td>15</td>
<td>Boundary ranges from less than 5 to 15 cm</td>
</tr>
<tr>
<td></td>
<td>diffuse</td>
<td>d</td>
<td>Character</td>
<td>cm</td>
<td>&gt;15</td>
<td></td>
<td>Boundary is greater than 15 cm</td>
</tr>
<tr>
<td></td>
<td>b)</td>
<td>T</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>Topography is the lateral undulation and continuity of the boundary between horizons. Topography refers to the irregularities of the surface that divides the horizons.</td>
</tr>
<tr>
<td></td>
<td>smooth</td>
<td>s</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>The boundary is a plane one with few or no irregularities</td>
</tr>
<tr>
<td></td>
<td>wavy</td>
<td>w</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>The boundary has undulations in which depressions are wider than they are deep.</td>
</tr>
<tr>
<td></td>
<td>irregular</td>
<td>i</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>The boundary has pockets that are deeper than they are wide</td>
</tr>
<tr>
<td></td>
<td>broken</td>
<td>b</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>Discontinuous horizons ; discrete but intermingled, or irregular pockets</td>
</tr>
</tbody>
</table>

**NSDI-12**
Soil Physical Characteristics
SOIL PHYSICAL CHARACTERISTICS

Bulk Density → Saturated Hydraulic Conductivity

Texture (USDA)
- Sand
- Loamy fine sand
- Loamy sand
- Sandy loam
- Loam
- Silty loam
- Silt
- Sandy clay loam
- Clay loam
- Silty clay loam
- Sandy clay
- Silty clay
- Clay

Horizon
- Organic Material
- Mineral Horizon
- Bed Rock

Depth
- Very Deep
- Very Shallow
- Shallow
- Moderately Shallow
- Moderately deep
- Deep
- Extremely Shallow

Particle size Class
- Fragmental
- Sandy skeletal
- Loamy skeletal
- Clayey skeletal
- Sandy
- Very Fine
- Coarse loamy
- Fine Loamy
- Coarse silty
- Silty
- Clayey
- Fine
- Loamy

Moisture Retention

Water Holding Capacity

Available Water Capacity
## Depth

<table>
<thead>
<tr>
<th>S.No</th>
<th>Data Element Name</th>
<th>Short Name</th>
<th>Data Type</th>
<th>Unit Of Measure</th>
<th>Minimum value</th>
<th>Maximum Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Depth</td>
<td>D</td>
<td>Float</td>
<td>cm</td>
<td>0</td>
<td>&gt;150</td>
<td>Soil depth indicates the depth of the solum, which includes A and B horizons, occurring above the parent material or hard rock. Depth is measured from the soil surface.</td>
</tr>
<tr>
<td></td>
<td>Extremely Shallow</td>
<td></td>
<td>Float</td>
<td>cm</td>
<td>0</td>
<td>10</td>
<td>Soil depth ranging from 0 to 10 cm</td>
</tr>
<tr>
<td></td>
<td>Very Shallow</td>
<td></td>
<td>Float</td>
<td>cm</td>
<td>10</td>
<td>25</td>
<td>Soil depth ranging from 10 to 25 cm</td>
</tr>
<tr>
<td></td>
<td>Shallow</td>
<td></td>
<td>Float</td>
<td>cm</td>
<td>25</td>
<td>50</td>
<td>Soil depth ranging from 25 to 50 cm</td>
</tr>
<tr>
<td></td>
<td>Moderately Shallow</td>
<td></td>
<td>Float</td>
<td>cm</td>
<td>50</td>
<td>75</td>
<td>Soil depth ranging from 50 to 75 cm</td>
</tr>
<tr>
<td></td>
<td>Moderately deep</td>
<td></td>
<td>Float</td>
<td>cm</td>
<td>75</td>
<td>100</td>
<td>Soil depth ranging from 75 to 100 cm</td>
</tr>
<tr>
<td></td>
<td>Deep</td>
<td></td>
<td>Float</td>
<td>cm</td>
<td>100</td>
<td>150</td>
<td>Soil depth ranging from 100 to 150 cm</td>
</tr>
<tr>
<td></td>
<td>Very Deep</td>
<td></td>
<td>Float</td>
<td>cm</td>
<td>&gt;150</td>
<td></td>
<td>Soil depth &gt; 150 cm</td>
</tr>
</tbody>
</table>
## Particle Size Class

<table>
<thead>
<tr>
<th>S.No</th>
<th>Data Element Name</th>
<th>Short Name</th>
<th>Data Type</th>
<th>Unit Of Measure</th>
<th>Minimum Value</th>
<th>Maximum Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Particle size Class</td>
<td>PSD</td>
<td>Float</td>
<td>Percent</td>
<td></td>
<td></td>
<td>Particle size classes are used only for the family names of terric sub groups of Histosols and Histels. The classes are determined from the properties of the mineral soil materials in the control section through use of the key to particle-size classes. The classes are more generalized than those for soils in other orders.</td>
</tr>
<tr>
<td></td>
<td>Fragmental</td>
<td>G</td>
<td>Float</td>
<td>Percent</td>
<td></td>
<td></td>
<td>A fine earth component of less than 10 per cent (including associated medium and finer pores) of the total volume.</td>
</tr>
<tr>
<td></td>
<td>Sandy skeletal</td>
<td>Z</td>
<td>Float</td>
<td>Percent</td>
<td></td>
<td></td>
<td>A texture (of the fine earth) of sand or loamy sand, including less than 50 percent (by weight) very fine sand in the fine earth fraction.</td>
</tr>
<tr>
<td></td>
<td>Loamy skeletal</td>
<td>K</td>
<td>Float</td>
<td>Percent</td>
<td></td>
<td></td>
<td>Less than 35 percent clay in the fine-earth fraction and a content of rock fragments of 35 percent or more of the total volume.</td>
</tr>
<tr>
<td></td>
<td>Sandy</td>
<td>S</td>
<td>Float</td>
<td></td>
<td></td>
<td></td>
<td>The texture of the fine earth includes sands and loamy sands, exclusive of loamy very fine sand and very fine sand textures; particle &gt;2 mm occupy less than 35% (by volume).</td>
</tr>
<tr>
<td></td>
<td>Clayey Skeletal</td>
<td>P</td>
<td>Float</td>
<td>Percent</td>
<td></td>
<td></td>
<td>A content of rock fragments of 35 percent or more of the total volume.</td>
</tr>
<tr>
<td></td>
<td>Loamy</td>
<td>L</td>
<td>Float</td>
<td>Percent</td>
<td></td>
<td></td>
<td>7 to 27 % clay, 28 to 50 % silt and 52 % or less sand.</td>
</tr>
<tr>
<td></td>
<td>Coarse loamy</td>
<td>R</td>
<td>Float</td>
<td>Percent</td>
<td></td>
<td></td>
<td>A loamy particle size that has 15% or more (by weight) of fine sand (0.25-0.1 mm) or coarser particles, including fragments up to 75 mm, and has less than 18% (by weight) clay in the fine earth fraction.</td>
</tr>
<tr>
<td></td>
<td>Fine Loamy</td>
<td>M</td>
<td>Float</td>
<td>Percent</td>
<td></td>
<td></td>
<td>A loamy particle size that has less than 15% (by weight) of fine sand (0.025-0.1 mm) including fragments up to 75 mm, and has less than 18-35% (by weight) clay in the fine earth fraction.</td>
</tr>
<tr>
<td></td>
<td>Coarse silty</td>
<td>T</td>
<td>Float</td>
<td>Percent</td>
<td></td>
<td></td>
<td>A loamy particle size that has 15% or more (by weight) of fine sand (0.25-0.1 mm) or coarser particles, including fragments up to 75 mm, and has less than 18% (by weight) clay in the fine earth fraction.</td>
</tr>
<tr>
<td></td>
<td>Silty</td>
<td>Y</td>
<td>Float</td>
<td>Percent</td>
<td></td>
<td></td>
<td>80 % or more silt and less than 12 % clay.</td>
</tr>
<tr>
<td></td>
<td>Clayey</td>
<td>C</td>
<td>Float</td>
<td>Percent</td>
<td></td>
<td></td>
<td>A clayey particle size that has 35% or more of the total volume.</td>
</tr>
<tr>
<td></td>
<td>Fine</td>
<td>F</td>
<td>Float</td>
<td>Percent</td>
<td></td>
<td></td>
<td>A clayey particle size that has 35-60% (by weight) clay.</td>
</tr>
</tbody>
</table>
Soil Chemical Characteristics
SOIL CHEMICAL CHARACTERISTICS

Soil reaction (pH)
- Strongly acidic
- Moderately acidic
- Slightly acidic
- Neutral
- Slightly alkaline
- Moderately alkaline
- Strongly alkaline

Salinity
- Negligible
- Slight
- Moderate
- Moderately Strong
- Strong
- Severe
- Very Severe

Sodicity
- Negligible
- Slight
- Strong
- Severe

Depth
- Very Deep
- Very Shallow
- Shallow
- Moderately Shallow
- Moderately deep
- Deep
- Extremely Shallow

Horizon
- Organic Material
- Mineral Horizon

Calcium Carbonate

Electrical Conductivity

Extractable Nutrients
- Nitrogen
- Phosphorous
- Potassium
- Sulphur
- Calcium
- Magnesium
- Boron
- Manganese
- Zinc
- Iron
- Copper

Cation Exchange Capacity
- Calcium
- Magnesium
- Sodium
- Potassium
- Aluminium
- Hydrogen

Extractable Cations
- Calcium
- Magnesium
- Sodium
- Potassium

Base saturation Percent

Organic Carbon

Sum Of Cations

Exchangeable Sodium Percentage
### SOIL CHEMICAL CHARACTERISTICS

#### Horizon

<table>
<thead>
<tr>
<th>S.No</th>
<th>Data Element Name</th>
<th>Short Name</th>
<th>Data Type</th>
<th>Unit Of Measure</th>
<th>Minimum value</th>
<th>Maximum Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Horizon</td>
<td>H</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>Horizon development indicates the extent and degree of soil genesis. It varies widely from soil to soil. In the early stages of soil formation, horizon development may be weak.</td>
</tr>
<tr>
<td></td>
<td>Organic Material</td>
<td>O</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>This layer is dominated by organic material. They consist of undecomposed or partially decomposed litter, deposited on the surface of either mineral or organic soils. The O layer may be present on the surface of a mineral soil or at any depth beneath the surface, if it is buried. A horizon formed by illuviation of organic material into mineral subsoil is not considered as an O horizon.</td>
</tr>
<tr>
<td></td>
<td>Mineral Horizon</td>
<td>A</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>It is a mineral horizon formed at the surface or below O horizon. They exhibit obliteration of all or much of the original rock structure and show an accumulation of humified organic matter intimately mixed with the mineral fraction. This horizon is not dominated by properties of either E or B horizons or properties resulting from cultivation, pasturing, or similar kinds of disturbance.</td>
</tr>
<tr>
<td></td>
<td>Mineral Horizon</td>
<td>E</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>Mineral horizon in which the main feature is loss of silicate clay, iron, aluminium, or some combination of these, leaving a concentration of sand and silt particles. These horizons exhibit obliteration of all or much of the original rock structure. This horizon is usually lighter in colour than B and A horizons. The organic matter is normally less than A horizon and occurs commonly near the surface (below O or A horizon and above B horizon).</td>
</tr>
<tr>
<td></td>
<td>Mineral Horizon</td>
<td>B</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>Horizons that formed below an A, E, or O horizon and are dominated by obliteration of all or much of the original rock structure.</td>
</tr>
<tr>
<td></td>
<td>Mineral Horizon</td>
<td>C</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>Horizons or layers, excluding hard bedrock, that are little affected by pedogenic processes and lack properties of O, A, E, or B horizons. The material of C layers may be either like or unlike that from which the solum presumably formed. The C horizon may have been modified even if there is no evidence of pedogenesis.</td>
</tr>
<tr>
<td></td>
<td>Bed Rock</td>
<td>R</td>
<td>Character</td>
<td></td>
<td></td>
<td></td>
<td>The R layer is sufficiently coherent when moist to make hand digging with a spade impractical, although it may be chipped or scrapped.</td>
</tr>
</tbody>
</table>
## Depth

<table>
<thead>
<tr>
<th>S.No</th>
<th>Data Element Name</th>
<th>Short Name</th>
<th>Data Type</th>
<th>Unit Of Measure</th>
<th>Minimum Value</th>
<th>Maximum Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Depth</td>
<td>D</td>
<td>Float</td>
<td>cm</td>
<td>0</td>
<td>&gt;150</td>
<td>Soil depth indicates the depth of the solum, which includes A and B horizons, occurring above the parent material or hard rock. Depth is measured from the soil surface.</td>
</tr>
<tr>
<td></td>
<td>Extremely Shallow</td>
<td>Float</td>
<td>cm</td>
<td>0</td>
<td>10</td>
<td></td>
<td>Soil depth ranging from 0 to 10 cm</td>
</tr>
<tr>
<td></td>
<td>Very Shallow</td>
<td>Float</td>
<td>cm</td>
<td>10</td>
<td>25</td>
<td></td>
<td>Soil depth ranging from 10 to 25 cm</td>
</tr>
<tr>
<td></td>
<td>Shallow</td>
<td>Float</td>
<td>cm</td>
<td>25</td>
<td>50</td>
<td></td>
<td>Soil depth ranging from 25 to 50 cm</td>
</tr>
<tr>
<td></td>
<td>Moderately Shallow</td>
<td>Float</td>
<td>cm</td>
<td>50</td>
<td>75</td>
<td></td>
<td>Soil depth ranging from 50 to 75 cm</td>
</tr>
<tr>
<td></td>
<td>Moderately deep</td>
<td>Float</td>
<td>cm</td>
<td>75</td>
<td>100</td>
<td></td>
<td>Soil depth ranging from 75 to 100 cm</td>
</tr>
<tr>
<td></td>
<td>Deep</td>
<td>Float</td>
<td>cm</td>
<td>100</td>
<td>150</td>
<td></td>
<td>Soil depth ranging from 100 to 150 cm</td>
</tr>
<tr>
<td></td>
<td>Very Deep</td>
<td>Float</td>
<td>cm</td>
<td>&gt;150</td>
<td></td>
<td></td>
<td>Soil depth &gt; 150 cm</td>
</tr>
</tbody>
</table>
Development of metadata for soil resources as per the NSDI standards under NDSI framework

Creation of NSDI node for development of Soil Resources Data Infrastructure under NDSI framework

Associated in NSDI Working Groups on Meta data, Data Content Standards and Metadata Delivery Protocols.
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Page No.</th>
<th>Data Element</th>
<th>Existing text</th>
<th>Remarks</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Page 8</td>
<td>Alluvium</td>
<td>Transported material by water</td>
<td>Sediment deposited by flowing water, as in a riverbed, flood plain, or delta.</td>
<td>Accepted</td>
</tr>
<tr>
<td>2</td>
<td>Page 8</td>
<td>Colluvium</td>
<td>Transported material by mass movement or gravity and local wash</td>
<td>A loose deposit of rock debris accumulated through the action of gravity at the base of a cliff or slope.</td>
<td>Accepted</td>
</tr>
<tr>
<td>3</td>
<td>Page 8</td>
<td>Granite</td>
<td>Residual or in place or in-situ deposits</td>
<td>A light-coloured coarse-grained acid plutonic igneous rock consisting of quartz, feldspars, and such ferromagnesian minerals as biotite or hornblende: widely used for building</td>
<td>Accepted</td>
</tr>
<tr>
<td>S. No.</td>
<td>Page No.</td>
<td>Data Element</td>
<td>Existing text</td>
<td>Remarks</td>
<td>Decision</td>
</tr>
<tr>
<td>-------</td>
<td>----------</td>
<td>--------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>4</td>
<td>Page 8</td>
<td>Gneiss</td>
<td>Metamorphic rocks resulted from profound alteration of igneous and sedimentary rocks by heat and pressure</td>
<td>Metamorphic rock formed by high-grade regional metamorphic processes from pre-existing formations that were originally either igneous or sedimentary rocks</td>
<td>Accepted</td>
</tr>
<tr>
<td>5</td>
<td>Page 8</td>
<td>Schist</td>
<td>Metamorphic rocks resulted from profound alteration of igneous and sedimentary rocks by heat and pressure</td>
<td>Metamorphic rocks, chiefly notable for the preponderance of lamellar minerals such as micas, chlorite, talc, hornblende, graphite, and others.</td>
<td>Accepted</td>
</tr>
<tr>
<td>6</td>
<td>Page 8</td>
<td>Basalt</td>
<td>Residual or in place or in-situ deposits.</td>
<td>A hard, dense, dark volcanic igneous rock composed chiefly of plagioclase, pyroxene, and olivine, and often having a glassy appearance</td>
<td>Accepted</td>
</tr>
<tr>
<td>S. No.</td>
<td>Page No.</td>
<td>Data Element</td>
<td>Existing text</td>
<td>Remarks</td>
<td>Decision</td>
</tr>
<tr>
<td>--------</td>
<td>----------</td>
<td>----------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>7</td>
<td>Page 9</td>
<td>Marine sediment</td>
<td>Transported Material by water</td>
<td>Sediments that accumulate in the abyssal plain of the deep ocean.</td>
<td>Accepted</td>
</tr>
<tr>
<td>8</td>
<td>Page 9</td>
<td>Orthogneiss/paragneiss</td>
<td>See page 9 of Data Content Standard – Soil. under the data element name and the description columns</td>
<td>Metamorphic rock formed as the result of change, or metamorphosis, of such igneous rocks as class granites and quartz diorites. Orthogneiss is distinguished from paragneiss, which derives from sedimentary rock.</td>
<td>Accepted</td>
</tr>
<tr>
<td>9</td>
<td>Page 9</td>
<td>Quartzite</td>
<td></td>
<td>Metamorphic rock composed of firmly cemented quartz grains</td>
<td>Accepted</td>
</tr>
<tr>
<td>S. No.</td>
<td>Page No.</td>
<td>Data Element</td>
<td>Existing text</td>
<td>Remarks</td>
<td>Decision</td>
</tr>
<tr>
<td>--------</td>
<td>----------</td>
<td>-----------------------</td>
<td>--------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Page 7</td>
<td>Soil Mapping legend</td>
<td>Table.1 - Soil mapping legend may be replaced by Soil Mapping unit.</td>
<td>It will be Soil Mapping Legend</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Page 9</td>
<td>Quartzite</td>
<td>Description is missing for quartzite under parent material.</td>
<td>Metamorphic rock composed of firmly cemented quartz grains</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Page 13</td>
<td>Slope gradient (%)</td>
<td>Slope gradient (%) (S.No.17) - the data type could be integer.</td>
<td>Since slope data is providing in coded form, it will be in Character</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Page 22</td>
<td>Rock out crops</td>
<td>Rock out crops (S.No.27) - Data Type not mentioned.</td>
<td>Character</td>
<td></td>
</tr>
</tbody>
</table>
DATA EXCHANGE- STNADARDS

• Automatic exchange of datasets amongst different systems necessitating to define the standards.

• It is necessary to standardize data elements, exchange formats, networks and software interfaces, etc.

• There is a need to standardize the content of the NSDI nodes, database design and creation processes, network protocols, and exchange/transfer of spatial data sets.
Purpose of the Data Content Document

- To provide common definitions for geospatial data to facilitate the effective use.
- To standardize attributes, which will enhance data sharing.
- To resolve discrepancies related to the use of homonyms and synonyms in the datasets.
- To provide standardized attributes and definitions.
- Data inter-operability for many applications services
THE NSDI STANDARD

• Under NSDI framework major efforts are on in standardizing data content and schemas, designing and processing, network protocols, exchange and transfer data.

• The NSDI standard would have to be developed and should cover:
  • Content standardization
  • Design and process standardization
  • Network protocols standards
  • Exchange and transfer standard
  • NSDI Quality standards
Scope of Data Standard Document

This deliverable identifies definitions and scope of spatial data themes. For each spatial data themes, the document provides:

- **Definition** – brief explanation
- **Description** – explains the spatial data theme in more detail
- **Scope, Use examples** - Provide prominent use examples, which are in compliance to National policies.
- **Important feature types and attributes** – this is a non-exhaustive list of the most prominent feature types and attributes.
- **Overlaps and links with other themes** - known overlap with and/or dependencies from other spatial data themes.
Thank you